M. HOEFT.

TACHOMETER.

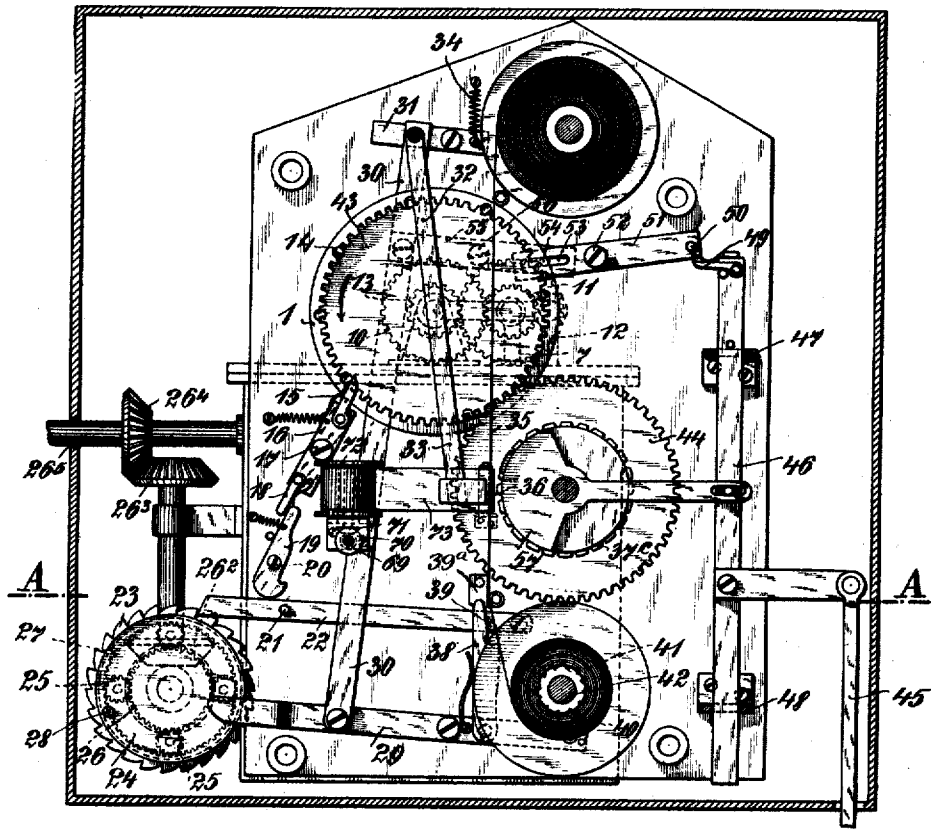
APPLICATION FILED AUG. 19, 1908.

1,005,035.

Patented Oct. 3, 1911.

7 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

J. P. Davis

C. E. Holske

INVENTOR

Max Hoeft

BY

Munn & Co

ATTORNEYS

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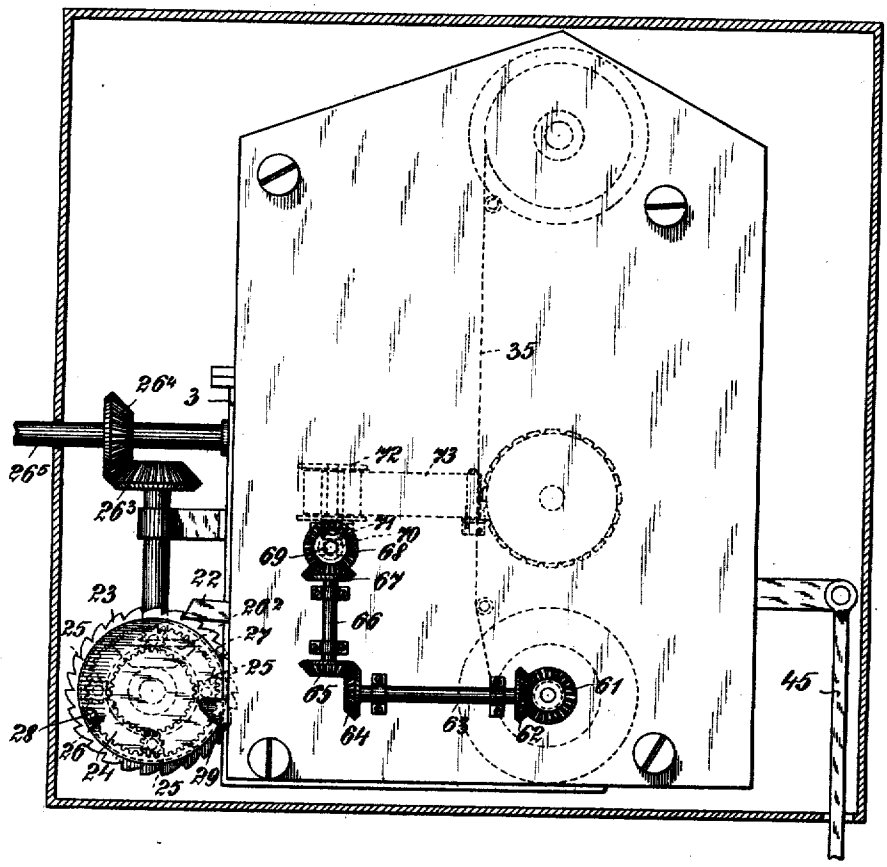
7 SHEETS—SHEET 2.

