

May 16, 1939.

R. J. WISE

2,158,391

SYSTEM AND APPARATUS FOR FACSIMILE TELEGRAPHY

Filed June 12, 1936

6 Sheets-Sheet 3

FIG. 3

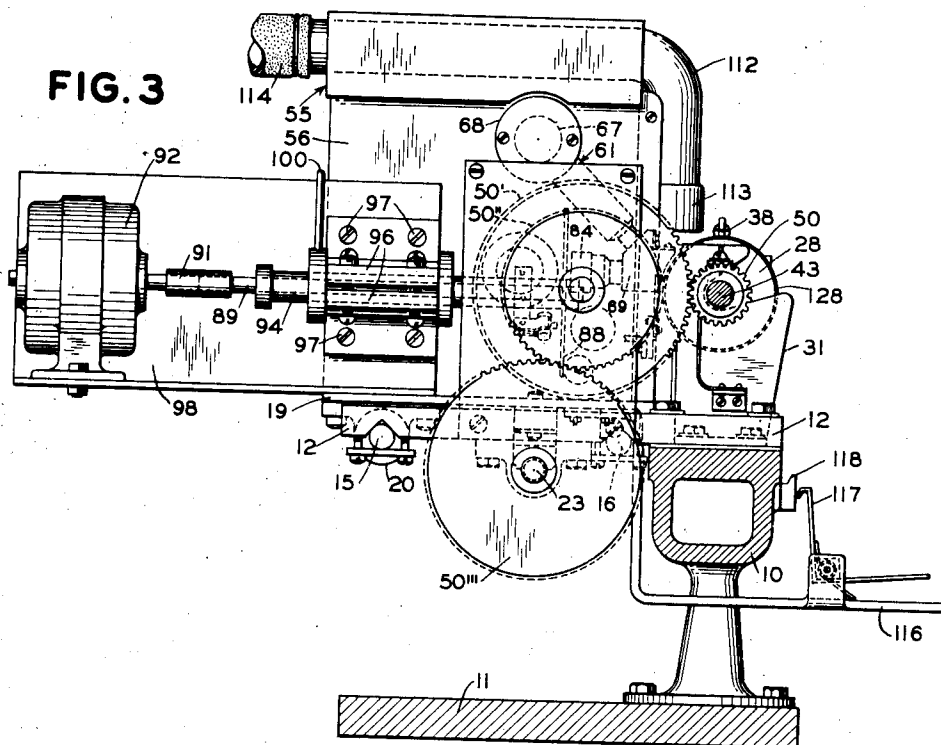
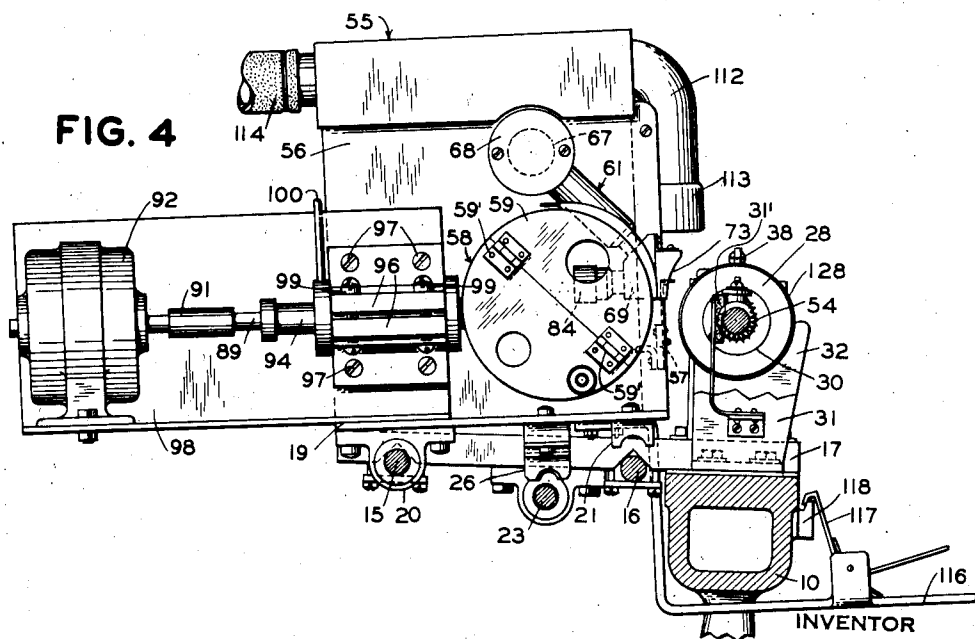


