No. 630,151. Patented Aug. 1, 1899.

S. WHITEHALL.

AUTOMATIC TELEGRAPHY.

(Application filed Feb. 4, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

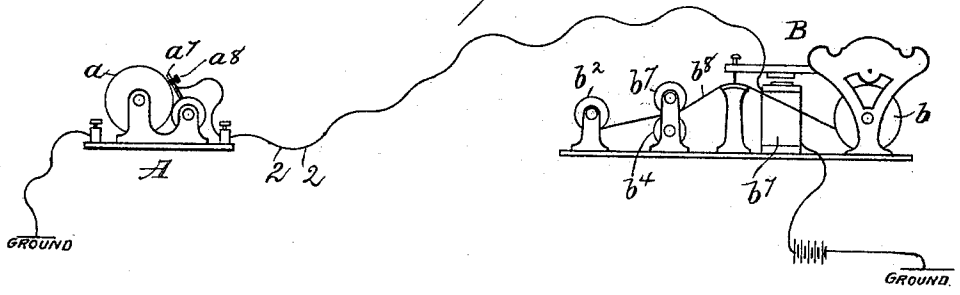

Fig. 6.

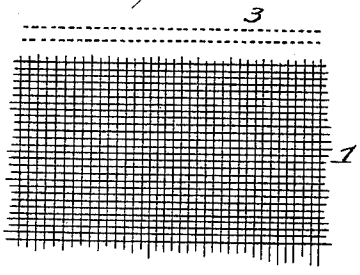

Fig. 7.

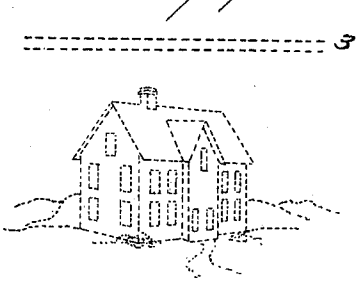

Fig. 8.

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Fig. 2.

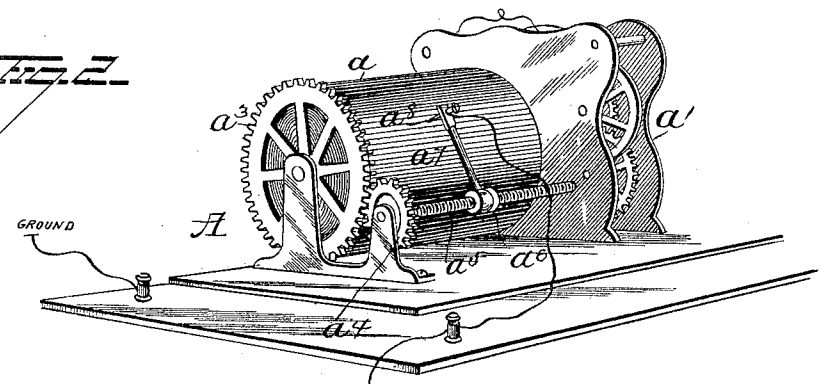

Fig. 3.

