No. 625,823. Patented May 30, 1899.

K. ZICKLER.

TELEGRAPHY BY MEANS OF ELECTRIC LIGHT.

(Application filed June 24, 1898.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 2.

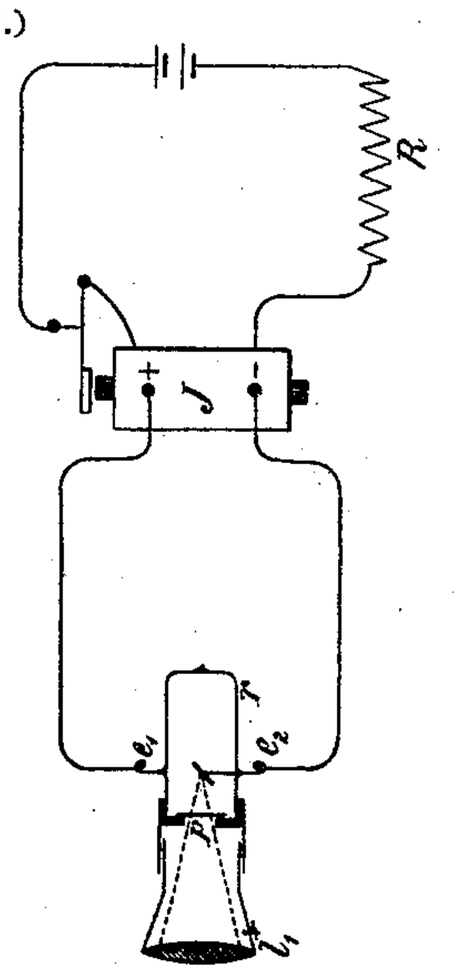


FIG. 3.

