

M. HOEFT.
TACHOMETER.

APPLICATION FILED SEPT. 7, 1910.

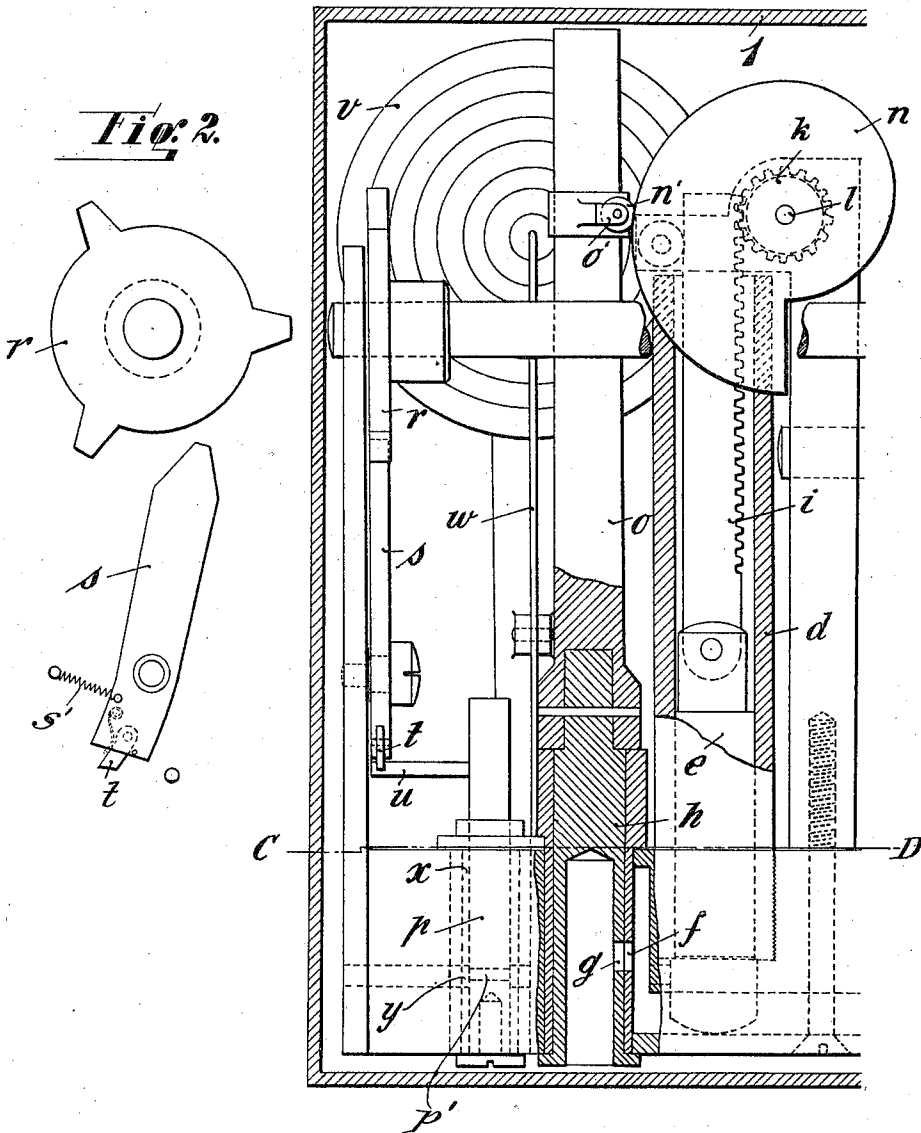
1,038,751.

Patented Sept. 17, 1912.

4 SHEETS—SHEET 1.

Fig. 1.

Fig. 2.



Witnesses:
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L. J. Murphy

Inventor:
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by James L. Lape
his Attorney.

