No. 639,306. Patented Dec. 19, 1899.

# A. STEINBART.

## INSTRUMENT FOR RECORDING VARIATIONS IN TENSION OF GASES.

(Application filed Apr. 19, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

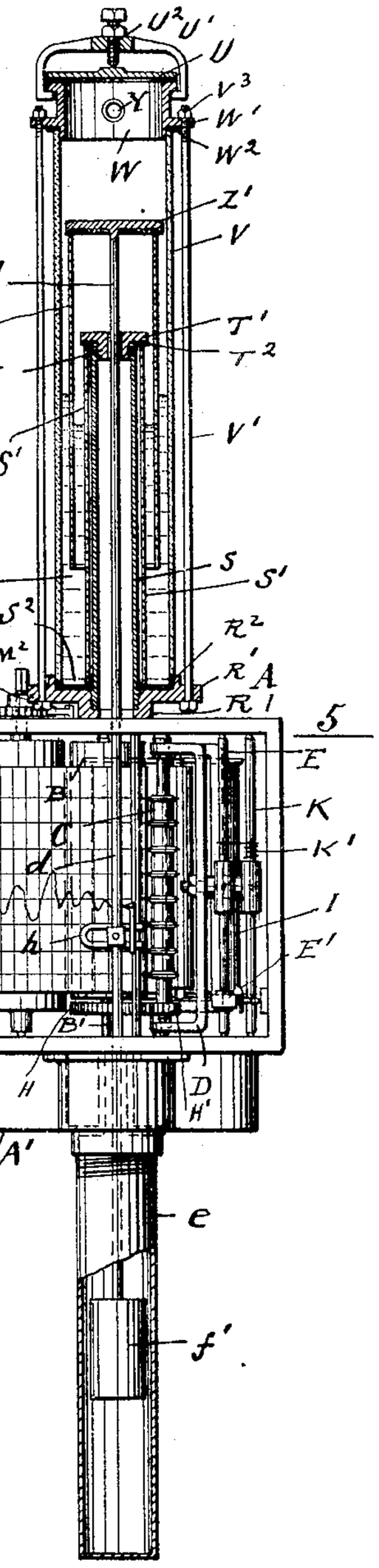



Fig. 4.

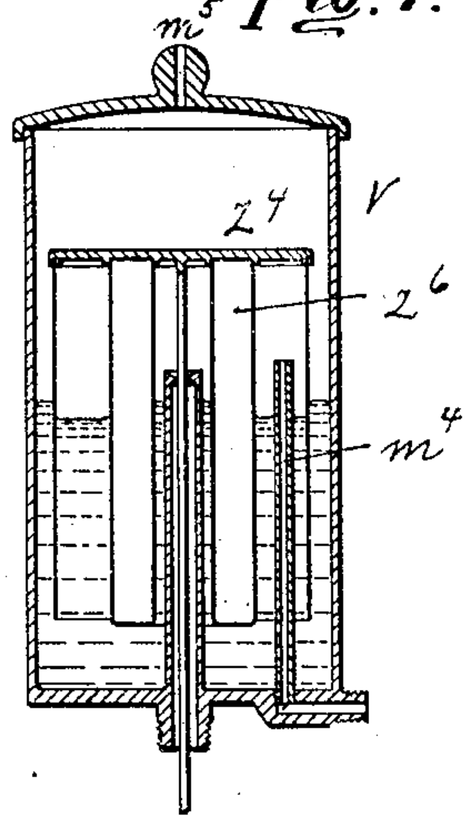



Fig. 3.

