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PROVISIONAL SPECIFICATION.

Method and Apparatus for Reproducing Pictures and the like at a Distance by Means of Electricity.

We, JAN SZCZEPANIK, Engineer, and LUDWIG KLEINBERG, Banker, both of I Bartensteinstrasse 16, Vienna, Austria, do hereby declare the nature of this invention to be as follows:—

This invention relates to a method and an apparatus for transmitting a picture or representation of an object (hereinafter called the picture) and rendering it visible in its natural colours at a distant place by electrical means.

According to this method the picture that is to be rendered visible at a distance is broken up into a number of points and the several rays corresponding to these points are combined together again to form a picture by means of two pairs of mirrors placed at the transmitting and receiving stations and oscillating synchronously; for the purpose of transmission, the differences of light of the rays of light passing from the picture-points obtained by breaking up being first converted into differences of current, and the latter being then transmitted through the line conductor to the receiving station and there re-converted into differences of light.

The conversion of the light-rays into electrical current impulses can be effected in various known ways. If the conversion of the several points of the picture that is to be rendered visible take place in sufficiently rapid succession, the eye of the observer will receive the impression of the entire picture, and if the picture be reproduced repeatedly in sufficiently rapid succession, the observer will receive the impression of a permanent picture, the subject of which may appear to be at rest or in motion according to the nature of the successive pictures thus "telelectroscoped."

A suitable arrangement of apparatus for carrying out this method comprises therefore two main portions—*viz.*, the transmitting device and the receiving device which are connected together by conducting wires or, it may be, by a single wire only.

In each of the two devices there are arranged two oscillating mirrors which are moved synchronously by means of electromagnets. As in transmitting the picture by means of a single conducting wire only one point of the picture situated at the transmitting-station can be sent at a time, therefore the mirrors must be so arranged that in any position and at any instant they will reflect only one of the picture-points and thus bring each time a ray of definite property or quality into operation in that portion of the apparatus which converts the differences of light into differences of electric current.

This portion of the apparatus may be variously constructed according as the conversion is effected by (*a*) the variation of the conductivity in consequence of exposure to light (by using selenium, sulphur, tellurium, soot or lampblack, or other substance having this property); (*b*) photoelectricity; (*c*) thermo-electricity; (*d*) radiophonic action; (*e*) variation of magnetism by exposure to light; or by other causes.

The rays, which are converted into electric currents of various strengths according

[*Price 8d.*]

to the colour of the light emitted from the several picture-points, produce at the receiving-station a corresponding energizing of an electro-magnet and the consequent movement of a prism in such a manner that only a ray of similar kind of the light falling from a source of light on to the prism and becoming decomposed thereby, can reach the synchronously oscillating mirrors at the receiving station. The reflecting action of these mirrors is such as to cause the picture-point transmitted to the eye of the observer to be visible to him at the place and in the colour corresponding to the point at the transmitting station.

We shall now proceed to describe a particular form of construction of this apparatus, in which a selenium cell is employed.

Fig. 1 of the accompanying drawings illustrates the general arrangement of the apparatus (transmitting station and receiving station);

Fig. 2 shows one of the oscillating mirrors;

Fig. 3 shows the electromagnet for moving the mirror;

Figs. 4 and 5 illustrate, in plan and in vertical section respectively, the selenium cell employed; and

Figs. 6 to 9 inclusive are diagrams showing different ways of breaking up the picture that is to be telegraphed.

Each of the four mirrors a is made by coating the reflecting surface of the mirror with an opaque mass, and by making, by means of a pointed or sharp-edged tool (needle or knife), a straight scratch or cut, so as to produce a reflecting surface in the form of a very narrow linear strip. By means of a mirror of this kind, only one line of the object G under observation is rendered visible, because if the eye is stationary, only those rays can reach the eye which are reflected at an angle that is equal to the angle of incidence at which the rays projected from a line of the picture in the same plane, fall upon the mirror.

The mirror is fixed to an iron plate b which forms the armature of an electro-magnet E and is provided with pivots C.

By means of the attraction of the armature b in consequence of the action of the electromagnet E, the mirror a is caused to vibrate or oscillate, and consequently continually changing lines of the picture under observation become visible, because the angle of the incident rays and therefore also of the reflected rays is continually being changed thereby.

Now, for the purpose of breaking up those lines into points, the other mirror a^1 of the transmitting apparatus A, which is likewise operated by an electromagnet E^1, is arranged on the armature b^1 in such a manner that the reflecting lines of the two mirrors are situated in planes at right angles to each other. Then in a given mutual position of the two mirrors, only a determined point of the reflecting line of the first mirror will appear in the second mirror, and therefore only the reflected ray corresponding to this point will be reflected by the second mirror.