Fig. 2.



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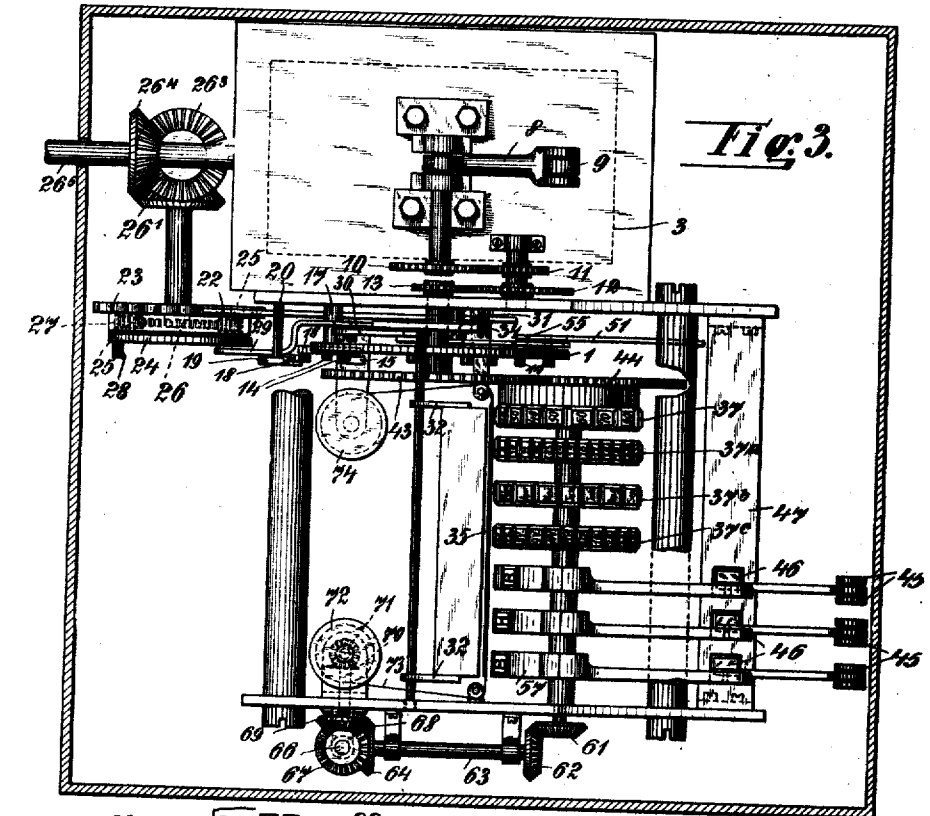


Fig. 3.

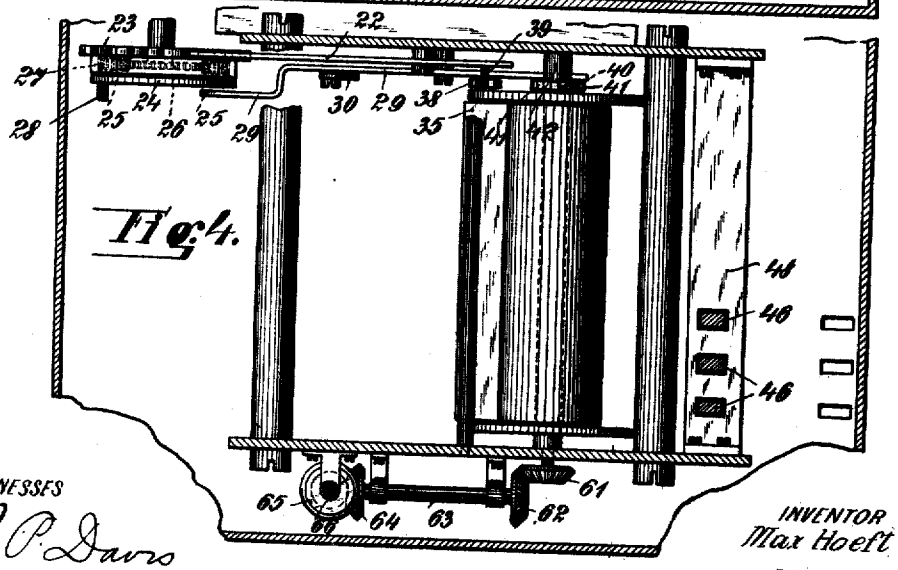


Fig. 4.