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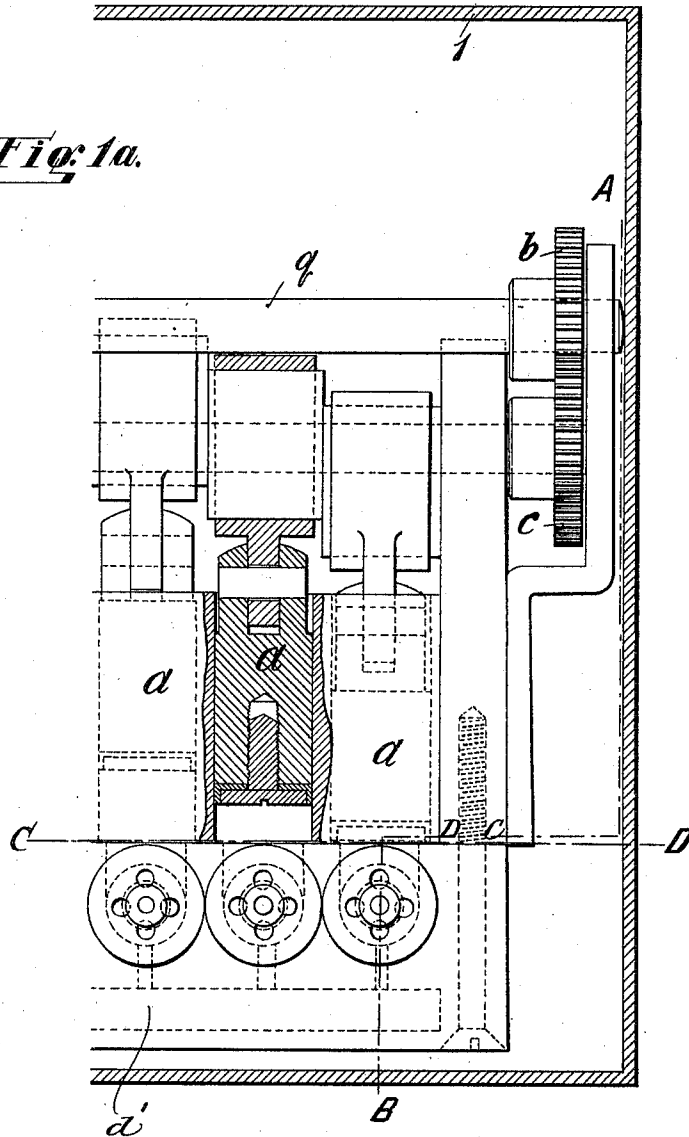
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4 SHEETS—SHEET 2.

Fig. 1a.



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4 SHEETS—SHEET 3.

Fig. 3.

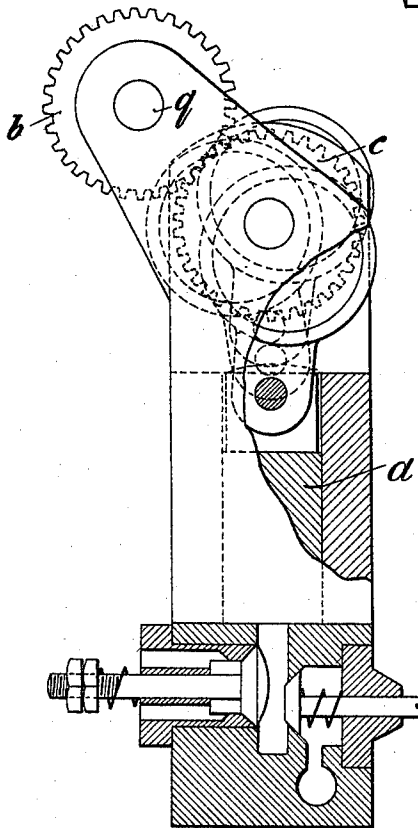
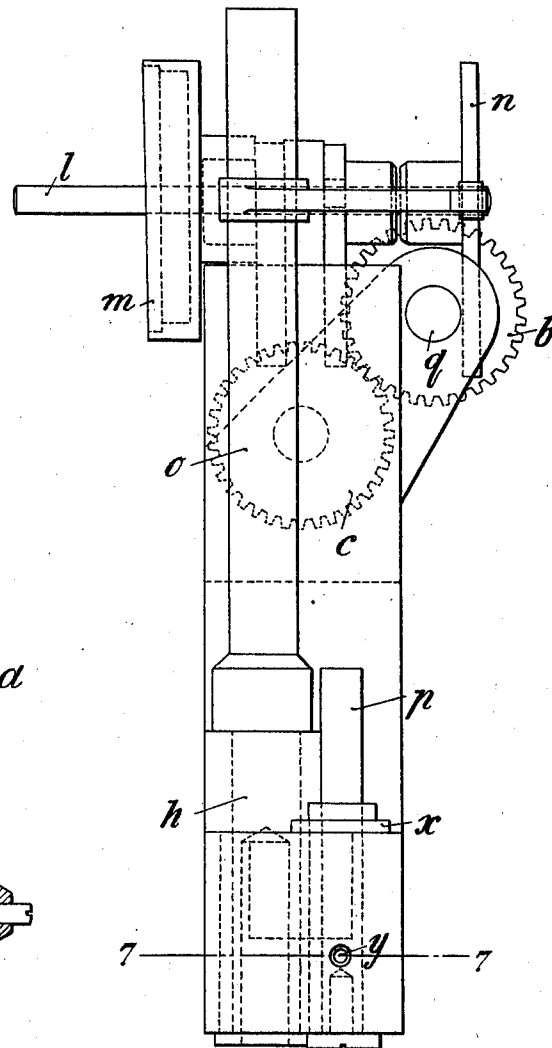