When the two mirrors vibrate on their pivots C, the double reflection causes rays of different points of the object to fall successively upon a determined part of a wall w provided in the transmitting apparatus A, and in this manner an endless line can be formed of the successive points of the picture.

Figs. 6 and 8 illustrate diagrammatically different ways of breaking up the picture into points k, which follow one another so as to form an endless line K. The abscissae X of the points k determine the motion of the first mirror, which oscillates about a horizontal axis, and the ordinates y of the said points determine the alteration of position of the second mirror, which oscillates about a vertical axis.

The results of the motion of these two mirrors are the endless lines K, of which the one shown in Fig. 8 is the longest, because the difference between the movements of the two mirrors is greatest. The greater or less closeness of the succession of the points k in the line K is dependent on this said difference, which therefore also serves to determine the accuracy of the reproduction of the decomposed picture.

By this means, during the motion of the mirrors, continually changing rays of light

emitted from the picture are thrown on to a definite spot on the wall *w*, which rays differ from one another as regards intensity and also colour.

These differences of light have now to be converted into differences of current, in order to ensure their reproduction at a distant place.

This is, in the example of apparatus shown, advantageously effected with the aid of a selenium cell S the conductivity of which, as is well known, is considerably increased by exposure to light, and is also varied in different degrees by the action of rays of different colours. This selenium cell is arranged behind an aperture *o* provided at the place in the wall *w* where the ray falls that is reflected from the second mirror a^1 of the transmitting apparatus. The cell S is included together with a battery B in a circuit L, which leads to the receiving apparatus A^1, and is there connected to an electro-magnet E^2 and also to a small incandescence-lamp *l*, which is located on a branch.

When the selenium cell S is not exposed to light, no current passes in the circuit L because selenium has a very great resistance in the dark. But as soon as a reflected ray of light falls through the aperture *o* upon the selenium, this resistance becomes at once diminished to such an extent that a current flows from the battery through the circuit, energizing the electro-magnet E^2 and rendering the lamp *l* incandescent. As the action of the several rays varies according to their colour, various degrees of conductivity of the selenium are produced, and consequently battery-currents of various strengths are sent into the circuit L.

For the purpose of converting the differences of current thus produced, back again into differences of light, there is arranged on the armature b^2 of the electro-magnet E^2 a prism *p*, and in the wall w^1 there is provided an aperture o^1 such that of the light emitted from the incandescent lamp and decomposed by the prism there can pass through the aperture only the portion that corresponds in colour to the ray to which the selenium cell of the transmitting apparatus is exposed at the same moment and which produces a current of a definite strength corresponding to its colour and thus brings about a corresponding movement of the armature towards the energized electro-magnet and consequently a change of position of the prism *p*.

Instead of the light of the incandescence-lamp *l* direct sunlight may be employed, which will then enter through a slit o^2 in the casing and be decomposed by the prism.

The ray passing through the aperture o^1 of the receiving apparatus—for instance, a blue ray when the selenium cell is exposed to a blue ray—undergoes, in the same manner but in the opposite direction, a double reflection by means of two mirrors *a a* which also oscillate on their pivots *c* under the action of electro-magnets E^1 E, and thereby effect the composition of the several successive rays so as to form a picture or image G^1.

For this purpose all that is necessary is that the mirrors of the two apparatus A and A^1 move in perfect synchronism. With this object the two electro-magnets E E of the mirrors that oscillate about horizontal axes are connected with a battery B^1 by means of a lead L^1, whilst the electro-magnets E^1 E^1 of the mirrors that oscillate about vertical axes are connected with a battery B^2 by means of a lead L^2, and in each of these battery-circuits there is arranged a current-interrupting device, an induction-apparatus, a microphone, or some other device M^1 or M^2 by means of which the current is constantly interrupted or varied in strength.

As the light emitted from the object G into the transmitting apparatus A, acts only at one point in consequence of the operation and position of the mirrors, the use of an objective may be dispensed with.

In front of the receiving apparatus A^1 there may be arranged a photographic plate upon which the object situated in front of the transmitting apparatus will appear after a certain time, or the eye itself may be employed as a photographic camera in which case the several light-rays are rendered visible upon the retina. The impressions of images upon the same are, however, of very short duration and disappear after 0·1 to 0·5 of a second. Consequently if the whole of the points of the original picture be telelectroscoped, the observer will, from this succession of

photographs produced in the eye, have the consciousness of seeing the entire picture just as if the whole of the points of the picture were transmitted simultaneously.