WITNESSES

J. P. Davis

C. E. Wolcke

INVENTOR

Max Hoeft

BY

ATTORNEYS

M. HOEFT.

TACHOMETER.

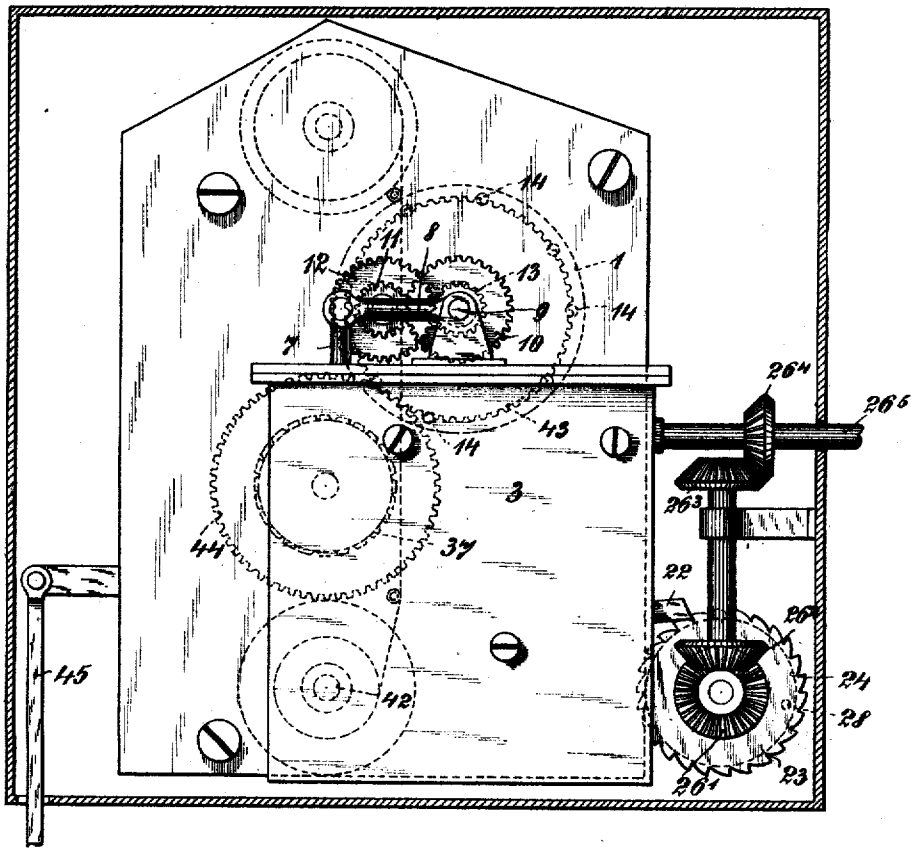
APPLICATION FILED AUG. 10, 1908.

1,005,035.

Patented Oct. 3, 1911.

7 SHEETS—SHEET 4.

Fig. 5.



WITNESSES

J. P. Davis

C. E. Wolcke

INVENTOR

Max Hoeft

BY

Munn & Co

ATTORNEYS

M. HOEFT.

TACHOMETER.

APPLICATION FILED AUG. 19, 1908.

1,005,035.

Patented Oct. 3, 1911.

7 SHEETS—SHEET 6.

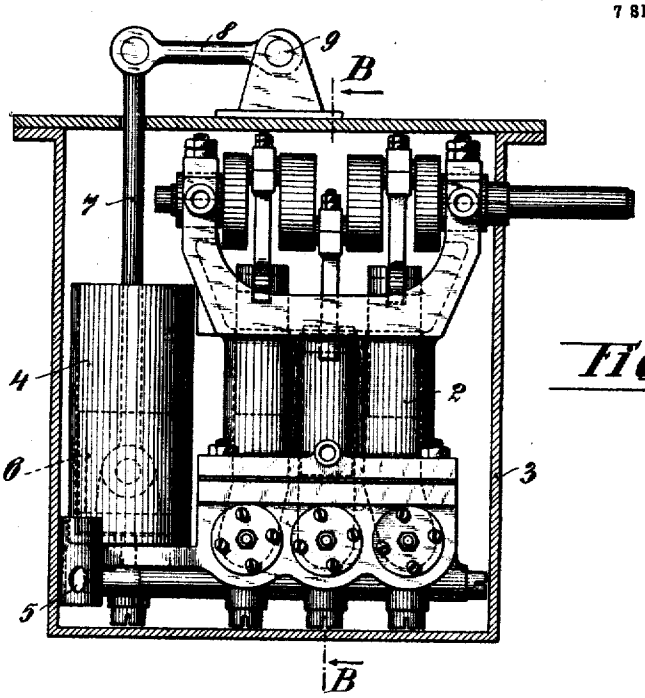


Fig. 6.