FIG. 4



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6 Sheets-Sheet 4

FIG. 5

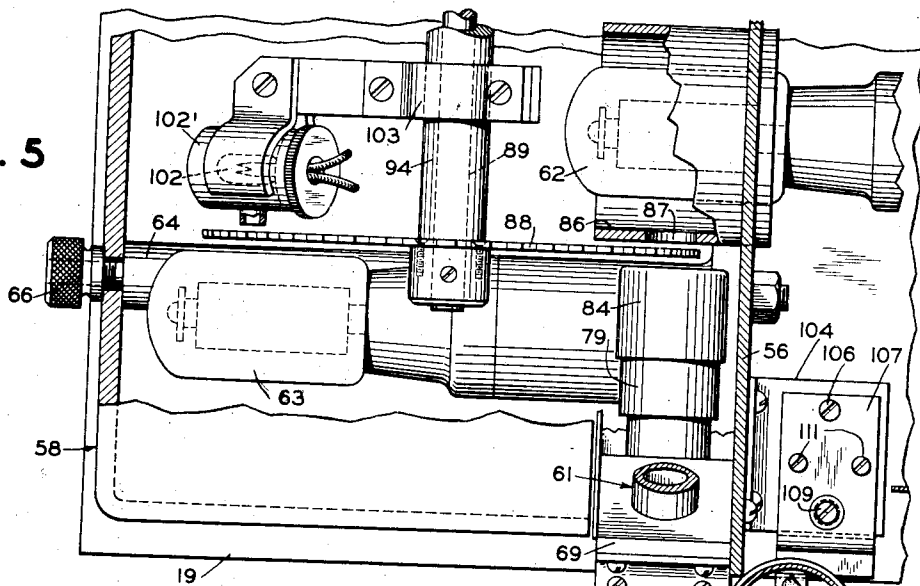
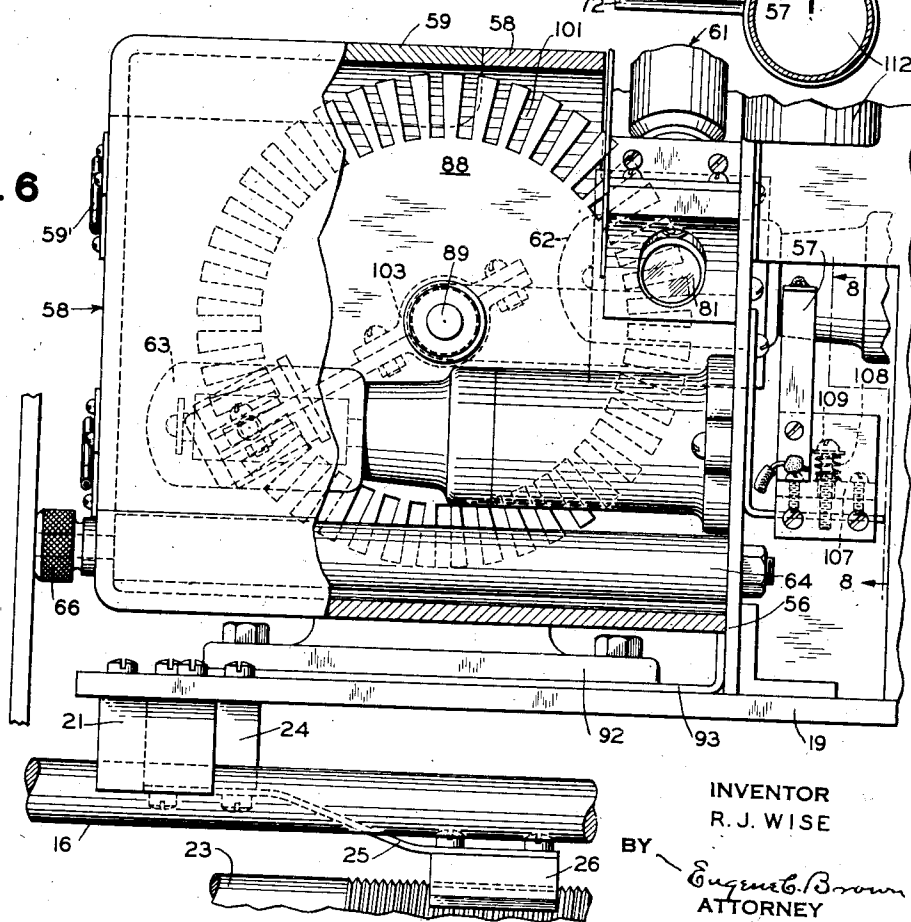