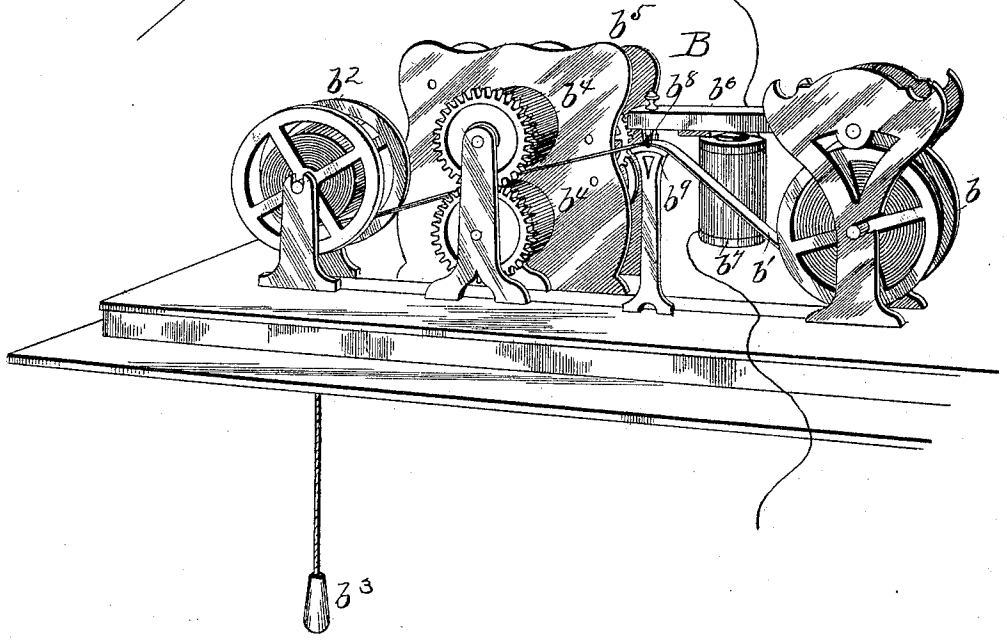

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Fig. 4.

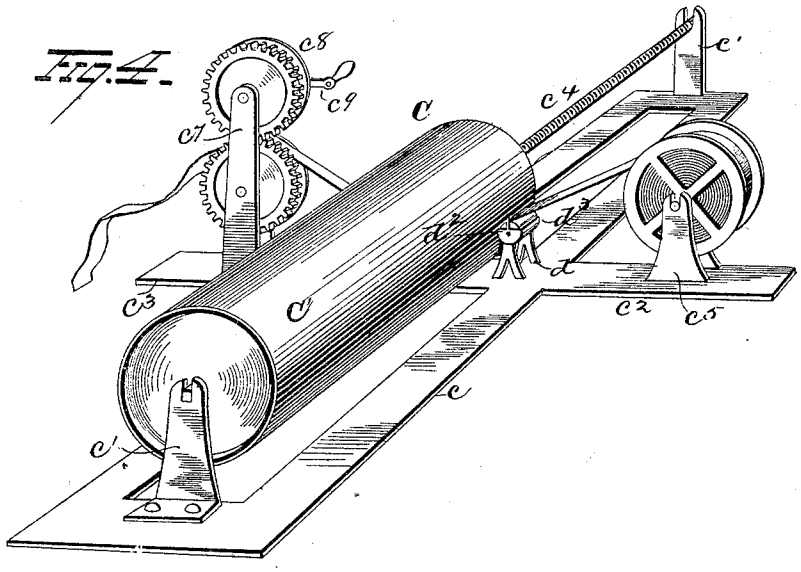
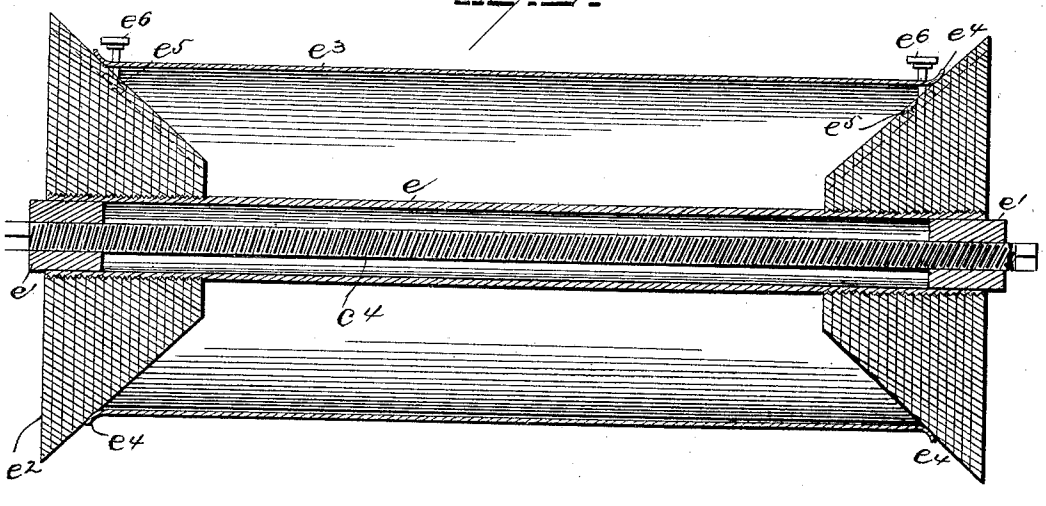