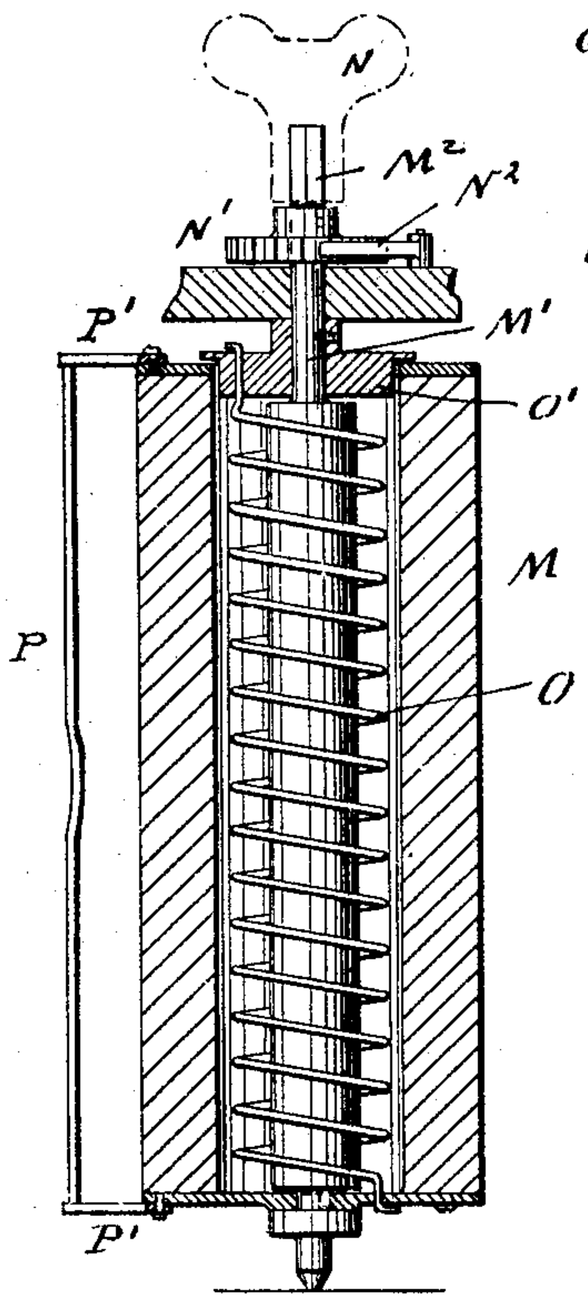
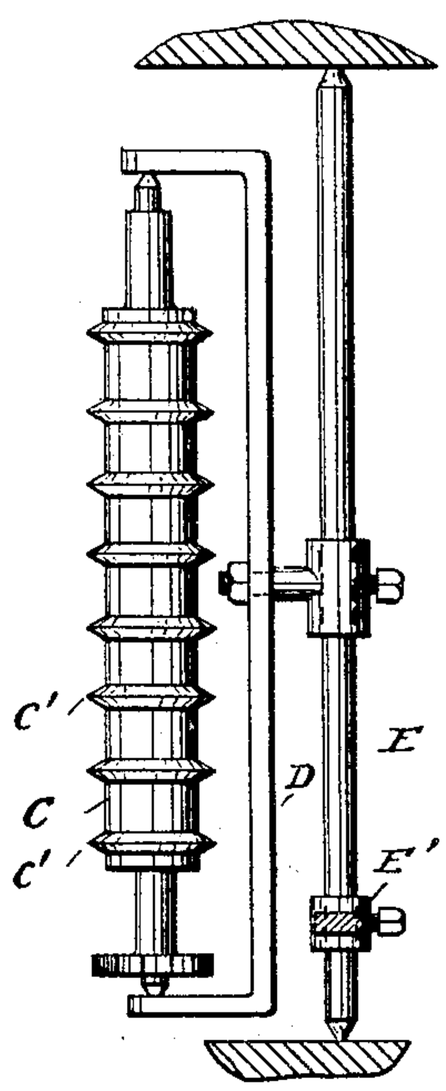



Fig. 2.

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## INSTRUMENT FOR RECORDING VARIATIONS IN TENSION OF GASES.

(Application filed Apr. 19, 1898.)

(No Model.) 2 Sheets—Sheet 2.

Fig: 5.