If, before the complete disappearance of the picture, a second, third, and so on repetition of the picture be transmitted in the same way, the eye will receive the impression of a permanent picture. If the successively transmitted pictures correspond to different phases of motion of the object, the impression of a moving picture can be made on the retina of the eye, exactly as in the case of the stroboscope, kinematograph, and the like.

The employment of an objective is of advantage if a large picture is to be transmitted, or if it is to be projected or observed directly to a large scale.

As will be seen, in the described apparatus three batteries B, B^1, and B^2 and three conductors L, L^1, & L^2 are necessary in order to render its operation possible, the conductor L, with its battery B, serving for transmitting the picture, and the electromagnets conductors L^1 and L^2, with their batteries, serving for moving the mirrors synchronously.

For greater distances between the transmitting and receiving places, it is, however, desirable, on account of the great cost of a plurality of conductors, to do away with two of them, so that the seeing from a distance and the synchronous movement of the mirrors can be effected with a single wire.

This is, as regards the one electromagnet-conductor, effected by connecting two corresponding ones of the electromagnets with the conductor L that serves for transmitting the differences of light converted into electric currents.

The two other electromagnets cannot, however, be directly connected with the main conductor, as otherwise the two mirrors of the transmitting or the receiving apparatus would execute a uniform movement, which would have as a result that there would always be reflected only a single limited line K in the direction of the diagonal (as shown in Fig. 9) and there would consequently be transmitted only this line and not the entire picture. Therefore with the line-conductor L there are connected two like apparatus (inductors, transformers) and into the secondary conductors thereof there are inserted the two electro-magnets acting on the mirrors; thereby the number of the current-oscillations is changed uniformly and the electromagnets of each part A and A^1 of the apparatus will produce oscillations differing in number but proceeding synchronously in the two apparatus.

When employing three conductors, the electro-magnets E E^1 can be used as microphones acting independently of one another as soon as they are suitably connected with telephones, the mechanical action on the microphones that takes place in the case of the ordinary telephone apparatus, being, of course, omitted. The signal bell may be put into circuit in a manner similar to that of the latter apparatus and the entire apparatus be accordingly used simultaneously for seeing from a distance and for speaking from a distance. If one or both of the electro-magnet-conductors be omitted, the microphone will be omitted in one or both of the parts of the apparatus (transmitting or receiving station).

To ensure certainty in the operation of the arrangement for a long time, it is essential to remove the drawback attaching to the hitherto known selenium-cells serving for different purposes and consisting in that with constant illumination the selenium loses in sensitiveness to light.

This is attained by using the construction of selenium cell shown in Figs. 4 and 5.

This consists of two concentric brass-rings r r^1 between which there is put, as a lining, a thin annular layer s of selenium, so that a disc is produced; this can be displaced in slow rotation about its axis t by means of a clockwork t^1 (Fig. 1). On the brass-rings rest two contact-makers u u^1, which are connected with the battery B or with the line-conductor L. The disc is placed in a part of the apparatus shut off from the interior by the wall w, so that during its rotation only a small portion of the selenium ring s can be struck by the ray passing in through the opening o, whilst the remaining selenium remains unilluminated. The object of the walls or

plates v v^1, which shut-off the boxes of the transmitting and receiving devices A and A^1 as regards the object or as regards the eye or the photographic camera and which leave free only a small slit for the passage in and out of the rays that are to be or have been, transmitted, is to protect particular parts of the apparatus from other rays injurious to its proper operation.

Dated this 24th day of February 1897.

F. WISE HOWORTH,
46, Lincoln's Inn Fields, London, W.C., Agent for the Applicant.

COMPLETE SPECIFICATION.

Method and Apparatus for Reproducing Pictures and the like at a Distance by Means of Electricity.

We, JAN SZCZEPANIK, Engineer, and LUDWIG KLEINBERG, Banker, both of I Bartensteinstrasse 16, Vienna, Austria, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

This invention relates to a method and an apparatus for transmitting a picture or representation of an object (hereinafter called the picture) and rendering it visible in its natural colours at a distant place by electrical means.

According to this method the picture that is to be rendered visible at a distance is broken up into a number of points and the several rays corresponding to these points are combined together again to form a picture by means of two pairs of mirrors placed at the transmitting and receiving stations and oscillating synchronously; for the purpose of transmission, the differences of light of the rays of light passing from the picture-points obtained by breaking up being first converted into differences of current, and the latter being then transmitted through the line conductor to the receiving station and there re-converted into differences of light.

The conversion of the light rays into electrical current impulses can be effected in various known ways. If the conversion of the several points of the picture that is to be rendered visible take place in sufficiently rapid succession, the eye of the observer will receive the impression of the entire picture, and if the picture be reproduced repeatedly in sufficiently rapid succession, the observer will receive the impression of a permanent picture, the subject of which may appear to be at rest or in motion according to the nature of the successive pictures thus "telelectroscoped."