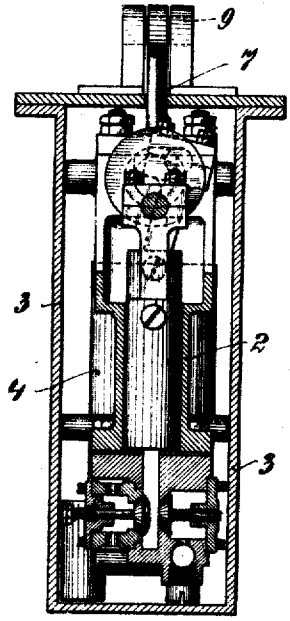


Fig. 7.

WITNESSES

J. P. Davis

C. E. Wolcke

INVENTOR

Max Hoeft

BY Munn & Co

ATTORNEYS

M. HOEFT.

TACHOMETER.

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7 SHEETS—SHEET 6.

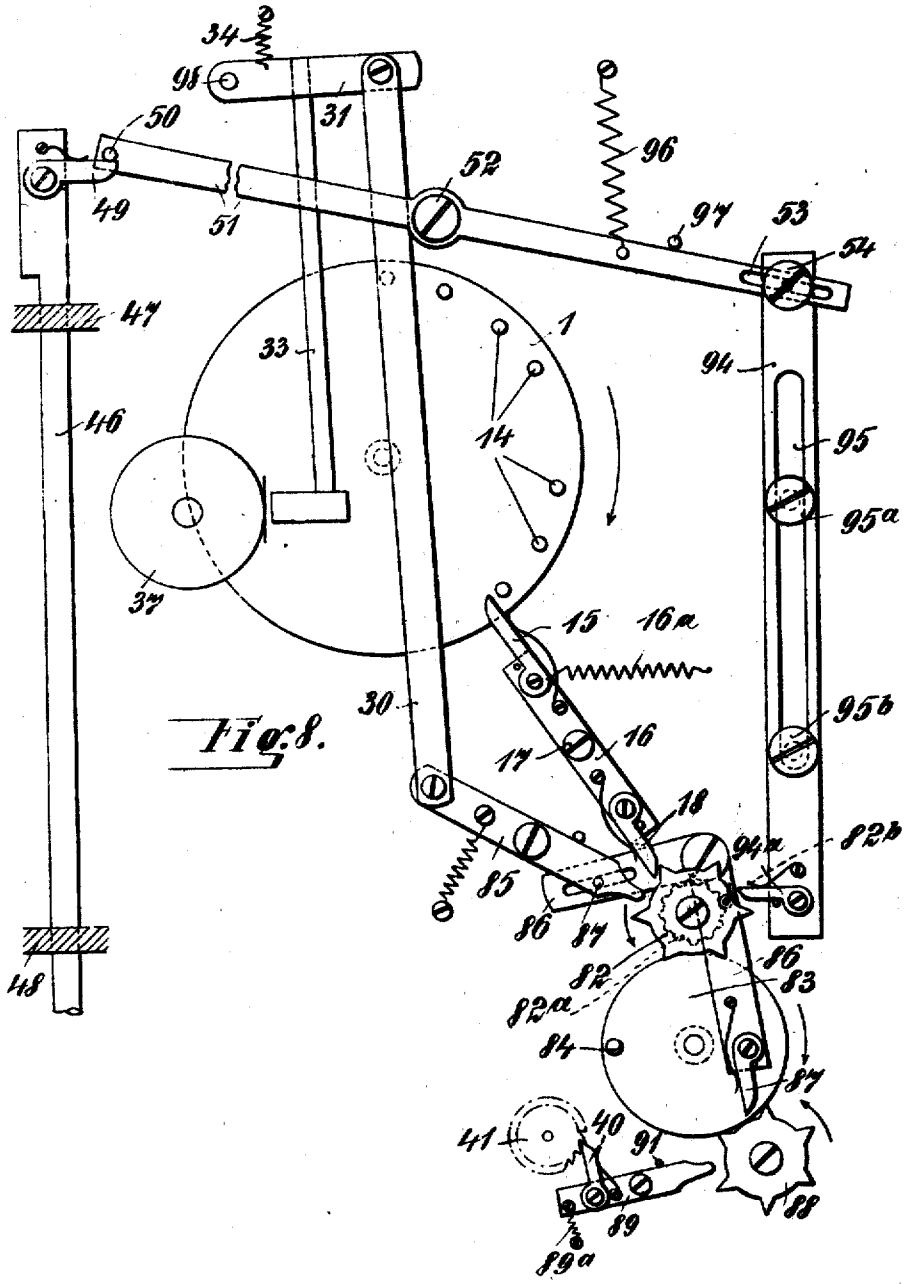

Fig. 8.

WITNESSES

J. P. Davis

C. E. Holske

INVENTOR

Max Hoeft

BY

Munn & Co

ATTORNEYS

M. HOEFT.

TACHOMETER.