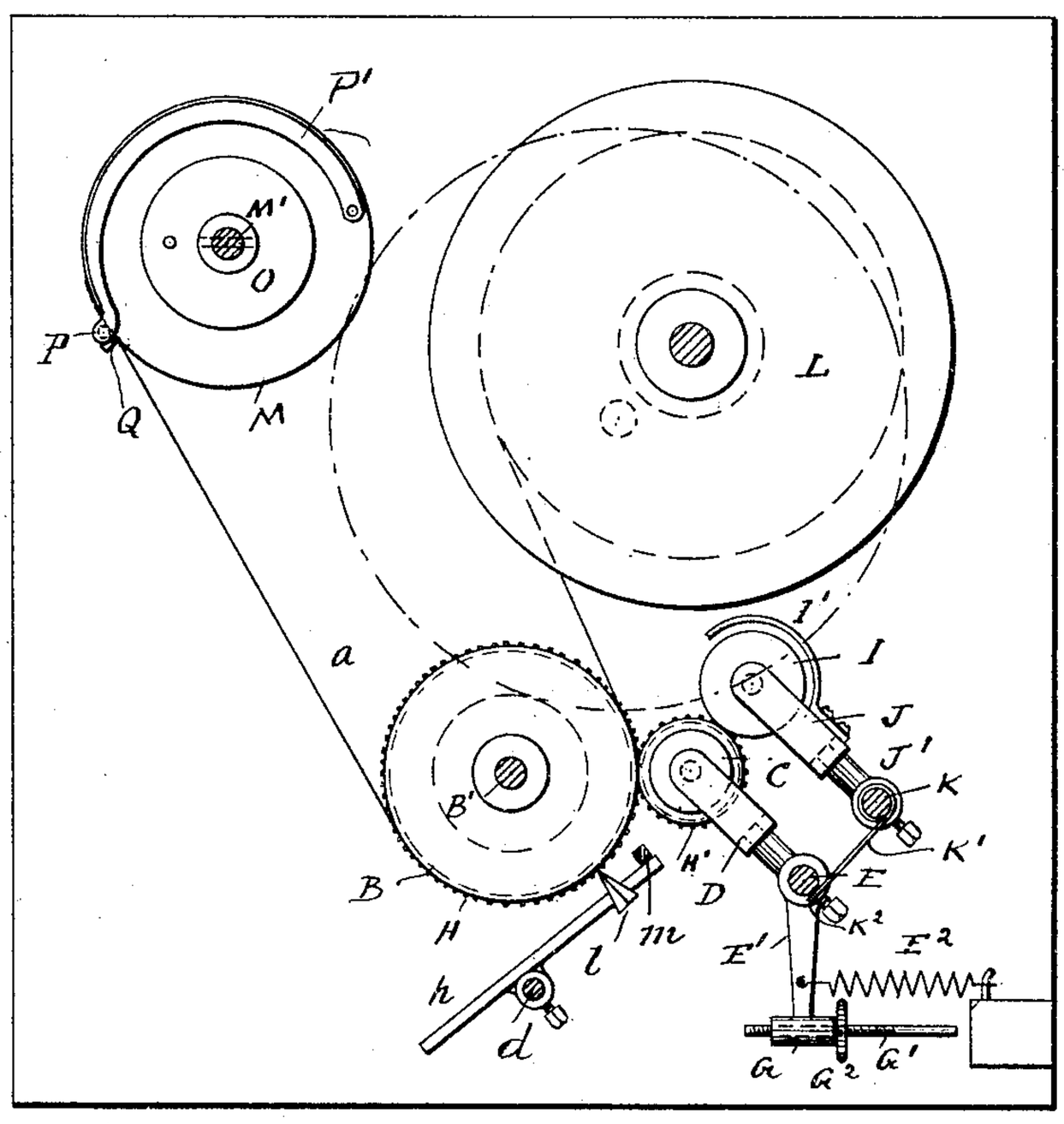
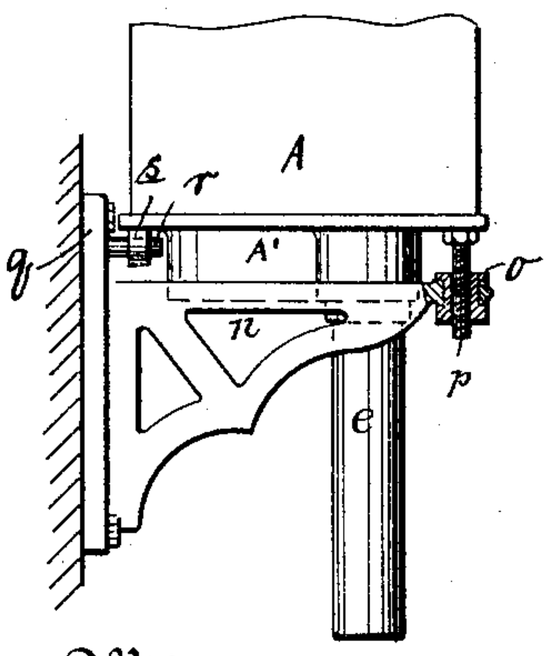



Fig: 7.