FIG. 6



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6 Sheets-Sheet 5

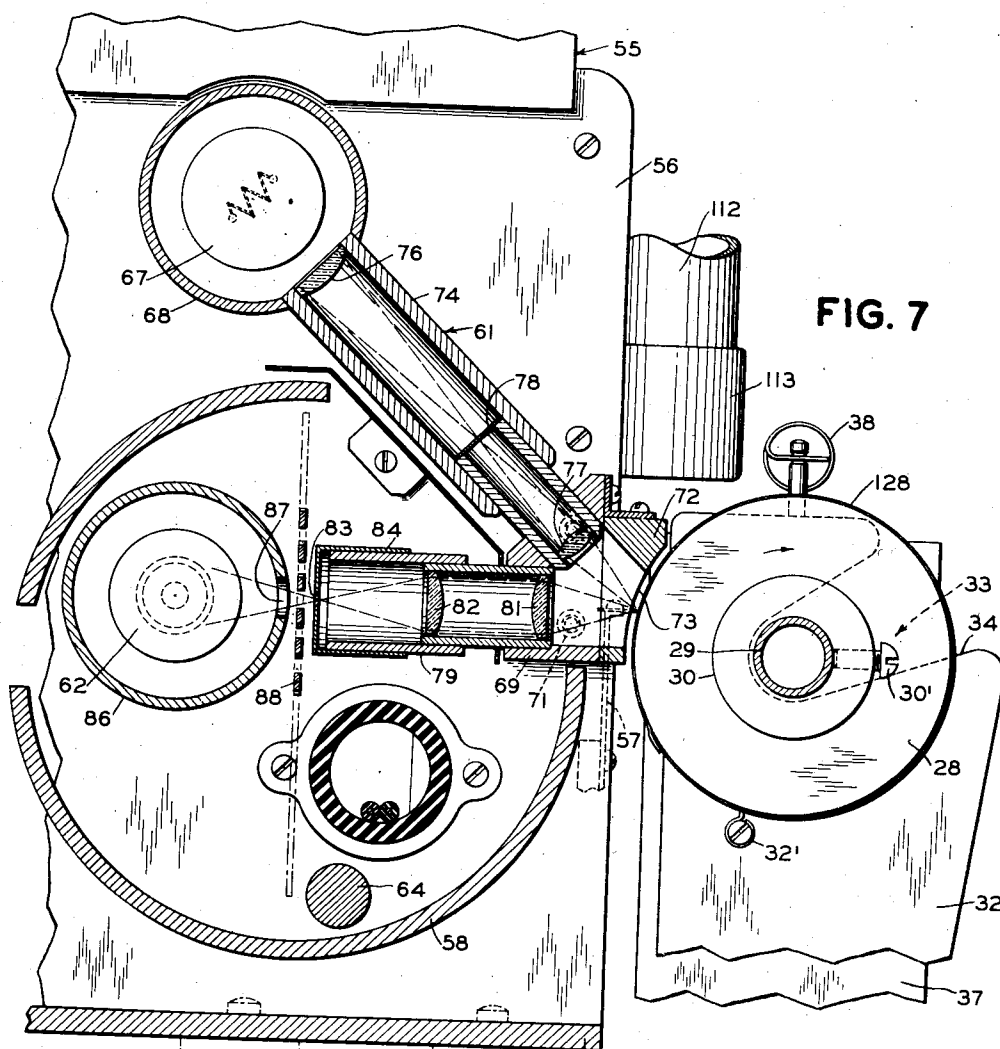


FIG. 7

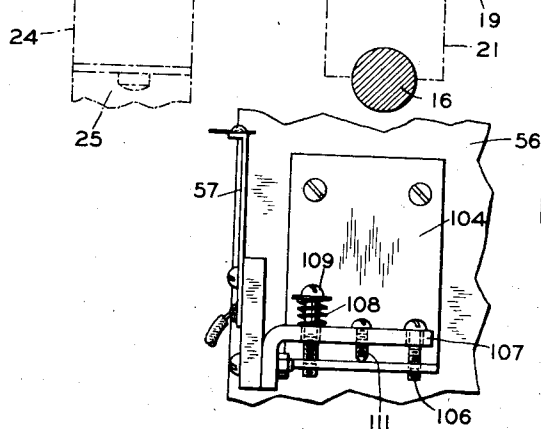


FIG. 8

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SYSTEM