Fig. 5.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 630,151, dated August 1, 1899.

Application filed February 4, 1898. Serial No. 669,091. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL WHITEHALL, a resident of South Bend, in the county of St. Joseph and State of Indiana, have invented certain new and useful Improvements in Automatic Telegraphy; 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.

My invention relates to an improvement in automatic telegraphy, and more particularly to the preparation of a message, design, or picture, the transmission of the same to a distant point, and then the final reproduction thereof, one object of the invention being to transmit a message, picture, or other representation telegraphically without the necessity for synchronism between the transmitter and receiver.

A further object is to provide a simple and efficient transmitting-surface for use in the operation of transmitting a message or pictorial representation telegraphically.

A further object is to provide a transmitting-surface which shall be so constructed that when a message, design, or pictorial representation shall be produced thereon, so as to expose conducting portions adapted to cooperate with a contact device included in circuit with said conducting-surface and a receiver, the circuit will be rapidly made and broken and cause the receiver to operate rapidly and produce a continuous record.

A further object is to provide simple and efficient apparatus whereby telegraphically-transmitted messages can be accurately reproduced.

A further object is to provide means whereby to transmit a design or pictorial representation and record the same telegraphically in a single line on a continuous strip or tape and to reproduce the design or pictorial representation thus telegraphically transmitted connectedly with lines arranged side by side on a broad surface.

With these objects in view the invention consists in certain novel features of construction, combinations, and arrangements of apparatus and in certain novel steps in the method and system of preparation, transmission, and reproduction of designs or pictorial representations between distant points.

In the accompanying drawings, Figure 1 is a diagrammatical view. Fig. 2 is a view of the transmitter. Fig. 3 is a view of the receiver. Fig. 4 is a view of the reproducer. Fig. 5 is an enlarged sectional view of the cylinder of the reproducer. Fig. 6 is a view of an unprepared plate or sheet for the transmitter-surface. Fig. 7 represents the prepared transmitter-surface, the exposed portions appearing as dots. Fig. 8 represents various forms of perforators.

In proceeding to prepare a design or picture for transmission to a distant point I prefer to employ a sheet of wire-cloth 1 or a metal sheet having longitudinal and transverse intersecting grooves. This sheet or plate is covered with a non-conducting material, portions of which are to be removed to form the design or picture, such removed portions thus exposing the metal conducting portions of the plate or sheet. The transmitter plate or sheet may have the design or picture produced thereon in various ways. For instance, the wire-cloth may be covered with a thin coating of wax, portions of which can be removed by means of a suitable instrument, as in drafting or engraving, when the lines will appear as shown in Fig. 7, the wires of the cloth representing dots. Thus it will be seen that the portions of the plate or surface representing the design or picture will be a metallic surface broken between the meshes of the wire-cloth or grooved plate. Instead of the use of wax as an insulating-coating varnish or other material which can be readily removed to form the design or picture may be employed. Instead of forming the plate for the transmitter-surface in the manner above mentioned the metallic plate or sheet may be coated with a mixture of bichromate of potash and gelatin, which when exposed to the light will become insoluble, except in the shadows, which will remain soluble and can be washed off to expose the metal surface representing the design or picture. By thus producing the surface for the transmitter photographically the details of the picture will be obtained and the lights and shadows of the reproduced picture will