APPLICATION FILED AUG. 19, 1908.

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7 SHEETS—SHEET 7.

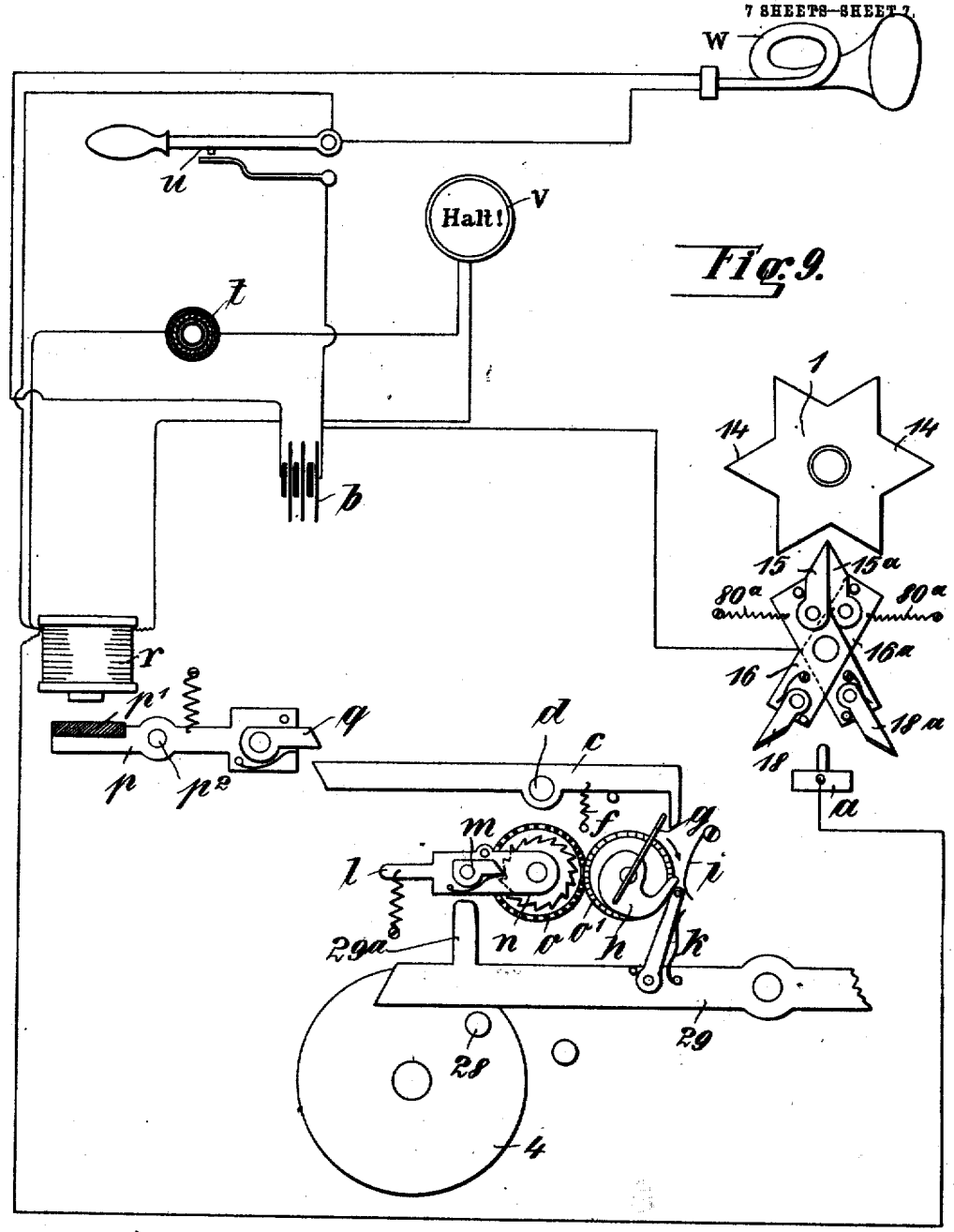

Fig. 9.

WITNESSES

J. P. Davis

C. E. Wolcott

INVENTOR

Max Hoeft

BY Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

MAX HOEFT, OF BERLIN, GERMANY.

TACHOMETER.

1,005,035. Specification of Letters Patent. Patented Oct. 3, 1911.

Application filed August 19, 1908. Serial No. 449,295.

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 Empire, have invented new and useful Improvements in Tachometers, of which the following is a specification.

My present invention relates to improvements in tachometers etc. of the kind in which the speed of the vehicle or the like is recorded, or printed, either periodically or on changing the speed, or on operating any one or more parts of the vehicle or motor, such as the brake, steering wheel.

