(No Model.) 2 Sheets—Sheet 1.

C. ADER.

PHOTOGRAPHIC TELEGRAPH RECORDER.

No. 565,657. Patented Aug. 11, 1896.

Fig. 1

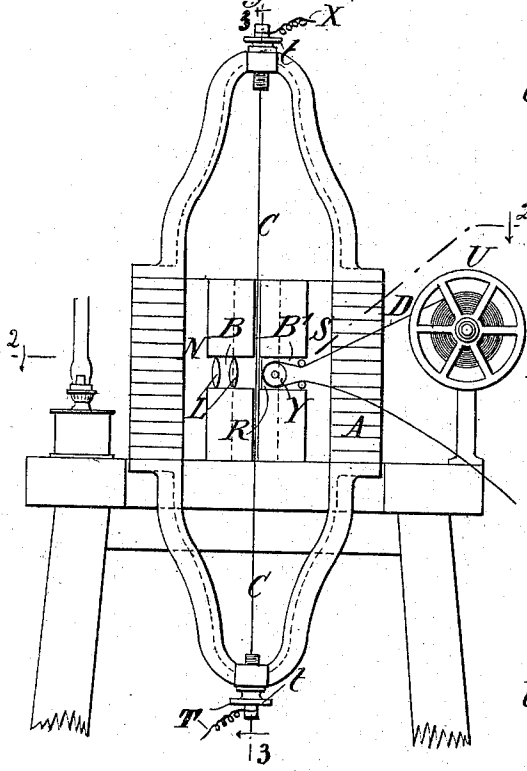


Fig. 3

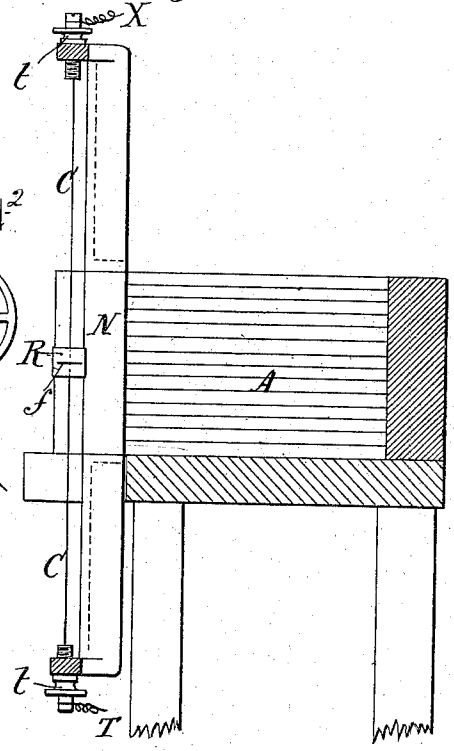
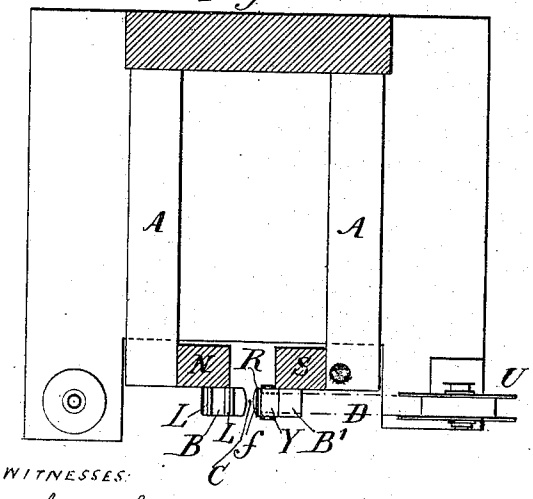


Fig. 2



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Thomas F. Wallace

INVENTOR:
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

C. ADER.

PHOTOGRAPHIC TELEGRAPH RECORDER.

No. 565,657 Patented Aug. 11, 1896.