be obtained by a greater multiplicity of dots in a line to represent the shadows and a fewer number of dots where the lights appear, as will be more readily understood from the description of the apparatus and its mode of operation as hereinafter outlined. The transmitting-plate having been prepared it will be applied to a cylinder a of the transmitter A and secured thereto in any suitable manner. The cylinder of the transmitter will preferably be made of metal and will be driven, preferably at a regular speed, by means of a clock-motor a'. Said cylinder is also provided at one end with a gear-wheel a^3, adapted to transmit motion to a pinion a^4, secured to one end of a worm-shaft a^5. A sleeve a^6, provided internally with a thread, is adapted to travel on the worm-shaft as the latter is rotated, and said sleeve carries an arm a^7, carrying a pin a^8, adapted to travel over the transmitting-surface on the cylinder as the latter rotates and the arm and pin move longitudinally of the cylinder. The contact-pin a^8 is connected in an electric circuit 2 with the cylinder a or the metallic portion of the transmitting plate or surface and through a line-wire with a receiver B at a distant point, any suitable electric generator being also included in said circuit.

The construction of the receiver B may be considerably varied in detail, the essential features being an instrument by means of which a tape can be continuously fed under a perforator actuated by an electromagnet, the circuit of which shall be controlled by the transmitter A. In the drawings I have shown a convenient and simple form of receiver comprising a supply-reel b for the tape b', a receiving-reel b^2 for said tape adapted to be turned to wind the tape by means of a weight b^3 or in any other suitable manner, rolls b^4 for pulling the tape from the supply-reel and under a perforator, and a clock-motor b^5 for operating the feed or pulling rollers, said motor preferably being so constructed as to have its speed controllable. The perforator of the receiver comprises an armature-lever b^6, which is actuated by an electromagnet b^7, included in circuit with the line and with the transmitter, a perforating-pin b^8, carried by said armature-lever, and an anvil b^9, over which the tape is adapted to pass, said anvil being provided with a socket or recess for the accommodation of the perforating-pin as it passes through the tape.

From the construction and arrangement of transmitter and receiver as above described it will be seen that when the cylinder of the transmitter is set in motion the contact-pin a^8 will move slowly longitudinally of the cylinder, while the cylinder rotates rapidly. As the exposed portions of the transmitting-surface of the cylinder pass under the contact-pin a^8 the electric circuit will be manipulated—that is to say, the circuit will be rapidly made and broken as the contact-pin makes contact with one wire of the wire-cloth and then the next wire. Thus as the cylinder rotates the electric circuit, which includes the transmitter and also the receiver at a distant station, will be rapidly made and broken whenever the exposed metallic portions of the transmitting-surface of the transmitter-cylinder ride under the contact-pin a^8. These rapid interruptions of the circuit will cause the operation of the armature-lever of the receiver in an obvious manner and cause the perforating-pin to puncture the tape passing under it, and thus produce the record in a continuous line on said tape. Each revolution of the cylinder of the transmitter represents one line of the design or picture, (said design or picture being made up of a number of parallel lines;) but all of these lines will be produced on the tape of the receiver one after the other in a single line, and to reproduce the design or picture this continuous line of perforations must be subdivided into shorter lines and arranged side by side, as in the design or picture on the surface of the transmitter-cylinder. For this purpose I provide a reproducer or translator C, adapted to carry the paper on which the design or picture is to be reproduced, and the cylinder or paper-carrier C′ is made adjustable for the accommodation of pictures of different sizes, it being important that the circumference of said cylinder or paper-carrier shall be exactly equal to the diameter of the picture or design—that is to say, the circumference of the cylinder of the reproducer shall be equal to the length of the parallel lines which go to make up the design or picture, and in order that the terminals of the parallel lines of the design can be readily determined when reproduced in one line on a continuous strip by the receiver correction-lines 3 are made in the transmitting-surface of the transmitter above the design. These correction-lines are composed of dots or dashes in line with the dots or dashes composing the parallel lines of the design, so that when the design is reproduced on a continuous strip the lines composing the design will appear one behind another, separated by the dots or dashes of the correction-lines. Thus it will be seen that the line of dots or dashes on the continuous strip of the receiver will be subdivided into shorter lines of equal lengths by the dots or dashes of the correction-lines, said shorter lines corresponding to the parallel lines of the design on the transmitting-surface.