A suitable arrangement of apparatus for carrying out this method comprises therefore two main portions—*viz.* the transmitting device and the receiving device which are connected together by conducting wires or, it may be, by a single wire only.

In each of the two devices there are arranged two oscillating mirrors which are moved synchronously by means of electro magnets. As in transmitting the picture by means of a single conducting wire only one point of the picture situated at the transmitting-station can be sent at a time, therefore the mirrors must be so arranged that in any position and at any instant they will reflect only one of the picture-points and thus bring each time a ray of definite property or quality into operation in that portion of the apparatus which converts the differences of light into differences of electric current.

This portion of the apparatus may be variously constructed according as the conversion is effected by (*a*) the variation of the conductivity in consequence of exposure to light (by using selenium, sulphur, tellurium, soot or lampblack or other substance having this property); (*b*) photoelectricity; (*c*) thermo-electricity;

(*d*) radiophonic action; (*e*) variation of magnetism by exposure to light; or by other causes.

The rays, which are converted into electric currents of various strengths according to the colour of the light emitted from the several picture-points, produce at the receiving-station a corresponding energizing of an electromagnet and the consequent movement of a prism in such a manner that only a ray of similar kind of the light falling from a source of light on to the prism and becoming decomposed thereby, can reach the synchronously oscillating mirrors at the receiving station. The reflecting action of these mirrors is such as to cause the picture-point transmitted to the eye of the observer to be visible to him at the place and in the colour corresponding to the point at the transmitting station.

We shall now proceed to describe a particular form of construction of this apparatus, in which a selenium cell is employed.

Fig. 1 of the drawings filed with our Provisional Specification illustrates the general arrangement of the apparatus (transmitting station and receiving station);

Fig. 2 shows one of the oscillating mirrors;

Fig. 3 shows the electro-magnet for moving the mirror;

Figs. 4 and 5 illustrate, in plan and in vertical section respectively, the selenium cell employed; and

Figs. 6 to 9 inclusive are diagrams showing different ways of breaking up the picture that is to be telegraphed.

Each of the four mirrors a a a^1 a^1 is made by coating the reflecting surface of the mirror with an opaque mass, and by making, by means of a pointed or sharp-edged tool (needle or knife), a straight scratch or cut, so as to produce a reflecting surface in the form of a very narrow linear strip. By means of a mirror of this kind, only one line of the object G under observation is rendered visible, because if the eye is stationary only those rays can reach the eye which are reflected at an angle that is equal to the angle of incidence at which the rays projected from a line of the picture in the same plane, fall upon the mirror.

The mirror is fixed to an iron plate b which forms the armature of an electro magnet E and is provided with pivots c.

By means of the attraction of the armature b in consequence of the action of the electro magnet E, the mirror a is caused to vibrate, or oscillate and consequently continually changing lines of the picture under observation become visible, because the angle of the incident rays and therefore also of the reflected rays is continually being changed thereby.

Now, for the purpose of breaking up those lines into points, the other mirror a^1 of the transmitting apparatus A, which is likewise operated by an electro-magnet E^1, is arranged on the armature b^1 in such a manner that the reflecting lines of the two mirrors are situated in planes at right angles to each other. Then in a given mutual position of the two mirrors, only a determined point of the reflecting line of the first mirror will appear in the second mirror, and therefore only the reflected ray corresponding to this point will be reflected by the second mirror.

When the two mirrors vibrate on their pivots c the double reflection causes rays of different points of the object to fall successively upon a determined part of a wall w provided in the transmitting apparatus A, and in this manner an endless line can be formed of the successive points of the picture.

Figs. 6, 7 and 8 illustrate diagrammatically different ways of breaking up the picture into points k, which follow one another so as to form an endless line K. The abscissae x of the points k determine the motion of the first mirror, which oscillates about a horizontal axis, and the ordinates y of the said points determine the alteration of position of the second mirror, which oscillates about a vertical axis.

The results of the motion of these two mirrors are the endless lines K, of which the one shown in Fig. 8 is the longest, because the difference between the movements of the two mirrors is greatest. The greater or less closeness of the succession

of the points *k* in the line K is dependent on this said difference, which therefore also serves to determine the accuracy of the reproduction of the decomposed picture.

By this means, during the motion of the mirrors, continually changing rays of light emitted from the picture, are thrown on to a definite spot on the wall *w*, which rays differ from one another as regards intensity and also colour.