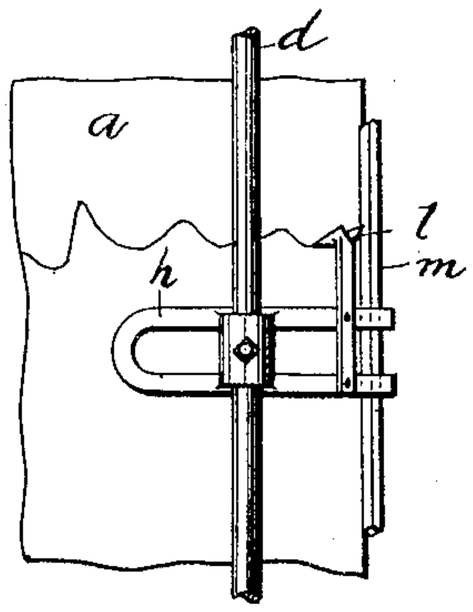
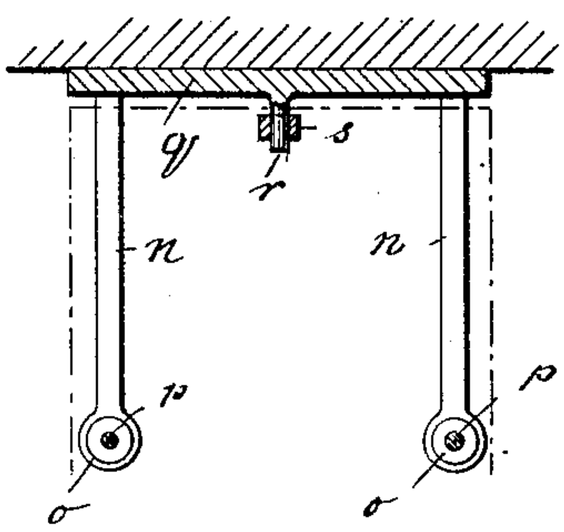




Fig: 6.

Fig: 8.

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# UNITED STATES PATENT OFFICE.

ALFRED STEINBART, OF CARLSTADT, NEW JERSEY.

## INSTRUMENT FOR RECORDING VARIATIONS IN TENSION OF GASES.

SPECIFICATION forming part of Letters Patent No. 639,306, dated December 19, 1899.

Application filed April 19, 1898. Serial No. 678,119. (No model.)

*To all whom it may concern:*

Be it known that I, ALFRED STEINBART, a native of Germany, (but having declared my intention of becoming a citizen of the United States,) and a resident of Carlstadt, in the county of Bergen, in the State of New Jersey, have invented certain new and useful Improvements in Instruments for Recording Variations in the Tension of Gases, of which the following is a specification.

The object of my invention is to provide a new and improved instrument for recording the variations in the tension of gases, which device is simple in construction, reliable, sensitive, not apt to get out of order, and produces a record which is plain and distinct throughout.

In the accompanying drawings, forming a part of this specification, and in which like letters of reference indicate like parts in all the views, Figure 1 is a front elevation of my improved device for recording variations in the tension of gases, parts being broken away and others shown in section. Fig. 2 is an enlarged detail elevation of the roller for printing the horizontal lines on the record-paper and its mountings. Fig. 3 is an enlarged vertical sectional view of the take-up roller on which the record-paper is wound. Fig. 4 is a detail view of a modified construction of the bell. Fig. 5 is a horizontal sectional view of the recording device on the line 5 5 of Fig. 1. Fig. 6 is a detail view of the tracing-pen and its carrier. Fig. 7 is a side view of the bracket-support for the instrument. Fig. 8 is a plan view of the bracket-support, parts being in section.

The greater part of the mechanism is contained in a casing A, provided on its under side with a compartment A′ for receiving a clock-movement of any approved construction. This clock-movement by means of suitable gearing rotates the vertical arbor B′ in the casing A, on which arbor is fixed a roller or cylinder B, which will be termed the "feed-roller," as it serves for feeding or shifting the strip of paper *a*, on which the desired record is to be produced.