AND APPARATUS FOR FACSIMILE TELEGRAPHY

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6 Sheets-Sheet 6

FIG. 9

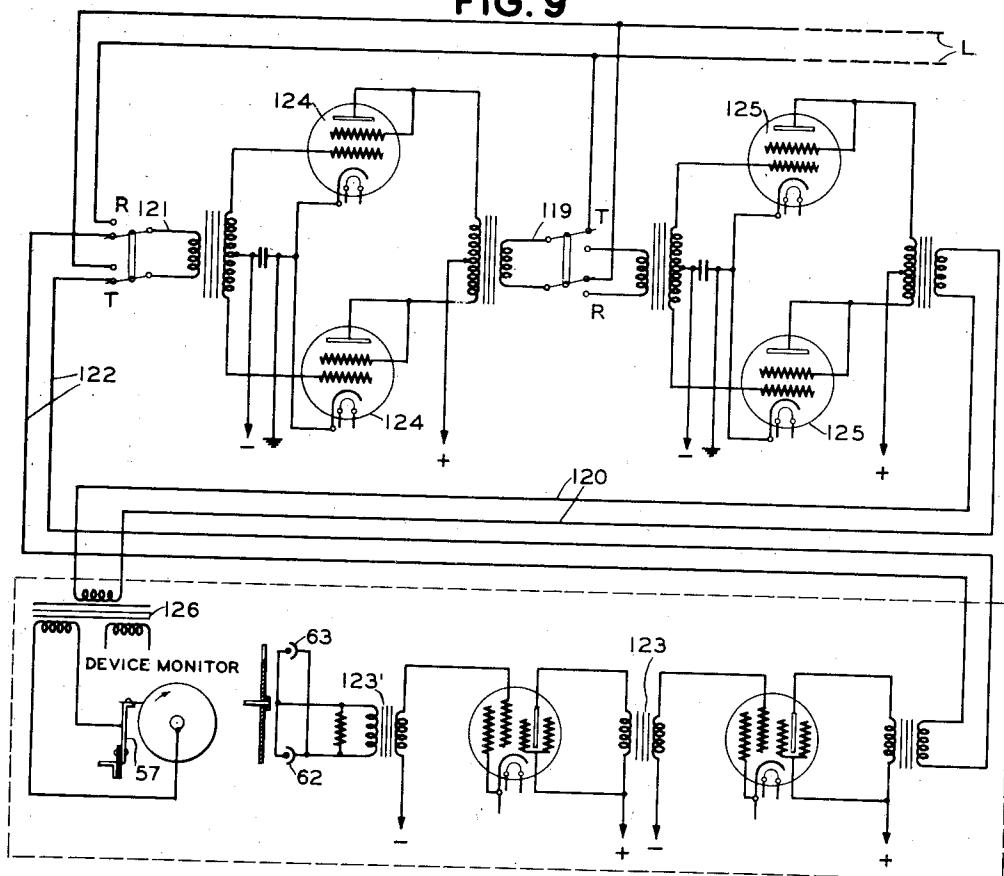
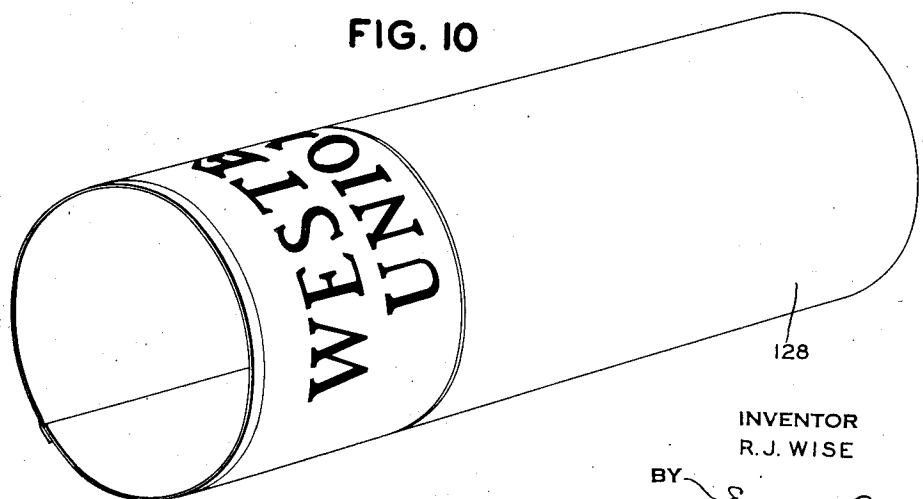