In constructing the reproducer C, I may employ a suitable base c, provided at its respective ends with standards c' and at points between its ends with lateral arms c^2 c^3. The upper ends of the standards c' are recessed to form bearings for the respective ends of a worm-shaft c^4, which is held stationary by its bearings in said standards and on which the cylinder or paper-carrier is mounted, so that when said cylinder or paper-carrier is turned it will also move longitudinally. Suitable standards c^5 project upwardly from the arm c^2

of the base, and in these standards the reel carrying the tape bearing the transmitted record is mounted. At the other side of the cylinder suitable standards c^7 project upwardly from the arm c^3 of the base and serve as bearings for two rollers c^8 c^8, arranged one above the other and geared together. One of the rollers c^8 is provided with a crank c^9 by means of which to operate it. Thus when the tape is passed from the reel carrying the record-tape under and in contact with the cylinder (or rather the paper thereon) and between the rollers c^8 and said rollers are turned the frictional contact of said rollers against the tape will be sufficient to draw it taut and pull it from the carrying-reel. The tape will thus be made to bear against the cylinder with sufficient pressure to cause said cylinder to turn, each revolution of the cylinder representing one parallel line of the design on the transmitting apparatus.

In order to reproduce the lines of dots on the paper carried by the cylinder C′, I provide an inking-roller d, adapted to force ink through the perforations of the tape onto the surface of the paper on the cylinder C′. The inking-roller is carried by suitable standards d', and the tape is guided over it by small guides d^2, and ink is supplied to the roller from a well d^3, disposed under it. Instead of a roller a brush or any other desired marking device may be employed. As before mentioned, the record is produced on the tape by the receiver in a continuous line—that is to say, the parallel lines of the design are produced on the tape one behind the other. Now by passing the tape in contact with the paper on the cylinder C′, so as to revolve said cylinder and cause it to move slowly longitudinally, the lines on the tape will be reproduced on the paper carried by said cylinder, and as each revolution of the cylinder represents one line of the parallel lines going to make up the design and as the cylinder moves longitudinally during the time it is revolving it will be seen that the continuous line on the tape will be produced on the paper on cylinder C′ as a series of parallel lines corresponding with the parallel lines on the cylinder of the transmitter, and thus the connected design will be reproduced on the paper of the cylinder C′ of the reproducer or translator.

It has been heretofore stated that synchronism between the transmitter and receiver of the record is not necessary, and in view of this fact delicate adjustments and a multiplicity of accurately and nicely arranged parts are avoided. I am also enabled to take advantage of the lack of necessity for synchronism for a useful purpose—viz., to regulate the size of the picture or design as reproduced or translated. For this purpose it is only necessary to regulate the speed of the tape through the perforator of the receiver. If a large picture is desired, the tape will be fed under the perforator more rapidly than if a smaller reproduction is desired. As designs or pictures of different sizes can thus be recorded on the tape by the receiver, the necessity for an adjustable cylinder to carry the paper on which the reproduction is to be made becomes apparent, especially when it is remembered that the circumference of the cylinder must be equal in length to the parallel lines of the design or picture. In Fig. 5 of the drawings a simple and efficient construction of adjustable cylinder is shown and may be described in detail as follows: The hub e of the cylinder through which the worm-shaft c^4 passes is made tubular in form and provided in its respective ends with blocks e', having internal threads for the accommodation of said worm-shaft. The blocks may be brazed or otherwise secured into the ends of the tubular hub. The heads e^2 are made tapering and are adapted to screw onto the respective ends of the tubular hub, said heads supporting by their inclined or conical faces the shell e^3, which is expansible, its meeting edges being disconnected and adapted to overlap. The respective ends of the shell where they bear against the inclined faces of the heads e^2 are preferably curved slightly, as at e^4. Each head is provided in its inclined face with a groove for the reception of lugs e^5, carried by set-screws e^6, passing through the shell and securing the latter in place. When it is desired to adjust the circumference of the shell for the purpose before stated, it is simply necessary to loosen the set-screws and turn the heads e^2, at the same time holding the hub and worm-shaft from turning by means of any suitable key applied to the squared end of the worm-shaft.