A roller C, having a series of circumferential ridges C′, is mounted at its ends between the shanks of a U-shaped frame D, which is swiveled at the center of its height to an upright spindle E, mounted in the top and bottom of the casing A in such a manner that it can turn axially. The spindle E has an arm E′, to which is fastened one end of a helical spring $E^2$, the other end of which is attached to the casing A, and whereby the roller C is pressed against the strip of paper resting on the feed-roller B. A sleeve G is formed on the end of the arm E′, and into said sleeve, which is threaded internally, a screw G′ is screwed, on which is secured a disk $G^2$, about midway the length of the screw, so as to permit of turning said screw and causing it to project a greater or less distance from said sleeve. By means of this screw the roller C can be held out of contact with the roller B when the paper is to be inserted, shifted, or adjusted. A cog-wheel H on the arbor B′ engages a cog-wheel H′, fixed on the arbor of the roller C. An inking-roll I, covered with felt or other suitable substance, is mounted in a U-shaped frame J, which is swiveled at J′ to an upright spindle K, mounted to turn axially. A spring K′, coiled around and attached at one end to the spindle K has its free end $K^2$ rested against the spindle E, so that said spring presses the inking-roll I against the circumferential ridges C′ on the roller C.

The U-shaped frame J is provided with a curved guard I′, which extends partly around the inking-roll.

The strip of paper *a* is wound upon a reel L, which is mounted vertically in the casing to turn axially. The strip of paper is passed around the feed-roll B in the manner shown and passed to the take-up roller M, which is hollow and mounted loosely upon a spindle M′, mounted to turn axially in the top and bottom of the casing A. Said spindle has a squared extension $M^2$ projecting above the top of the casing and adapted to receive a winding-key N. A ratchet-wheel N′, fixed on the squared extension $M^2$, is engaged by a pawl $N^2$ on the top of the casing A. A spring O is coiled loosely around the spindle M′ within the hollow take-up roller, and the lower end of the spring is secured to the roller M, the upper end of the spring being attached to a cover-plate O′, fixed on the upper part of the spindle M′ to turn with the same and resting loosely on the upper open end of the

take-up roller M. A retaining-rod P is secured to two curved arms P′, pivoted on the two ends of the take-up roller M, which arms are slightly longer than a half-circle, so that when the retaining-rod P is pressed against the take-up roller it is held in place thereon. Two pins Q project from the take-up roller near the ends of the same and serve to limit the movement of the retaining-rod and to facilitate placing the paper strip *a* properly on the roller M, and the paper is held in place by the retaining-rod P. A neck R is secured on the top of the casing A and is provided with an annular flange R′, provided on its upper surface with an annular rib $R^2$. A metal tube S is secured at its lower end vertically and centrally on the neck R and is closely surrounded by a glass tube S′, the lower edge of which rests upon a flat annular washer $S^2$, resting upon the flange R′ between the rib $R^2$ and tube S. A centrally-apertured plug T is screwed into the upper end of the metal tube S, and its flange T′ bears on the upper end of the glass tube S′, a washer $T^2$ being interposed between the upper end of the glass tube S′ and the flange T′, whereby the glass tube is held securely in place. A glass tube V has its lower open end placed upon the washer $S^2$ adjacent to the rib $R^2$, and on the upper end of said tube rests the flange W′ of a head W, a packing-ring $W^2$ being interposed between the flange W′ and the upper end of the tube V. Vertical rods V′ are passed through the flanges of the neck R and head W, respectively, and said rods are each provided at the lower ends with heads $V^2$ and at the upper ends with screw-nuts $V^3$, so that by turning up said nuts the glass tube V can be clamped securely between the head W and the neck R. A cover-plate U is clamped on the upper end of head W by a U-shaped clamp U′ and screw $U^2$. The head W has a neck Y, on which a tube can be applied for connecting the recording instrument with the vessel or apparatus containing the gas of which the variations in tension are to be recorded. A glass bell Z is formed of a tube sealed at its upper end to a metal disk Z′, said bell surrounding the glass tube S′. From said disk Z′ a rod *d* extends down through the plug T, the neck R, the casing A, and into a tubular casing *e*, projecting downward from the bottom of the casing A, and on the lower end of said rod *d* a weight *f*′ is secured. A quantity of mercury *g* is placed into the glass vessel V to form a seal for the bell Z.