FIG. 10



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UNITED STATES PATENT OFFICE

2,158,391

SYSTEM AND APPARATUS FOR FACSIMILE
TELEGRAPHY

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Application June 12, 1936, Serial No. 84,935

18 Claims. (Cl. 178-6.7)

The present invention relates to telegraphy and more particularly to improvements in apparatus for transmitting and receiving messages, pictures and other subject matter in facsimile.

A primary object of the present invention is to provide simplified apparatus of a compact nature capable of serving either as a facsimile transmitter or receiver.

In accordance with the present invention a picture, message or other subject matter is transmitted from or received upon a subject matter sheet which is carried by interchangeable copy holders which can be readily placed in operative position in the combined transmitter-recorder or removed therefrom and in the preferred form of the invention, tubular picture or message sheets are carried by interchangeable cylinders. Accordingly, another important object is to provide a facsimile transmitter and receiver having novel means for readily and conveniently supplying messages or pictures in succession for transmission, or message blanks in succession for reception.

A further object is to provide a novel arrangement of the parts of an optical scanning device.

A still further object is to provide a novel wiring system for interconnecting the amplifiers of a combined facsimile transmitter and receiver.

The foregoing and other objects of the invention will appear from the following description of an illustrative embodiment of the invention.

In the drawings:

Fig. 1 is a front elevational view of a facsimile transmitter-recorder embodying the present invention;

Fig. 2 is a top plan view of the apparatus disclosed in Fig. 1;

Fig. 3 is a sectional elevation taken on line 3-3 of Figs. 1 and 2 as viewed in the direction of the arrows;

Fig. 4 is a sectional elevation taken on line 4-4 of Figs. 1 and 2 as viewed in the direction of the arrows, certain of the parts of the apparatus being shown in non-operating position;

Figs. 5, 6 and 7 are fragmentary sectional views taken on the lines indicated in Figs. 1 and 2 to illustrate the arrangement of details of the optical scanning device;

Fig. 8 is a fragmentary detail view in side elevation of the scanning stylus;

Fig. 9 is a wiring diagram illustrating the interconnection of the amplifiers and the switching means for connecting the amplifiers in circuit for sending or receiving; and

Fig. 10 is a perspective view of a message sheet

rolled into a tube for use in the sender or receiver of the present invention.

Referring to the drawings and for the present to Figs. 1 to 4 thereof, 10 indicates a base which forms the principal support for the operating parts and driving mechanism of the apparatus and which rests upon a table 11 or other convenient sub-base. It will be apparent to those skilled in the art that the entire assembly of the apparatus may be readily arranged to lie wholly above the bottom of the base 10, thereby permitting the base 10 to rest directly upon the sub-base 11. The base is provided with brackets 12 and 14 serving to support the longitudinal guide member 15, bracket 12 also serving to support one end of an additional guide member 16. The guide member 15, positioned at the rear of the apparatus, is supported between its ends and the guide member 16 is secured at one end to an additional bracket 17, which in turn is secured to the base 10. The guide members 15 and 16 slidably support the longitudinally movable scanning assembly which comprises the optical pickup system for sending messages and the independent stylus 57 which may be employed for either transmitting or receiving.