Fig. 4.



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4 SHEETS—SHEET 4.

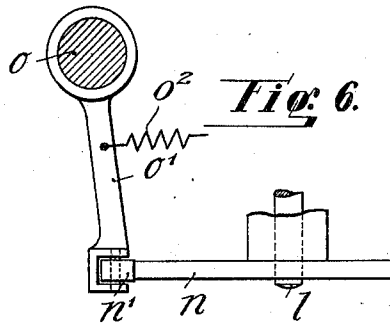


Fig. 5.

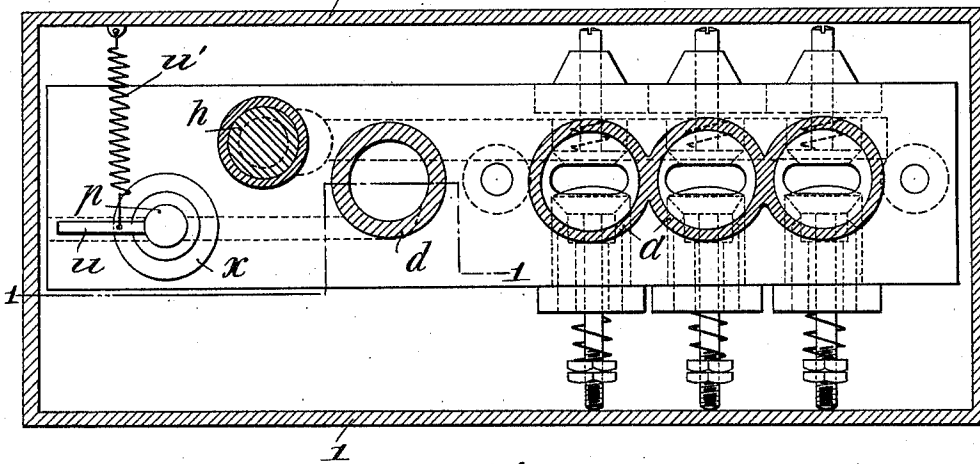
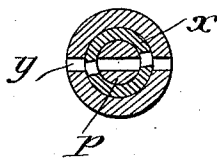


Fig. 7.



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UNITED STATES PATENT OFFICE.

MAX HOEFT, OF BERLIN, GERMANY.

TACHOMETER.

1,038,751.

Specification of Letters Patent.

Patented Sept. 17, 1912.

Application filed September 7, 1910. Serial No. 580,857.

To all whom it may concern:

Be it known that I, MAX HOEFT, a subject of the King of Prussia, residing at Berlin, in the Kingdom of Prussia and German
5 Empire, have invented new and useful Improvements in Tachometers, of which the following is a specification.

My invention relates to a tachometer of the kind in which one or more pumps force
10 a liquid into an apparatus resembling an accumulator (hereinafter called an accumulator) the outlet opening of which is automatically opened more or less, according to the speed at which the pump is driven, so
15 that the height of the piston in the accumulator will depend on, and will serve to indicate, said speed. In apparatus of this kind it has been found that the piston, on the speed decreasing, cannot retreat sufficiently quickly. Further, the valve by
20 which the outlet is regulated is prevented, apparently owing to compression of the fluid, from returning with the necessary speed. In order to overcome these drawbacks of existing apparatus, one or more
25 auxiliary openings are provided in the accumulator, which openings, according to the speed, are opened either for a longer or shorter time, or, as experience has shown
30 to be better, more or less frequently.

On the drawing the invention is illustrated by way of example.