Perforators have usually been made to form round holes. With my improvements the form of the holes may be varied for the production of different effects as best adapted to each particular design of message. Thus if the perpendicular parallel lines on the message transmitted are one-fiftieth of an inch apart and the perforator made flat at the point full one-fiftieth of an inch wide and set crosswise of the paper strip or ribbon it would make continuous lines of all contacts that are laterally contiguous and dashes of those that are isolated when the lines are reproduced side by side. If the perforator were turned lengthwise of the paper strip, it would merge into lines, all dots following each other as close as one-fiftieth of an inch, making perpendicular marks of the ones farthest apart. In such case the form of the perforator would be as shown at w, Fig. 8.

The perforator might be made oval in cross-section, as shown at x, Fig. 8, or curved, as shown at z, or rhomboidal or diamond-shaped, as shown at y, which latter would produce the effect of dark shades between the angling cross-cut lines of an ordinary engraving.

My improvements are very simple in construction, comprise no parts which require

very sensitive adjustment, and are effectual in all respects in the performance of their functions.

Numerous slight changes might be made in the details of construction of my invention without departing from the spirit thereof or limiting its scope, and hence I do not wish to limit myself to the precise details herein set forth.

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

1. The method herein described, consisting in forming a message or design made up of parallel lines; telegraphically transmitting the lines composing said message or design; recording said lines in the form of one continuous line and then reproducing the message or design by subdividing said continuous line and arranging said subdivisions side by side to form a facsimile of the original message or design, substantially as set forth.

2. The method of transmitting a design telegraphically, consisting in constructing a transmitter with a conducting and a non-conducting face, one upon the other, removing portions of the non-conducting face to form a series of parallel lines which coöperate to form the design, and then transmitting and recording said parallel lines telegraphically in a single line on a continuous strip, and then transcribing the record thus made whereby to form a reproduction of the design as it appears on the transmitter-face.

3. The herein-described method consisting in forming a transmitter comprising a broken or subdivided conducting-face and a non-conducting face on the conducting-face and removing portions of the non-conducting face to expose the conducting-face in a series of parallel broken or subdivided lines to represent a design, transmitting said design telegraphically and reproducing said parallel broken lines in the form of a continuous line and then transcribing said continuous line by subdividing it into shorter lines placed side by side to represent a reproduction of the design on the transmitter, substantially as set forth.

4. A transmitting-surface consisting of a broken metallic surface covered partially with insulating material whereby to expose portions of the metallic surface representing the message or design to be transmitted, substantially as set forth.

5. A transmitting-surface consisting of a sheet of wire-cloth covered partially with insulating material whereby to expose portions of the wire-cloth representing the message or design to be transmitted, substantially as set forth.

6. In automatic telegraphy, a transmitter consisting of a revoluble cylinder, a transmitting-surface on said cylinder consisting of a broken metallic surface covered partially with insulating material whereby to expose portions of said broken metallic surface representing the design in a series of parallel broken lines, a contact or tracing point and means for moving said contact or tracing point longitudinally as the cylinder revolves and trace the parallel broken lines, substantially as and for the purpose set forth.