These differences of light have now to be converted into differences of current, in order to ensure their reproduction at a distant place.

This is, in the example of apparatus shown, advantageously effected with the aid of a selenium cell S the conductivity of which, as is well known, is considerably increased by exposure to light, and is also varied in different degrees by the action of rays of different colours. This selenium cell is arranged behind an aperture *o* provided at the place in the wall *w* where the ray falls that is reflected from the second mirror a^1 of the transmitting apparatus. The cell S is included together with a battery B in a circuit L, which leads to the receiving apparatus A^1, and is there connected to an electromagnet E^2 and also to a small incandescence-lamp *l*, which is located on a branch connected to a switch actuated by the armature b^2 of the electro-magnet E^2.

When the selenium cell S is not exposed to light, no current passes in the circuit L because selenium has a very great resistance in the dark. But as soon as a reflected ray of light falls through the aperture *o* upon the selenium, this resistance becomes at once diminished to such an extent that a current flows from the battery through the circuit, energizing the electro-magnet E^2 and rendering the filament of the lamp *l* incandescent. As the action of the several rays varies according to their colour, various degrees of conductivity of the selenium are produced, and consequently battery-currents of various strengths are sent into the circuit L.

For the purpose of converting the differences of current thus produced, back again into differences of light, there is arranged on the armature b^2 of the electro-magnet E^2 a prism *p*, and in the wall w^1 there is provided an aperture o^1 such that of the light emitted from the incandescent lamp and decomposed by the prism there can pass through the aperture only the portion that corresponds in colour to the ray to which the selenium cell of the transmitting apparatus is exposed at the same moment and which produces a current of a definite strength corresponding to its colour and thus brings about a corresponding movement of the armature towards the energized electro-magnet and consequently a change of position of the prism *p*.

Instead of the light of the incandescence-lamp *l*, direct sunlight may be employed, which will then enter through a slit o^2 in the casing and be decomposed by the prism.

The ray passing through the aperture o^1 of the receiving apparatus—for instance, a blue ray when the selenium cell is exposed to a blue ray—undergoes, in the same manner but in the opposite direction, a double reflection by means of two mirrors a^1 *a* which also oscillate on their pivots *c* under the action of electro-magnets E^1 E, and thereby effect the composition of the several successive rays so as to form a picture or image G^1.

For this purpose all that is necessary is that the mirrors of the two apparatus A and A^1 move in perfect synchronism. With this object the two electro-magnets E E of the mirrors that oscillate about horizontal axes are connected with a battery B^1 by means of a lead L^1, whilst the electromagnets E^1 E^1 of the mirrors that oscillate about vertical axes are connected with a battery B^2 by means of a lead L^2; and in each of these battery-circuits there is arranged a current-interrupting device, an induction-apparatus, a microphone, or some other device M^1 or M^2 by means of which the current is constantly interrupted or varied in strength.

As the light emitted from the object G into the transmitting apparatus A, acts only at one point in consequence of the operation and position of the mirrors, the use of an objective may be dispensed with.

In front of the receiving apparatus A^1 there may be arranged a photographic plate

upon which the object situated in front of the transmitting apparatus will appear after a certain time, or the eye itself may be employed as a photographic camera, in which case the several light rays are rendered visible upon the retina. The impressions of images upon the same are, however, of very short duration and disappear after 0·1 to 0·5 of a second. Consequently if the whole of the points of the original picture be telelectroscoped, the observer will, from this succession of photographs produced in the eye, have the consciousness of seeing the entire picture just as if the whole of the points of the picture were transmitted simultaneously.

If, before the complete disappearance of the picture a second, third and so on repetition of the picture be transmitted in the same way, the eye will receive the impression of a permanent picture. If the successively transmitted pictures correspond to different phases of motion of the object, the impression of a moving picture can be made on the retina of the eye, exactly as in the case of the stroboscope, kinematograph, and the like.

The employment of an objective is of advantage if a large picture is to be transmitted, or if it is to be projected or observed directly to a large scale.

As will be seen, in the apparatus described three batteries B, B^1, and B^2 and three conductors L, L^1, and L^2 are necessary in order to render its operation possible, the conductor L, with its battery B, serving for transmitting the picture, and the electromagnet conductors L^1 and L^2, with their batteries, serving for moving the mirrors synchronously.

For great distances between the transmitting and receiving places, it is, however, desirable, on account of the great cost of a plurality of conductors, to do away with two of them, so that the seeing from a distance and the synchronous movement of the mirrors can be effected with a single wire.

This is, as regards the one electromagnet conductor, effected by connecting two corresponding ones of the electro magnets with the conductor L that serves for transmitting the differences of light converted into electric currents.