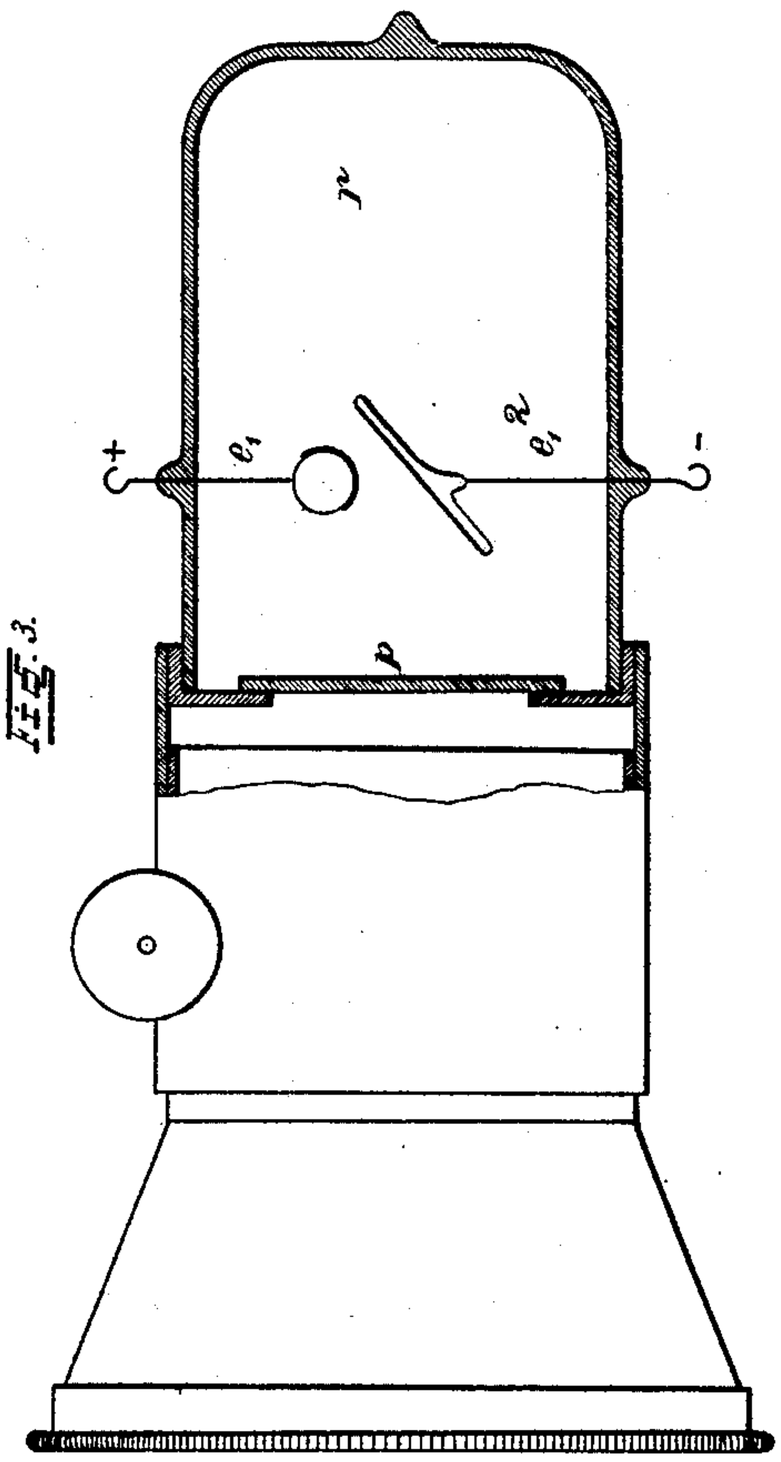


FIG. 1.

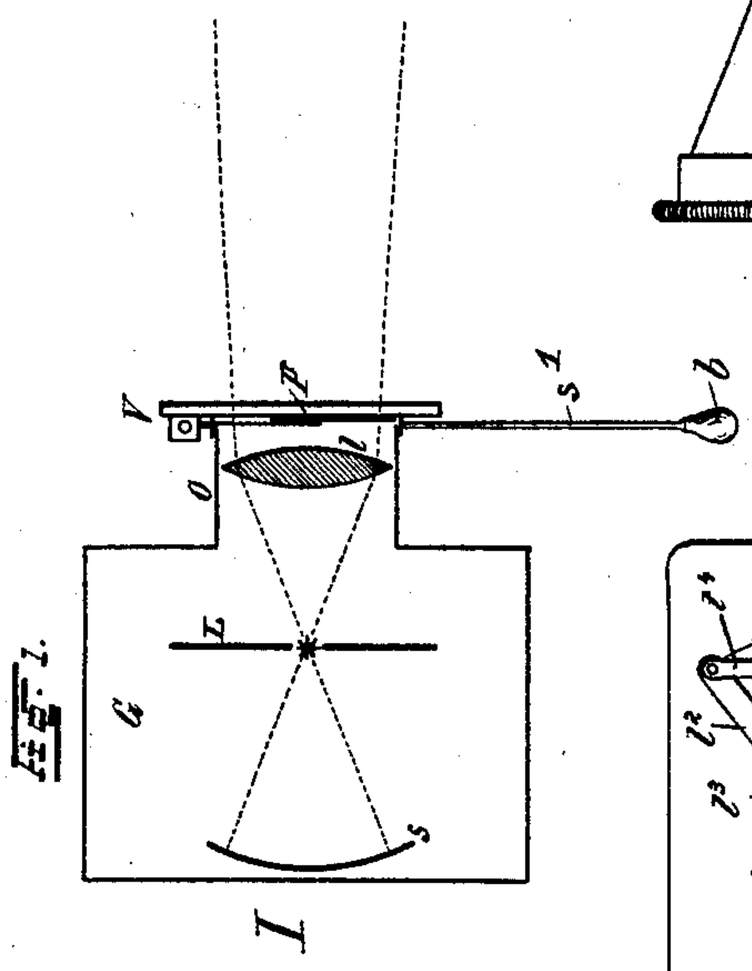
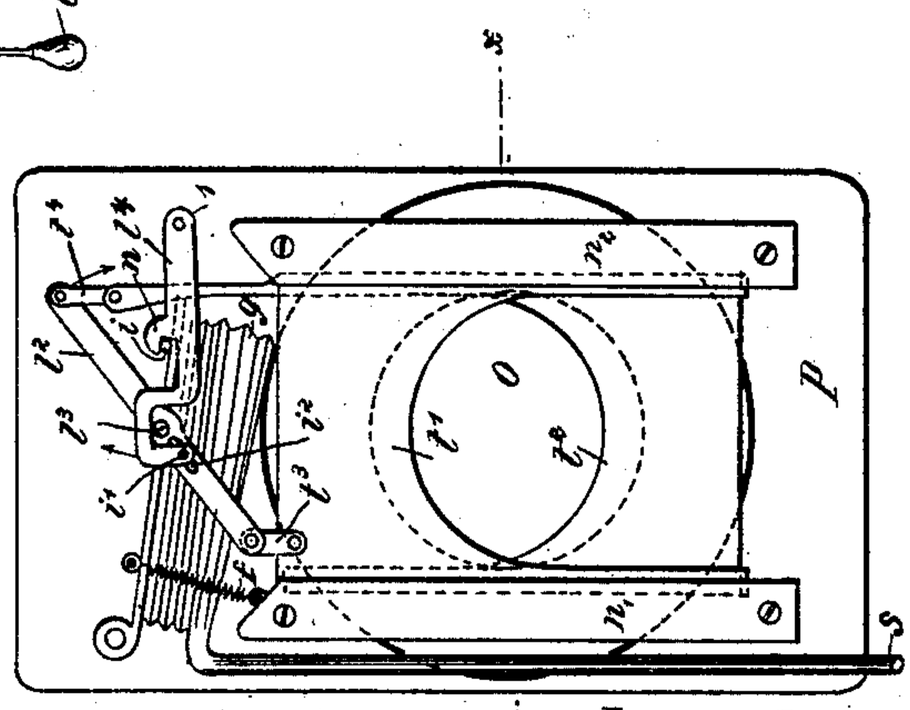