Fig. 4

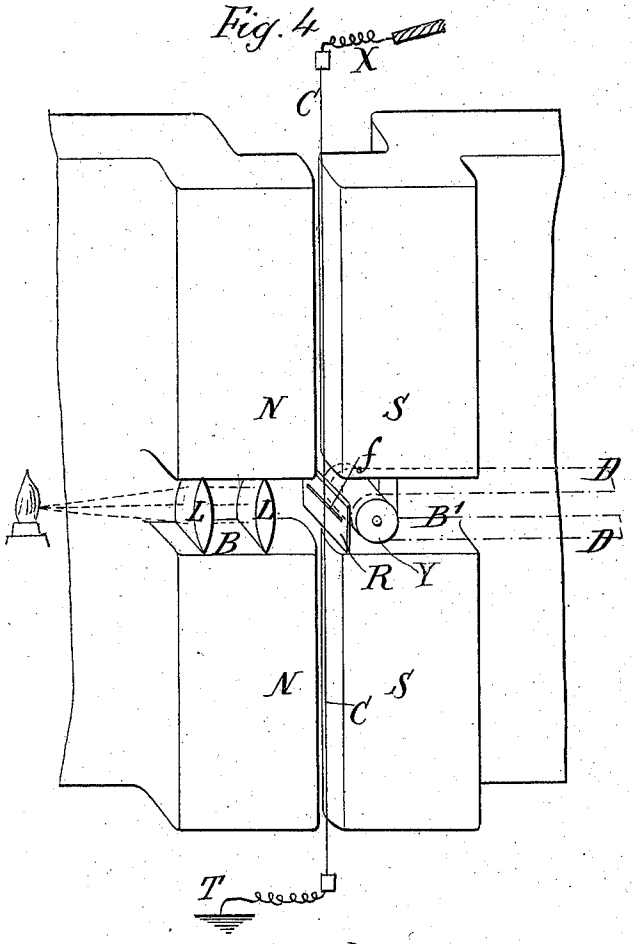
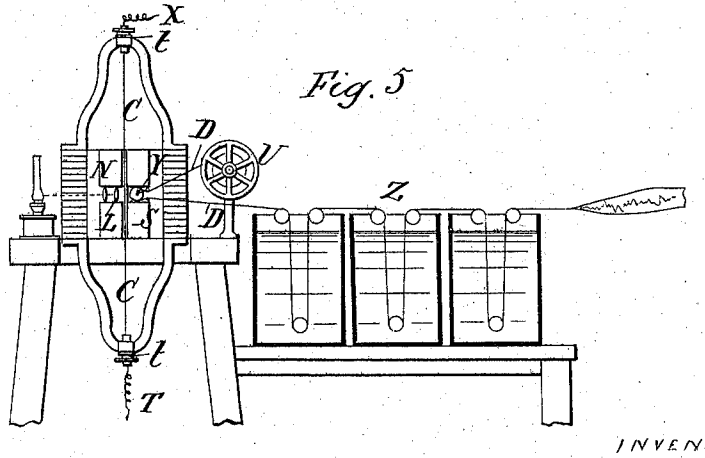


Fig. 5



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UNITED STATES PATENT OFFICE.

CLEMENT ADER, OF PARIS, FRANCE, ASSIGNOR TO LA SOCIÉTÉ INDUSTRIELLE DES TÉLÉPHONES, OF SAME PLACE.

PHOTOGRAPHIC TELEGRAPH-RECORDER.

SPECIFICATION forming part of Letters Patent No. 565,657, dated August 11, 1896.

Application filed October 24, 1895. Serial No. 566,682. (No model.) Patented in France April 16, 1895, No. 246,669.

To all whom it may concern:

Be it known that I, CLEMENT ADER, a citizen of the Republic of France, residing in Paris, France, have invented certain new and useful Improvements in Photographic Telegraph-Recorders, (which invention has been patented in France, No. 246,669, dated April 16, 1895,) of which the following is a specification.

This invention relates to photographic telegraph-recorders, and aims to provide certain improvements therein, which will be hereinafter fully set forth with reference to the accompanying drawings.