7. In automatic telegraphy, the combination with a transmitter comprising a revoluble cylinder, a transmitting-surface on said cylinder and consisting of a subdivided metallic surface partially covered with insulating material whereby to expose a series of parallel broken metallic lines, a tracing-point and means for moving said tracing-point longitudinally of the cylinder and trace the parallel broken lines of the transmitter-surface and rapidly make and break an electric circuit including said transmitting-surface and tracing-point, of a receiver included in circuit with the cylinder and tracing-point, said receiver consisting of electromagnets included in said circuit, a perforator actuated by said electromagnets, a tape and means for feeding the tape under the perforator whereby to make a line of perforations in the tape representing the parallel lines of the transmitter-surface, one after the other, substantially as set forth.

8. In automatic telegraphy, the combination with a revolving and longitudinally-movable drum or cylinder and means for holding a sheet of paper thereon, of means for pressing a continuous perforated tape against the drum or cylinder and forcing ink through said perforations as the drum or cylinder moves, whereby to arrange a series of parallel broken lines on the surface of the paper on the cylinder or drum from said continuous strip, substantially as set forth.

9. In an apparatus for subdividing a line of perforations representing the record of a message or design and arranging said subdivisions in parallel lines, the combination with a worm-shaft, of a cylinder mounted to revolve thereon and move longitudinally thereof, means for feeding the perforated tape past the cylinder, and means for forcing coloring-matter through the perforations in the tape and onto the surface of the cylinder, substantially as set forth.

10. In a reproducer, the combination with a fixed worm-shaft, of a cylinder, comprising a tubular hub, internally-threaded blocks secured in the respective ends of said hub for the accommodation of the worm-shaft, heads adjustably secured to the respective ends of said hub, and a shell having overlapping edges and held in position by said adjustable heads, substantially as set forth.

11. In a reproducer, the combination with a stationary worm-shaft, of a cylinder comprising a tubular hub, internally-threaded blocks secured in said tubular hub for the accommodation of said worm-shaft, conical heads adjustably secured to the respective ends of said tubular hub, and a shell having overlapping edges and supported at its ends

by the conical heads, substantially as set forth.

12. In a reproducer, the combination with a stationary worm-shaft, of a cylinder comprising a hub mounted to rotate and move longitudinally on said worm-shaft, conical heads adjustably secured to the ends of the hub, a shell having overlapping edges and having bearings on the conical faces of said heads, and set-screws to hold said shell in place, substantially as set forth.

13. In a reproducer, the combination with a stationary worm-shaft, of a shaft mounted to rotate and move longitudinally thereon, a reel-holder at one side of said cylinder, two rollers mounted at the other side of the cylinder and geared together whereby to receive a tape and pull it from the reel and against the cylinder and an inking device adjacent to the cylinder whereby to force ink through perforations in the tape and onto the surface of the cylinder while the latter is moving longitudinally and rotating, substantially as set forth.

14. The method of transmitting and reproducing a design consisting in transmitting the design telegraphically on a tape or strip in a continuous line, and breaking up said line by distinctive indications and then reproducing the design by arranging the fractions of said continuous line as indicated by said distinctive indications, side by side, substantially as set forth.

15. The herein-described method consisting in coating a broken metallic surface with insulating material, removing portions of said insulating material to expose the metallic surface representing the design to be transmitted, removing the insulating material over the design to expose the metallic surface in a straight line to form a correction-line, transmitting the picture telegraphically, reproducing it in a continuous series of indications on a tape or strip and divided into shorter lines by fractional parts of said correction-line, and then translating the design by arranging the short lines indicated by the fractional parts of said correction-line, side by side.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

SAMUEL WHITEHALL.

Witnesses:
WILLIAM BERGAN,
HORACE KIZER.