Figures 1 and 1^a together represent a side elevation partly in section on line 1, 1,
35 Fig. 5 of the tachometer, the casing being shown entirely in section, Fig. 2, an elevation of the pawl gearing at the right end of Fig. 1, Fig. 3, a section on A—B in Fig. 1^a, Fig. 4, an end elevation the casing not being shown in Figs. 3 and 4. Fig. 5 is a section on line C—D of Fig. 1, and on line
40 C—D of Fig. 1^a, and Fig. 6 is a plan of the lever for operating the main valve, and Fig. 7 is a detail horizontal section on line 7, Fig. 4.

The pumps *a* are driven by the machine, vehicle, or the like, the speed of which has to be measured, through the agency of the spur wheels *b*, *c* and force the fluid contained in
50 the casing I which incloses the whole apparatus through the passage *d'* into the cylinder *d*, so that it acts on the piston *e* contained therein. Near the bottom end of the cylinder *d* is situated the main outlet *f*,

which corresponds more or less with an
55 opening *g* of the valve *h*. The valve is moved by the piston *e*. For this purpose the piston is connected with a toothed rack *i*, which engages in the toothed wheel *k* fastened to the spindle *l*, to the ends of which
60 are fastened the spring case *m* and cam disk *n*. The spring in the case *m* has the tendency to depress the piston and is wound up by the piston rising. Against the cam *n* is pressed by a spring *o*² a roller *n'* which is attached to the arm *o'* secured on the spindle
65 *o*, so that the valve *h* is turned more or less according to the angular position of the cam *n*. On the speed decreasing, the liquid, as experience has shown, cannot escape quickly
70 enough out of the cylinder *d* to enable the piston *e* to descend and turn the toothed wheel *k* in exact accordance with the fall of speed. Moreover the liquid also prevents
75 the valve *g* from turning back even to the amount which will keep the roller *n'* in contact with the cam *n*. This drawback is effectually overcome by providing the auxiliary valve *p*, which is opened periodically by
80 the pawl *t* on the lever *s* striking against the arm *u* attached to the spindle of said valve. The lever *s* is oscillated by the tappet disk *r* on the shaft *q*, said shaft being driven by the spur-wheel *b*. By the tappets on the disk *r*
85 the lever *s* is moved in one direction, while it is returned by the spring *s'*. A spring *u'* closes the valve *p* as soon as the pawl *t* slips over the arm *u*. The area of the auxiliary valve opening is much less than that of the principal valve, but suffices to give the piston
90 and main valve the required relief when the speed falls.

Most fluids are influenced by changes of temperature, so that the height of the piston for a certain speed will be different at different temperatures. In order to overcome
95 this drawback a closed box *v* containing ether can be provided in the fluid. When the temperature rises the ether-box, or the like, expands, while it is contracted when
100 the temperature falls. This movement is transferred by the lever *w* to a sleeve *x* of the auxiliary valve which is provided with an outlet opening *y*, that corresponds more or less with the opening *p'* in the valve
105 *p*, so that according as the sleeve *x* is moved by the lever *w* through a larger or smaller angle the effective valve-opening *p'* is larger

or smaller. In this way the influence of the temperature on the fluid can be counteracted.

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

5 1. A tachometer comprising a pump, a cylinder communicating therewith and having a main outlet and an auxiliary outlet, means adapted to regulate the effective size
10 of the main outlet according to the position of the piston in said cylinder, and automatic means adapted to continuously open and close said auxiliary outlet.

15 2. A tachometer comprising a pump, a cylinder communicating therewith and having a main larger outlet opening and an auxiliary smaller outlet opening, a main valve adapted to control the larger outlet opening, an auxiliary valve adapted to control the smaller outlet opening, means adapted
20 to open said main valve to a greater or less extent according to the position of the piston in said cylinder, and mechanism

adapted to open and close said auxiliary valve.

3. A tachometer comprising a casing containing fluid, a pump in said casing, a cylinder communicating therewith and having a large or main outlet-opening, a small auxiliary outlet-opening, means adapted to regulate the effective size of the main outlet-opening according to the position of the piston in said cylinder, an expansion-box located in said casing, and a valve adapted by mechanical connection with said box to be adjusted by the same according to the temperature of the fluid in the casing. 25 30 35

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MAX HOEFT.

Witnesses:

WOLDEMAR HAUPT,
HENRY HASPER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