FIG. 4.



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No. 625,823. Patented May 30, 1899.

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TELEGRAPHY BY MEANS OF ELECTRIC LIGHT.

(Application filed June 24, 1898.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 5.

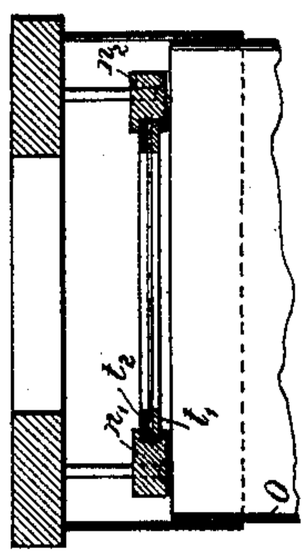


Fig. 7.

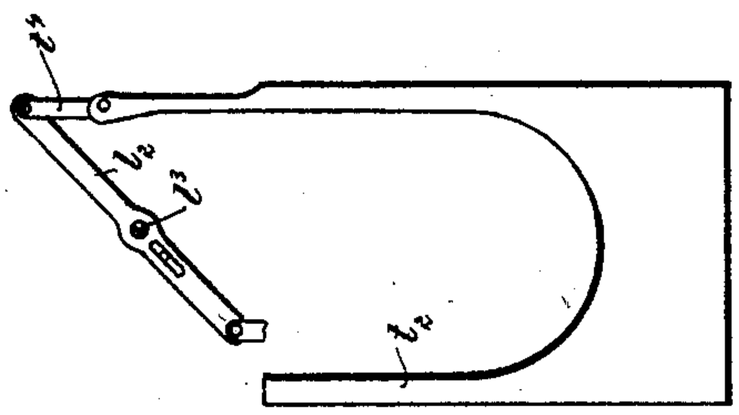
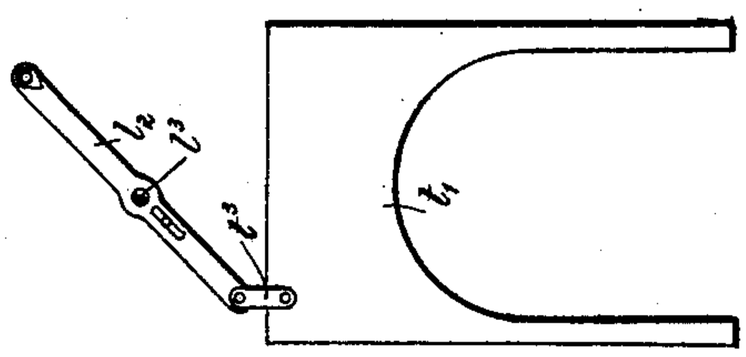


Fig. 6.