Within the casing A a horseshoe-magnet *h* is held adjustably on the rod *d*, and said magnet carries a tracing-pen *l* of any approved construction for tracing by means of ink a line on the paper *a*. An iron rod *m* is held vertically in the casing A adjacent to the feed-roller and attracts the open end of the horseshoe-magnet, thereby holding the point of the tracing-pen in contact with the paper on the feed-roller B. I am thus enabled to dispense with springs for holding the pen against the paper and obtain the required uniform contact without any undue pressure, which might retard the paper or cause the tracer to cut into the same or produce undue friction.

As the rod *d* must hang absolutely vertically, so as not to be restricted in its movements, it is necessary to adjust the casing A accordingly. The casing rests upon two brackets *n*, each provided at its front end with a sleeve-nut *o*, mounted to turn in the end of the bracket, and these sleeve-nuts are screwed on screws *p*, fastened to and projecting downward from the casing at the corners thereof. The said screw-nuts have top and bottom flanges, so that they can only turn in the brackets, but cannot be removed from the same. From the rear cross-piece *q*, connecting the brackets *n*, a pin *r* projects, which enters a hole in a lug *s*, extending downward from the rear end of the casing.

By turning the sleeve-nuts *o* the front of the casing A can be lowered or raised more or less at each front corner, as may be necessary for the proper adjustment, the pin *r* forming a pivot on which the rear part of the casing rests.

The operation is as follows: Whenever the tension of gas decreases, the bell Z rises under the action of the atmospheric pressure, and whenever the tension increases the bell descends. As it is usually only necessary to record these variations of tension within certain limits, the bell Z is weighted, preferably by means of the weight *f*′, attached to the rod *d* in the manner shown, so that a certain predetermined suction will be required to overcome this weight. Hence no record will be produced of any variations in tension until the desired suction is reached, which suction may be greater or less, the weight being selected accordingly. For example, if the variations in tension are only to be recorded which take place beyond a certain predetermined suction—say a suction capable of raising a column of water to forty-eight inches—then the bell is so weighted that any suction less than that capable of raising a column of water to forty-eight inches cannot affect it. Greater suction will then of course affect the bell. As the bell moves up or down under the influences of the various tensions of the gas the rod *d* moves with it, as does also the tracing-pen *l*, which produces a corresponding line on the paper *a*. The pen only moves vertically, but as the paper is drawn past the pen the record-line is thus traced. On the paper strip *a* vertical lines are printed, which are equidistant from each other, and the clock-movement is so adjusted that the paper is moved past the tracer at such speed that the space between two vertical lines is moved past the tracer in a given time—say one hour. As the paper is being thus fed the roller C prints horizontal lines on the same, which lines indicate the various tensions. Great accuracy is thus obtained, and inequalities in the paper or its po-

sition on the roller cannot affect the record produced.

If the horizontal lines be printed on the paper before the roll of paper is placed into the apparatus, all irregularities in the said horizontal lines would affect the record produced, and the same would not be near as reliable as when these horizontal lines are produced directly before the record-line is traced by the tracer.

The spring O in the take-up roller M has a tendency to wind the paper upon said take-up roller, and as rapidly as the paper is fed forward by the feed-roller B it is wound up by the take-up roller M, from which it can be removed daily or at greater intervals.

The apparatus shown is especially adapted for recording the variations in the tension of a gas the tension of which is less than that of the atmosphere—that is, of gas under suction.

For recording the variations in the tension of a gas under a tension greater than that of the atmosphere—that is, a gas under pressure—the vessel V is enlarged and the bell Z is made very buoyant, so as to have an upward thrust. Such a construction is shown in Fig. 4, the bell $Z^4$ having enlargements $Z^6$, which are filled with air. The gas under pressure is conducted into the interior of the bell $Z^4$ through a tube $m^4$, and it tends to raise the bell as the pressure increases. Air is admitted into the top of the vessel V through the neck $m^5$ on the cover of the vessel. The mechanism for moving the paper, tracing the record-line, &c., remains as previously described.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a recording device, the combination with means for shifting paper, of a tracer a rod carrying the tracer a magnet for holding the tracer on the paper, the tracer and magnet being mounted to move together, substantially as herein shown and described.