The invention provides a new recording receiver, comprising, essentially, the following parts: first, a magnetic field very long, straight, and strong; second, a naked-wire conductor, very fine, extending throughout the length of the magnetic field and traversed by the currents of the line, which may be a submarine or underground cable or a long overhead line; third, a rigid screen having a straight notch placed close to the wire, perpendicular thereof, with its center opposite the normal position of the wire; fourth, a system of lenses concentrating the light of a lamp on the straight notch and on the wire, and, fifth, a sensitized telegraphic band, traveling in the dark behind the straight slot and the wire, for photographing at each displacement of the wire a line on the band where the shadow of the wire strikes it through the slot, which line corresponds in its undulations to the extent and duration of the various deflections of the wire.

Suitable means for driving the band, protecting it from other actinic rays than those traversing the slot, and suitable developing and fixing media are employed, as usual, so that when the band is completed its surface is all darkened except a white undulating line which results from the movements of the wire, and which constitutes a record of the telegraphic signals transmitted through it. The length of the wire and its extended exposure to the strong magnetic field are conducive to marked deflections on its part corresponding to the nature and extent of the positive or negative currents traversing it. The wire constantly interrupts part of the light which passes through the slot, and hence must always be effective in disclosing on the band its position. The magnetic field may be caused by the pole-pieces of either a powerful permanent magnet or of an electro-magnet.

I will now describe in detail the preferred embodiment of my improved system, with reference to the accompanying drawings, in which—

Figure 1 is a fragmentary front elevation of my improved receiver. Fig. 2 is a plan view thereof, partly in section, on the line 2 2 of Fig. 1. Fig. 3 is a vertical mid-section thereof on the line 3 3 of Fig. 1. Fig. 4 is a fragmentary perspective view on a larger scale, looking from the front and partially diagrammatic. Fig. 5 is a fragmentary front elevation of the apparatus shown in Fig. 1 on a smaller scale, and showing the developing and fixing media in vertical section.

Referring to Figs. 1 to 5, inclusive, I will describe the embodiment of my invention therein shown. In these figures N and S are the pole-pieces of a powerful magnet, either a permanent or an electro magnet, the former being shown. These pole-pieces are very long, straight, parallel, and disposed in close proximity, say, about one-half of a millimeter apart. For the purposes of demonstration and clearness in the drawings these pole-pieces are given the appearance of an exaggerated separation and comparative shortness; but in reality they are as close together as will permit the movement of the wire, the inner adjacent faces of the pole-pieces being so close as to almost contact with the bare wire. It is between these faces, which are preferably slightly convex, that the magnetic field is all concentrated. In the transverse middle of the pole-pieces is a transverse notch, that in the piece N being lettered B and that in the piece S being lettered B′. These notches receive certain of the other organs of the apparatus. The length of the magnetic field will be varied, according to the necessities of cable use, between O^m10 and O^m50, and even more, if necessary.

A wire C, of red copper, or preferably of silver or aluminium, extremely fine, say, about two or three one-hundredths of a millimeter

in diameter, and bare, is stretched from one end to the other of the magnetic field by the tension-screws *t* and maintained in the middle of the field. It is exposed at its middle, where it traverses the band, opposite the slot *f* of the screen R. All the current arriving from the cable will pass at X to the wire C and will leave it at T for earth, or any other arrangement whereby the current traversing the telegraphic line shall also traverse this wire can be used. It follows by reason of the well-known law as to the effect of magnetic fields on electric currents that the wire when traversed by a current will be moved in the magnetic field proportionally to the intensity of the current which traverses it and to the left or right, according to whether this be a positive or a negative current. The fineness of the wire will have the further result of furnishing the necessary resistance to the passage of the current, and its excessive length, say, about one to one and a half meters, will render insignificant the inertia to be overcome or resulting from its movements.

In the well-known siphon recorders the bobbin and the siphons in movement weigh from one gram to three grams in the most delicate instruments, whereas my bare wire will weigh, perhaps, from one to two milligrams, (about one thousand times less,) and as its resistance will be as great as that of the bobbins of other recorders and it will oscillate in a magnetic field as strong its deflections will be almost instantaneous, and the friction tending to arrest its movements will be only that furnished by the resistance of the air. Thus the rapidity of action of the apparatus is guaranteed.