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UNITED STATES PATENT OFFICE.

KARL ZICKLER, OF BRÜNN, AUSTRIA-HUNGARY.

TELEGRAPHY BY MEANS OF ELECTRIC LIGHT.

SPECIFICATION forming part of Letters Patent No. 625,823, dated May 30, 1899.

Application filed June 24, 1898. Serial No. 684,392. (No model.)

To all whom it may concern:

Be it known that I, KARL ZICKLER, a subject of the Emperor of Austria-Hungary, residing at Brünn, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Telegraphy by Means of Electric Light; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In this new method of wireless telegraphy the telegraphic signals are transmitted by means of rays emitted from an electric-arc light. The rays of short-wave length, (mostly ultra-violet rays,) which the electric-arc light emits copiously, are those which are made use of. These rays are sent out from the sending-station at intervals corresponding to those of telegraphic signals in the direction of the receiving-station, where they are made to produce weak electric waves, by which the signals are made visible as sparks, or are made audible by a telephone or electric bell, or, if preferred, may be printed by a Morse apparatus.

The arrangement of the apparatus at the two stations is shown in the accompanying drawings, in which similar letters of reference denote similar parts throughout the several views.

Figure 1 is a diagram of the apparatus for generating the rays; Fig. 2, a diagram of the receiving apparatus; Fig. 3, an elevation, partly in longitudinal section, of the receiving apparatus, drawn to a larger scale; Fig. 4, a front elevation of the closure for the ray-generating apparatus, also drawn on a larger scale; Fig. 5, a section on line $x\,x$ of Fig. 4; Fig. 6, a detail elevation of the closure-plate, and Fig. 7 a similar elevation of the other closure-plate.

At the sending-station I is an apparatus for producing the rays in the form of an electric-arc light L of suitable power, which is inclosed in a case G, that can be turned around in the manner of a search-light or otherwise in a vertical and in a horizontal plane. The arc-light may be regulated either by mechanism or by hand, so that the arc is always in the same place. The pencil of light thus produced is transmitted through an opening O in the case and projected in the direction of the receiving-station. In order to send as many rays as possible in this direction, the employment of reflecting-mirrors s or of lenses, or of both in combination, is requisite. The lenses l must then, however, not be made of glass, but of rock crystal, so that they may allow the ultra-violet rays to pass through them. The closure V for the ray-emitting opening consists of a plate P, having an orifice for the objective o, Figs. 1 and 4. Two guide-rails n' and n^2 are attached to the said plate P by means of screws, glass plates t' t^2 being guided in these guide-rails. These plates are shaped as shown at Figs. 6 and 7, and plate t' is linked to one end of a lever l^2, pivoted at l^3, by means of a link t^3 and plate t^2 to the opposite end by means of link t^4.

By means of a pin-and-slot connection at i' i^2 a lever l^4 is coupled to the lever l^2, said lever l^4 being pivotally connected to the plate P at l. The said lever l^4 is provided with a hook n, in which a pin i of the bellows g, attached to the plate P, engages. When the said bellows are compressed, the plates t' and t^2 cover the orifice of the objective o; but if air is forced into the bellows g by compression of the pneumatic ball b, Fig. 1, attached to the air-tube s', the levers l^2 l^4 will be turned on their pivots in the direction of the arrows, as indicated, the lever l^2 drawing the plate t' upward and pressing the plate t^2 downward, thus opening the objective o. This movement of the parts stretches the spring f, attached at one end to the guide n' and at the other to the bellows g. As soon as the pressure on the ball b is released the bellows fall down, assisted by the spring f, thus closing the plates t' t^2 over the opening of the objective. Fig. 4 shows the plates t' t^2 when the objective is half-open. As soon therefore as the lamp is lighted the pencil of light is emitted, even when the opening is closed, since the visible rays pass through the glass shutter. The effective ultra-violet rays are, however, absorbed by the glass plate. They are only emitted when the glass shutter is removed. By leaving the shutter open for a longer or shorter time the ultra-violet rays can be sent out in a manner to correspond to the dots and dashes of the Morse alphabet. Instead of the glass plates for the shutter ex-