The two other electro magnets cannot, however, be directly connected with the main conductor, as otherwise the two mirrors of the transmitting or the receiving apparatus would execute a uniform movement, which would have as a result that there would always be reflected only a single limited line K in the direction of the diagonal (as shown in Fig. 9) and there would consequently be transmitted only this line and not the entire picture. Therefore with the line-conductor L there are connected two like apparatus (inductors, transformers) and into the secondary conductors thereof there are inserted the two electro magnets acting on the mirrors; thereby the number of the current-oscillations is changed uniformly and the electromagnets of each part A and A^1 of the apparatus will produce oscillations differing in number but proceeding synchronously in the two apparatus.

When employing three conductors, the electromagnets E E^1 can be used as microphones acting independently of one another as soon as they are suitably connected with telephones, the mechanical action on the microphones that takes place in the case of the ordinary telephone-apparatus, being, of course, omitted. The signal-bell may be put into circuit in a manner similar to that of the latter apparatus and the entire apparatus be accordingly used simultaneously for seeing from a distance and for speaking from a distance. If one or both of the electromagnet-conductors be omitted, the microphone will be omitted in one or both of the parts of the apparatus (transmitting or receiving station).

To ensure certainty in the operation of the arrangement for a long time, it is essential to remove the drawback attaching to the hitherto known selenium-cells serving for different purposes and consisting in that with constant illumination the selenium loses in sensitiveness to light.

This is attained by using the construction of selenium cell shown in Figs. 4 and 5.

This consists of two concentric brass-rings r r^1 between which there is put, as a lining, a thin annular layer s of selenium, so that a disc is produced; this can be displaced in slow rotation about its axis t by means of a clockwork t^1 (Fig. 1). On

the brass-rings rest two contact-makers u u^1, which are connected with the battery B or with the line-conductor L. The disc is placed in a part of the apparatus shut off from the interior by the wall w, so that during its rotation only a small portion of the selenium ring s can be struck by the ray passing in through the opening o, whilst the remaining selenium remains unilluminated. The object of the walls or plates v v^1, which shut-off the boxes of the transmitting and receiving devices A and A^1 as regards the object or as regards the eye or the photographic camera and which leave free only a small slit for the passage in and out of the rays that are to be or have been transmitted, is to protect particular parts of the apparatus from other rays injurious to its proper operation.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. The herein described method of electrical transmission of a picture or representation of an object for the purpose of rendering the same visible in its natural colours at a distant place according to which by means of two oscillating mirrors at the transmitting station, the picture or representation to be transmitted is split up into a number of points constituting an endless line, the differences of light of the rays emitted from the picture points at the transmitting station are converted into differences of current, and the said differences of current are transmitted through an electric circuit to the receiving station, and are there converted back again into differences of light which are re-composed to form the picture or representation by means of two mirrors which vibrate synchronously with the mirrors of the transmitting station.

2. In carrying out the method referred to in Claim 1, effecting the conversion of the light differences into current differences by causing the rays reflected at the transmitting station to act upon a selenium cell S which sends into the circuit L currents corresponding to the variations in the conductivity of the selenium cell produced by the action of the light upon it.

3. For carrying out the method referred to in Claim 1, apparatus comprising a transmitting station A having two linear mirrors a a^1, vibrating in planes at right angles to each other, and a selenium cell S, upon which the light rays emitted from the several picture points are thrown in succession by the double reflection of the mirrors and their movement by electromagnets E E^1, and a receiving station A^1 comprising a prism p illuminated from any suitable source, and two mirrors a a^1 which vibrate synchronously with the mirrors of the transmitting station, and which receive light rays by means of the movement of the prism p produced by the electromagnet E^2 that is energized on the exposure to light of the selenium cell, said light rays being of the same colour as the corresponding rays emitted from the object, and being composed by means of the double reflection so as to form a picture or image.

4. In apparatus such as referred to in Claim 3, for the purpose of seeing at a distance with the use of only one conducting wire, the connection of two of the electromagnets E E E^1 E^1 which serve to produce the synchronous motion of the mirrors a a a^1 a^1 directly to the line conductor L, and the inclusion of the other two electromagnets in the secondary circuits of two inducting devices or transformers which are connected to the line circuit.

5. In apparatus of the kind referred to in Claim 3, the combination of the electromagnets E E^1 arranged in separate leads L^1 L^2, with auditory telephones, so that the apparatus can be utilized at the same time for seeing at a distance and speaking at a distance.

6. In apparatus such as referred to in Claim 3, constructing the selenium cell S in the form of a selenium ring s arranged between two concentric brass rings r, r^1 the disc so formed being revolved slowly behind an aperture o which allows the light rays emitted from the object to pass through after being reflected, so that only a small portion of the selenium is exposed to the light at one time.