The screen R is painted black and is stationary or fixed relatively to the armature and close to the wire. A slot *f* is extended through it for a length equal to the width of the paper band. This slot will be straight and narrow and as close to the photographic paper as possible, to the end that this paper will be most sensible to the light traversing the slot. The position of the slot is perpendicular to the wire. The regulating-screw permits the putting of the screen in the most desirable position.

Lenses L, convex in a sense and rectilinear horizontally, or any other means, may be used to confine or concentrate the rays of light from a lamp in parallel alinement on all the extent of the slot *f*. One may use two or three lenses, two being shown, or mirrors, if it is necessary for the proper direction of the rays of light.

All the parts of the apparatus, or only those necessarily so, as desired, will be inclosed in a casing, excluding any sort of external light from the sensitized paper except that reaching it through the slot *f*.

The sensitized band D is rolled on a cylindrical roller Y, which is regulated so as to be able to bring the band close against the screen R without touching the latter. A reel U delivers the band, which is presented at rear of the slot by passing over the roller Y, and the light makes its effect on the band as it passes this point. The speed of movement of the band is measured, regular, and continuous past the slot and the wire C in front of it. The wire forms a shadow on the band through the slot, which shadow is displaced each instant with the movement of the wire as it is deflected. This shadow will be photographed on the band, and it is its impression which forms the record or signal.

In practice all the band will be affected by the light, to the end that finally the band will be more or less black or darkened with a narrow white line on its middle, which will form the signal. After leaving the impression-position the band will pass automatically through several developing and fixing baths Z, as shown on a small scale in Fig. 5, to make permanent the signal or record thereof.

Of course one can employ the band either in the dark or in a dark-red light.

It will be seen that my invention provides improvements in telegraphic recorders which can be variously and advantageously availed of, and it will be understood that the invention is not limited in its application to the particular details of construction, arrangement, and operation shown nor to the particular media for availing of the principles employed by my invention, as it can be employed according to such modifications of structural details, arrangement, and operation and according to such equivalents of the means shown as circumstances or the judgment of those skilled in the art may dictate without departing from the spirit of the invention.

I do not claim, broadly, as my invention either the use of a chemical or photographic telegraphic recorder, or the principle of continuously photographing the displacements of a conductor stretched in a magnetic field as these features are commonly employed in such apparatus; but what I do claim is the various features of improvement in photographic telegraphic recorders which are specified in the claims hereinafter contained.

What I claim is, in photographic telegraph-recorders and other devices for registering telegraphic signals from submarine or underground cables or long aerial lines, and for other purposes, the following-defined novel features and combinations, substantially as hereinbefore set forth, namely:

1. A permanent magnet having apertures in the longitudinal center of its pole-pieces, a source of light opposite one of said apertures, and a sensitized traveling band opposite the other aperture, in combination with a stretched vibrating wire in the magnetic field between and longitudinally of said pole-pieces, adapted to be traversed by the current of a telegraphic line and deflected according to such current, and a stationary slotted screen between said material and source of light, said screen confining the flow

of light to said material to the portion thereof opposite its slot, and said wire interrupting such flow and casting a shadow through such slot onto said material, whereby the deflection of the wire can be photographed thereon.

2. The combination with a long fine naked vibrating wire conducting the currents of a telegraphic line, of a magnet having long pole-pieces having adjacent convex faces substantially parallel with and in close proximity to but not touching said wire, a screw stretching and adjusting said wire, and means near the middle of the magnetic field for photographing the deflections of the wire, substantially as and for the purpose set forth.

3. The combination with a magnet A having pole-pieces N S having notches B B′, of a wire C between said pole-pieces and adapted to be traversed by the currents of an electric circuit, a screen R and a moving band D of sensitized material in one of said notches, said screen having a slot *f* crossing said wire and exposing said band, and means in the other of said notches concentrating a flow of light toward said screen, whereby the shadow of said wire through said slot is photographed on said band for recording the deflections of said wire.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

CLEMENT ADER.

Witnesses:
CLYDE SHROPSHIRE,
MICHEL COQUART.