2. In a recording device, the combination with means for shifting paper, of a rod, which rod is held parallel with the paper, a magnet carried by said rod, a tracer mounted on said magnet, means for moving the tracer up and down on the said rod, and an additional rod held adjacent to the paper and to the rod carrying the magnet and tracer, for the purpose of attracting the magnet, substantially as herein shown and described.

3. In a recording device, the combination with means for shifting paper, of a rod mounted to move lengthwise, parallel with the paper and transverse thereto, means for producing the movement of the rod by the variations of the tension of a gas, a magnet held on said rod and a tracer on said magnet, substantially as herein shown and described.

4. In a recording device, the combination with a paper-feed roller and means for rotating the same, of a tracer and a circumferentially-ridged roller held against said feed-roller, substantially as herein shown and described.

5. In a recording device, the combination with a paper-feeding roller and means for rotating the same, of a tracer, a roller provided with circumferential ridges, a forked frame in which said ridged roller is mounted, a spindle to which said frame is swiveled and a spring for pressing the ridged roller against the feed-roller, substantially as herein shown and described.

6. In a recording device, the combination with a paper-feeding roller and means for rotating the same, of a tracer, a roller provided with circumferential ridges, a spindle for supporting the ridged roller, a spring for pressing the ridged roller against the feeding-roller, means for adjusting the ridged roller in relation to the paper-feeding roller, and means for providing the ridged roller with printing-ink, substantially as herein shown and described.

7. In a recording device, the combination with a paper-reel, a paper-feeding roller and a tracer, of a spindle having a squared end, a ratchet-wheel on said squared end, a pawl engaging the ratchet-wheel, a roller mounted loosely on the spindle, a cap fitting loosely in the top of the roller and attached to the spindle and a spring coiled within the roller around the spindle and having one end attached to said cap and the other end to the roller, substantially as herein shown and described.

8. In a recording device, the combination with a casing and means in the same for moving paper on which the record is to be produced, of a glass cylinder held vertically on the top of the same and closed at its upper and lower ends, a metal tube open at both ends and projecting upward in the glass tube, a glass tube secured on the outside of the metal tube, a bell in the glass cylinder, a rod extending from said bell through the metal tube and casing, and a tracer actuated by said rod and located within the casing, substantially as herein shown and described.

9. In a recording device, the combination with a casing and means in the same for shifting paper on which the record is to be produced, of a neck held on the top of the casing and provided with a flange and an annular rib on said flange, a glass tube resting on the flange within said rib, a head on the upper end of the tube, rods secured to said flange and head, a cover-plate on said head, a tube open at both ends and projecting up into said outer glass tube, a bell in said outer tube, a rod extending downward from the same and a tracer actuated by said rod, substantially as herein shown and described.

10. In a recording device, the combination with a casing, of means in the same for moving paper on which the record is to be produced, a neck secured in the top of the casing, a metal tube secured in said neck and extending upward, a glass tube fitting on said

metal tube, an apertured plug secured on the upper end of the metal tube, an outer glass tube held on the neck and surrounding the metal and glass tubes, a head for closing the outer glass tube, a bell in said outer tube, a rod extending downward from said bell into the casing and a tracer actuated by said rod, substantially as herein shown and described.

11. In a recording device, the combination with a casing and means in the same for moving paper on which the record is to be produced, of a vessel for receiving a liquid, on said casing, a bell in said vessel, a tracer actuated from said bell, screws extending downward from the casing, sleeve-nuts into which said screws are screwed, a fixed support for said screw-nuts and a pivot-support for the casing, substantially as herein shown and described.

12. In a recording device, the combination with a casing and means in the same for moving paper on which the record is to be produced, of a vessel for receiving a liquid on said casing, a bell in said vessel, a tracer actuated by said bell, screws extending downward from the front corners of said casing, sleeve-nuts in which said screws are mounted and a pivot-pin for supporting the rear end of the casing, substantially as herein shown and described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 4th day of March, 1898.

ALFRED STEINBART.

Witnesses:
OSCAR F. GUNZ,
N. M. FLANNERY.