7. The apparatus for seeing distant objects by electrical means shewn in and described with reference to the drawings.

Dated this 16th day of November 1897.

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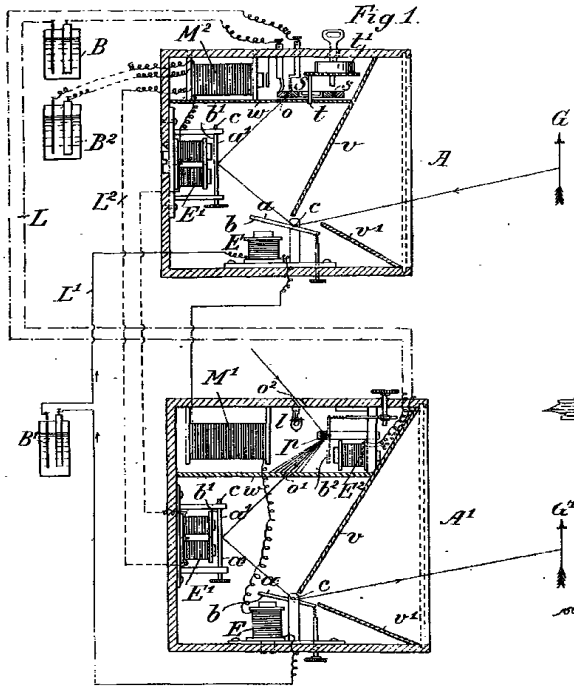
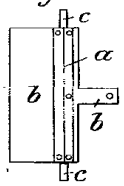
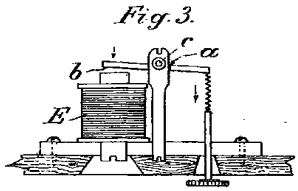
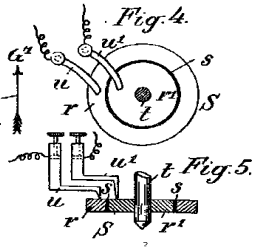
SZCZEPANIK & *another's* Provisional Specification.

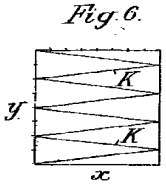
[1 SHEET]

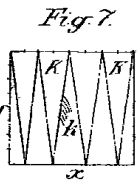


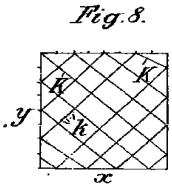


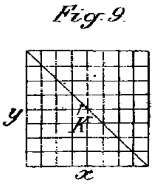












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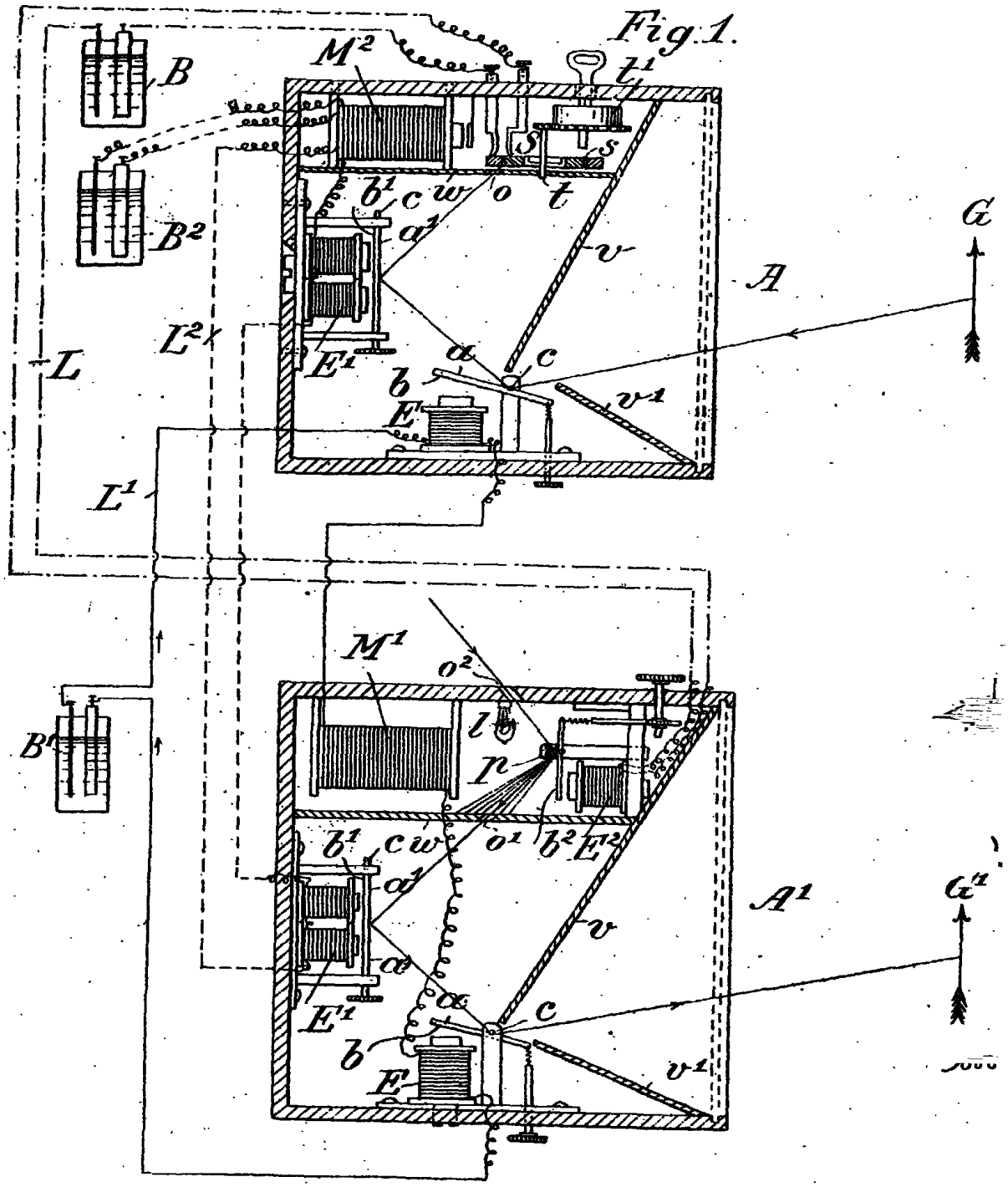