According to my invention the actual printing motion, for example the pressing of the type against the paper, or the like, on which the record is to be made, is not carried out by a clockwork spring or weight adapted to be wound up periodically, but either by coupling the printing mechanism with a shaft, or some other part, driven by the motor or by the force of the person moving some operative part of the vehicle or motor. The printing is thus effected with the greatest certainty and there is no possibility of the apparatus failing to operate owing to insufficient force being available as can occur when a clockwork spring is used. Further, the complicated mechanism heretofore necessary, in order to automatically wind up a clockwork spring is now avoided.

In the accompanying drawing illustrating my invention by way of example Figure 1 is a front elevation of the entire apparatus after removing the front plate of the clockwork as well as the front end disk of the paper roll and showing the casing in section. Fig. 2 a similar view showing the front plate in position. Fig. 3 a plan after removing the top plate and the upper paper roll, Fig. 4 a horizontal section on the line A—A in Fig. 1, Fig. 5, a back elevation showing the casing in section, Fig. 6, a vertical section of the pump used by way of example as speed indicator, Fig. 7, a cross section on the line B—B in Fig. 6, Fig. 8, a diagrammatic view of another construction of the mechanism for connecting the printing apparatus with the part driven by the motor, and Fig. 9, a diagrammatic view of an electric device to couple the printing device with the motor driven part.

The disk 1 is rotated to and fro, according as the speed of the vehicle or the like increases or decreases, by a pump 2, which comprises three cylinders, which suck oil or some other liquid contained in the casing 3 and force the same into the cylinder 4, from which it can escape through the opening 5 into the casing 3 again. The piston 6 in said cylinder 4 is raised therefore more or less according to the speed at which the pumps 2 are operated, and the piston rod 7 turns the link 8 about the spindle 9, on which is secured a spur-wheel 10. Said spur-wheel 10 drives the smaller spur-wheel 11, to which is secured a larger spur-wheel 12 engaging with the smaller spur-wheel 13 attached to the disk 1. It will be seen therefore that the gearing 10—13 will exaggerate the motion given to the piston 6, so that a comparatively small movement of said piston will turn the disk 1 through a comparatively large angle. To the disk 1 are secured pins 14 into the path of which projects the pawl 15, pivotally secured to the lever 16, which is adapted to turn about the screw 17, to the lower end of which lever is pivotally secured the pawl 18, which bears against the upper end of the lever 19 adapted to turn about 20, the lower end of which lever 19 has a hook form and normally holds the pin 21 attached to the lever 22. Said lever 22 is thus kept normally out of engagement with the toothed crown 23 of a sun and planet gear and as a consequence the front disk 24 of this sun and planet gear, which disk carries the pinions 25 engaging in the central spur-wheel 26 and in the internal teeth 27 of the crown, remains stationary, so that the pin 28 secured to the disk 24 is also stationary. The central spur-wheel 26 of the sun and planet gear is driven continuously by the motor or vehicle through the agency of the spur-wheels 26^1, 26^2, 26^3, 26^4 and shaft 26^5. If, now, one of the pins 14 of the disk 1, owing to the speed reaching a certain limit, strike against the pawl 15 in the direction of the arrow, the lever 16 will be turned about 17, and, as soon as the pin 14 slips past the pawl 15, the lever 16 will be returned into its first position, so that the pawl 18 will strike the upper end of the lever 19, which will therefore be turned about the pin 20 and the pin 21 will be released, so that the lever 22 can fall into engagement with the teeth 23. The disk 24 of the sun and planet gear, which was formerly stationary, will therefore now be rotated, so that the pin 28 will raise the lever 29. Said lever 29 is connected by the rod

30 with the lever 31 pivoted at 32 and carrying the hammer 33. As soon as the pin 28 leaves the lever 29 this lever will fall and the hammer 33 will be struck suddenly owing to the action of the spring 34 against the paper 35 and press the same against the type ribbon 36, so that the type of the type wheels $37, 37^a, 37^b, 37^c$ and type segments hereinafter explained will be printed on the paper. In falling the lever 29 will raise the pawl 38 secured thereto into contact with the pin 39 secured to the lever 22, so that this lever will be raised sufficiently high to enable the pin 21 to come into engagement with the hooked end of the lever 19. A stop 39^a is arranged to arrest the lever 22 so that it cannot rise higher than sufficient to allow engagement of pin 21 with hook 19. The toothed crown of the sun and planet gear being thus released it will begin to rotate, so that the disk 24 and pin 28 will become stationary. Immediately after the hammer 33 has effected the printing, the pawl 40 pivoted to the lever 29, in rising, which it does when the lever 29 falls down into its normal position, will turn the ratchet wheel 41, so that the paper strip 35 will be wound to a sufficient extent on the bottom roll 42 to make room for a second record. The type wheel 37 is of course rotated in exact accordance with the speed of the vehicle or the like in question, and, for this purpose, a spur-wheel 43 is secured to the disk 1 which engages in a spur-wheel 44 secured to the type wheel 37. The type wheel 37^c shows the time and is adapted to be turned by clockwork of any suitable kind, which is omitted in the drawing, in order not to render the same unintelligible, while the disks 37^a and 37^b show the date and month respectively.