tremely thin transparent mica sheets may be used.

At the receiving-station, Fig. 2, there is a ray-receiver. This consists of a tubular glass vessel r, which in front is closed air-tight by a quartz plate p. In this tubular-shaped glass vessel two electrodes e' e^2 are fused, one at each of two opposite points. One of these electrodes e' is spherical, having a diameter of a few millimeters. The other, e^2, is a small circular disk whose plane is so inclined to the axis of the glass vessel that the pencil of light entering through the transparent quartz plate p easily falls upon it. Both electrodes are covered with platinum-foil and are about ten millimeters distant from each other. The air in the glass vessel is rarefied to a suitable degree, or the vessel is filled with a rarefied gas. To the glass vessel there is attached in front of the transparent quartz plate a metal tube, in which a second tube fitted with a quartz lens l' is adjustable by means of a screw, so that by adjusting the lens the rays coming through the quartz plate from the sending-station can be concentrated in a small oval slightly-illuminated spot. For the proper adjustment of the lens l' by daylight it is desirable to inclose the glass vessel in an opaque covering and to observe the lighting of the electrodes through a peep-hole in the covering. The electrodes are electrically connected with the secondary windings of a small induction coil or apparatus J in such a way that the spherical electrode e' becomes the anode and the disk-shaped electrode e^2 becomes the cathode. In the primary circuit of the induction apparatus, which requires to have a sparking distance of only one or two centimeters, there is a variable-resistance coil R, which admits of a gradual alteration of the strength of the primary current. For receiving a telegram the induction apparatus is set in operation, the variable resistance having been beforehand so adjusted that the intensity at the electrodes is as yet insufficient to cause sparks to pass between them. As soon as the ultra-violet rays are emitted from the sending apparatus at the sending-station I, Fig. 1, by opening the glass shutter and fall upon the disk-shaped electrode at receiving-station, Fig. 2, their luminous electrical effect causes a release of the sparks, which, however, cease as soon as the projection of these rays is stopped by closing the glass shutter. The opening and shutting at the sender-station I in accordance with Morse signals produces also at the receiving-station a transmission of sparks of shorter or longer duration according to the same signals. In this way the signals may at once become visible, or otherwise electric waves are caused by the sparks in the space surrounding the ray-receiver corresponding to the signals. By these the signals can be rendered audible or reduced to writing by any of the well-known apparatuses.

What I claim is—

1. In a system of wireless telegraphy, the combination of a sender apparatus having means for producing and intermittently projecting a pencil of ultra-violet rays in the direction of a receiving apparatus, and a receiving apparatus having an air-tight electrode-chamber, having rarefied gas therein, a disk-shaped cathode-electrode to receive the rays projected from the sender and an anode mounted in proximity to said cathode and means for utilizing the sparks produced between the electrodes by the ultra-violet rays substantially as described.

2. In a system of wireless telegraphy, the combination of a sender and means in connection therewith for intermittently projecting a pencil of rays of light of short-wave length in the direction of the receiving apparatus, and a receiving apparatus having an air-tight electrode-chamber r with front quartz plate p said chamber being filled with rarefied gas, a disk-shaped cathode e^2 and a spherical anode e' mounted therein in proximity to each other and a variable resistance inserted in the primary circuit of the said electrodes and means for concentrating the rays received by the plate e^2 substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

KARL ZICKLER.

Witnesses:
LUDWIG CZERIVENY,
ARTHUR SCHOEINBURG.