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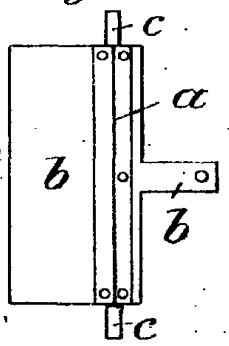

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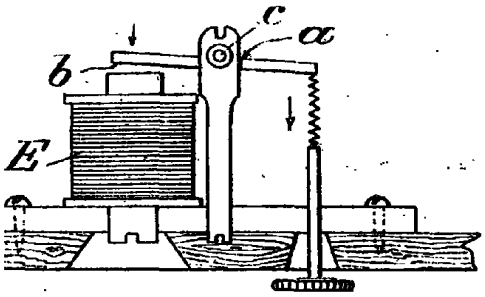

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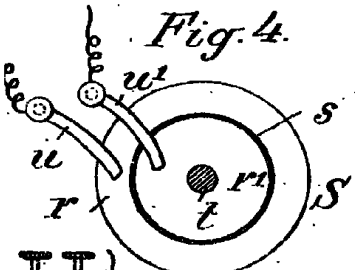

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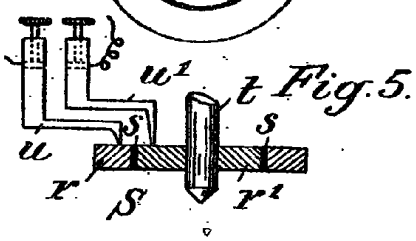

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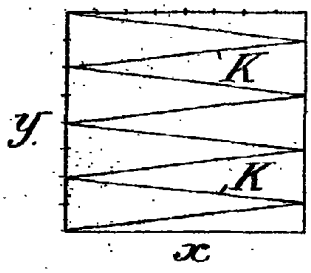

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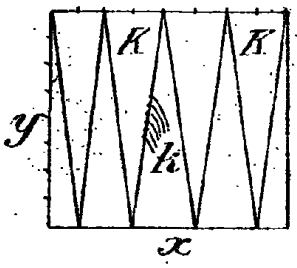

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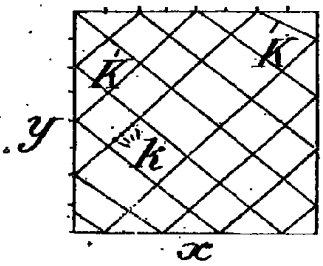
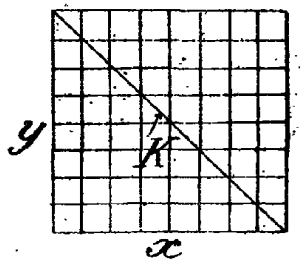


Fig. 9.



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