In the above description it has been shown how the printing device is put into operation in order to print the speed, time, date and month, when certain limits of speed are exceeded. It is intended, however, to also print the speed when some organ of the vehicle or motor, for example the brake, steering wheel or igniter, is operated. Supposing for example that the brake is connected with a rod 45, so that, on operating the brake, said rod will be raised, then the rod 46 guided at 47 and 48 will also be raised so that the pawl 49 carried by said rod will strike against the pin 50 and thus turn the lever 51 about the screw 52. In the lever 51 there is a slot 53, into which projects a pin 54 secured to the lever 55. This latter lever 55 turns about the screw 56 and will raise the rod 30 when the pawl 49 raises the pin 50. Consequently, the lever 31 will also be raised, and, as soon as the pawl 49 passes the pin 50, the printing of the speed, time, date and month will be effected by the spring 34 in the manner above explained.

It is preferable to connect the rod 46 with a type segment 57, on which the letter "B" can be provided, so that this letter will also be printed on the paper 35 and show that the brake has been operated.

In Fig. 3 similar segments are shown for the horn and for the steering wheel, the letter "H" denoting the horn, while the letter "R" will show that the steering wheel has been operated toward the right, the letter "L" being provided at another point on the same segment to show when the steering wheel is turned to the left.

Each time the printing mechanism is operated the speed, time, date, month and the position of the operative parts of the vehicle or motor will accordingly be recorded on the paper 35. The printing motion is carried out by the motive power when the printing organs are put into action by the tachometer disk 1, while the printing, on moving some operative part, such as the brake, steering wheel, horn, etc., is effected by the force exerted in moving said parts, or, more accurately, by the rebounding motion of the hammer 33 under the influence of the spring 34, which is stretched in operating the brake, etc.

In the construction sketched in Fig. 8 the printing is effected by the motive power in all cases, that is not only when the printing organs are released by the disk 1, but also when an operative part of the vehicle or motor, is moved. The disk 1 is turned also in this case by the tachometer and is provided with a number of pins 14, which at certain limits of speed strike against the pawl 15 and thus turn the lever 16 about the screw 17, so that when the latter rebounds under the influence of the spring 16^a the pawl 18 will rotate the star-wheel 82 through a space equal to half the distance between two teeth of said star-wheel. The star-wheel is restrained in its movement by a second star-wheel 82^a secured thereto and having twice as many teeth between which the spring pawl 82^b engages. The disk 83 is continuously rotated by the motor so that the pin 84 secured thereto will strike against the tooth brought by the pawl 18 into the path thereof and thus turn said star-wheel 82 through the remaining half of the distance between two teeth of this wheel. During the latter movement of the star-wheel 82 a tooth of said wheel strikes against the end of the lever 85 and this motion is transferred to the rod 30, lever 31 and hammer 33, which in rebounding effects the printing under the action of the spring 34.

To the lever 85 is secured a pin 87, which engages in a groove of the two-armed lever 86 at the bottom end of which a pawl 87 is provided, which turns a star-wheel 88 in the same way as the star-wheel 82 is moved by the pawl 18. The completion of the turning movement of the star-wheel 88 is also ef-

fected by the pin 84 and when said star-wheel 88 is turned by the pin 84 it strikes against the free end of the lever 89, which, in returning under the influence of the spring 89^a, turns the ratchet wheel 41, provided on the paper roll, so that the paper is transported as described above in connection with Fig. 1 and the motion of said paper roll is transmitted to the ink ribbon by suitable mechanism of the kind described below with reference to Figs. 2 and 3. The movement of the lever 89 under the influence of the spring 89^a is restricted by the stop 91.

On moving an operative part of the vehicle or motor a rod 46 is moved in the manner described above with reference to Fig. 1. To said rod 46 is secured a pawl 49, adapted to strike against the pin 50 provided on the lever 51. Said lever 51 turns right 52 and has a slot 53, in which engages the screw 54, secured to the rod 94, which has a longitudinal slot 95, to receive two screws 95^a and 95^b, serving to guide said rod 94. At the bottom end of the rod 94 is provided a pawl 94^a, adapted to act in exactly the same way on the star-wheel 82 as the pawl 18 when the rod 46 has raised the left end of the lever 51 and this lever returns into its first position under the influence of the spring 96. A stop 97 limits the return movement of the lever 51. It will be seen therefore that with this arrangement the printing is effected in every case by the motive force, that is, not only when the printing organs are put into action by the tachometer (disk 1) but also when some operative part of the vehicle or motor is moved.

The ink ribbon 73 (Fig. 1) is driven by the lower paper roll, for which purpose a bevel wheel 61 is provided on the roll 42, which bevel wheel engages in a second bevel wheel 62, keyed on the spindle 63 to the other end of which is keyed the bevel wheel 64, which engages in the toothed wheel 65 secured to the shaft 66 (Fig. 2). To the upper end of the shaft 66 is fastened the bevel wheel 67, which engages in the bevel wheel 68 secured on the spindle 69. The spindle 69 passes through the front plate of the casing and carries at its inner end a bevel wheel 70, which engages in a second bevel wheel 71, by which the ribbon roll 72 is turned, so as to wind the ribbon 73 thereon, it being unwound from the roll 74.

In the arrangement shown in Fig. 9 the printing device and the shaft of the vehicle or motor are coupled together by means of the electric current. A star-wheel 1, which corresponds with the disk 1 of Figs. 1–8, acts, through the agency of one of its teeth 14, on one of the two levers 16, 16^a, according as the disk 1, owing to the speed increasing or decreasing, is turned in one direction or the other. The action of the disk 1 on the levers 16, 16^a is the same as explained above with reference to Fig. 1, except that two levers, namely 16 and 16^a, are provided, in order to put the printing mechanism into action when the disk 1 moves both ways, that is according as the speed rises or falls. Supposing, for example, that the wheel 1 is turned through a sufficient angle to cause one of the teeth 14 to strike against the pawl 15 and 15^a then the pawl 15^a will turn on its axis without moving the lever 16^a, while the pawl 15 will be pressed against its stop and will, accordingly, rotate the lever 16, so as to cause the pawl 18 at the lower end of said lever 16 to touch the contact a. The circuit of the battery b will therefore be closed, so that the electromagnet r will be excited and will attract the armature p^1 on the lever p. As a consequence, the lever p will be rotated about the pin p^2 and will cause the pawl q to strike against the left end of the lever c, which turns about d, so that the arm g provided on the cam h will be released from the right end of the lever c and will accordingly rotate in the direction of the arrow by a spring acting thereon. The cam h will release a pin on the top end of the lever k, so that the lever 29 can fall. This lever 29 corresponds with the lever 29 of Fig. 1, and is so arranged that, on falling, the printing organs are put into operation. The lever 29 is raised again by the pin 28 on the disk 24 driven continuously by the motive power. The pin on the lever k being then guided by the spring i into engagement with the cam h again. In rising a projection 29^a on the lever 29 raises the lever l, so that the spring contained in the toothed casing o will be wound up and the tension of this spring will be transferred by the spur-wheel o^1 to the cam h, which will therefore again have the tendency to turn in the direction of the arrow, which however it cannot do, until the arm g is released by the stop at the right end of the lever c. The spring is kept under tension by the pawl m engaging in the ratchet n.

As an example how the printing device may be coupled with the shaft of the vehicle or motor when the operative parts of the vehicle or motor are moved the horn is chosen in Fig. 9. By depressing the lever u the horn, which is of the electric type, is sounded and at the same time the electromagnet r is excited, so that the apparatus prints in the manner already explained.

t is a press button, by means of which the sign stop ("Halt") can be given for the guidance of other vehicles on the road. When the driver intends to stop by pressing this button t electric contact is made and the electromagnet r is again excited, so that in this case also the printing device is operated.

It is immaterial what kind of tachometer is used or whether a distance recorder is adapted to release the printing device, as only the manner of carrying out the printing forms the subject-matter of my present invention.

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

1. A printing device to record the speed of a vehicle and the like, comprising in combination, type wheels operated in accordance with the speed of the vehicle, mechanism to print from said type wheels, a mechanical part continuously moved by the vehicle, and means to couple said mechanical part with said mechanism, substantially as, and for the purpose, set forth.

2. A printing device to record the speed of a vehicle and the like comprising in combination, a mechanical part driven by the vehicle, type wheels adapted to be driven in accordance with the speed of the vehicle, type wheels adapted to be moved when the operative parts of the vehicle are actuated, printing mechanism to print from all said type wheels, and means to couple said printing mechanism with said vehicle driven mechanical part, substantially as set forth.

3. A printing device to record the speed of a vehicle and the like, comprising in combination, type wheels operated in accordance with the speed of the vehicle, printing mechanism adapted to print from said type wheels, a mechanical part driven by the vehicle, mechanism operated in accordance with the speed of said tachometer and adapted to connect said printing mechanism with said part driven by the vehicle, and mechanism to operate said printing mechanism independent of said part driven by the vehicle, substantially as, and for the purpose, set forth.

4. A printing device to record the speed of a vehicle and the like comprising in combination, type wheels driven according to the speed to be recorded, printing mechanism to press against said type wheels, a sun and planet gear comprising a central motive driven spur-wheel, and internally and externally toothed crown, pinions connecting said central spur-wheel with said crown, a disk to carry said pinions, and a pin attached to said disk; a lever adapted to be brought in and out of engagement with the external teeth of said crown, and mechanism adapted to be moved by said pin and to operate said printing mechanism, substantially as, and for the purpose, set forth.

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.