The scanning assembly is mounted upon a suitable base member 19 (Figs. 1-4) which is provided with one or more bearing guide blocks 20, the apertures of which slidably engage the guide member 15, and an additional recessed guide block 21 which rests upon the guide member 16. The apertured guide blocks 20 at the rear of the scanning assembly serve as pivot points about which the scanning assembly may be rocked for the purpose of arresting operation of the machine when desired. Movement is imparted to the scanning assembly by means of a rotatably mounted threaded rod 23 which is journaled in bearings carried by the brackets 12 and 17. The base 19 of the scanning assembly has secured thereto a member 24, Fig. 6, to which is connected a flexible arm 25 provided at its free end with an internally threaded half-nut 26, the latter adapted for engagement with the threads on the rod 23.

The subject matter to be scanned which may be messages or pictures, either for purposes of transmission or reception, is carried upon readily interchangeable copy holders preferably in the form of cylinders 28, one of which is illustrated in Fig. 1 of the drawings in the operative position. Each cylinder 28 may comprise an external barrel portion having an outside diameter which will cause it to be operatively engaged by

either the transmitting or receiving scanning devices to be described hereinafter. Integral with or inserted within the barrel portion of each cylinder is a concentric shaft 29 which for convenience may be hollow, as shown. Adjustable sleeves 30 secured to the shaft 29 by suitable means, such as the set screws 30' serve to position the barrel axially of the shaft 29 in a desired position. A holder or cylinder 28 is supported prior to the beginning of a scanning operation and is brought into the operative position before the scanning devices by an arrangement which forms an important part of the present invention and which will now be described in detail.

Secured upon the base 10 and spaced apart a suitable distance, depending upon the desired axial length of travel of the scanning assembly, are two similarly shaped upright members 31 and 32, the essential details of member 32 being best shown by Fig. 7 of the drawings. Adjacent the upper end of each bracket is an upwardly inclined tapering notch 33, the lowermost edge 34 of which slopes rearwardly to cause a cylinder with its shaft 29 resting in these notches to roll rearwardly toward the scanning assembly, thereby ensuring that the cylinder will always be in proper position to be brought into the operative position when scanning is begun. When a cylinder 30 is rotated for scanning subject matter on or attached to its peripheral surface, it is supported between centering points which engage the hollow ends of the shaft 29 to maintain the mandrel in a concentric position. One of these conical points or centers 35 is formed upon the end of a rod 36 which is mounted for reciprocation in a bearing provided at the top of a bracket 37, this style of mounting permitting both rotation and reciprocation of the rod. The rod 36 is urged toward the left as viewed in Fig. 1 by means of spring 38 which engages an upstanding pin 39 secured to the rod. The remaining end of the spring 38 is fixed in any suitable manner, as for example, to the bracket 32 as illustrated in the drawings. Movement of the rod 36 under the influence of the spring is limited by a collar 41 which is preferably adjustable longitudinally of the rod 36. The collar 41 engages the upright 37 to limit travel of the rod. A conical point 42 which is formed at the end of a driven shaft 43 is complementary to the conical point 35, and it is to be noted that as the rod 36 is permitted to move toward the left, the conical points 35 and 42 will enter the ends of the hollow shaft 29 of a cylinder in position in the notches 33. This will raise the cylinder from the notches 33 and position it accurately in alignment with the shaft 43 and the rod 36, and parallel with the path of movement of the scanning device. A resiliently carried friction member 31' (Fig. 4) engages the shaft 29 of a cylinder in position between the centers 35 and 42 and by exerting a slight drag on the shaft, takes up back lash in the gears and also ensures that a pin 51 extending from shaft 29 will remain in contact with a member 52 carried by shaft 43, thereby causing shafts 29 and 43 to turn together substantially as one shaft. A light spring 32' secured on the bracket 32 may serve if desired to ensure that the drum will be grounded to furnish a circuit from the stylus. The rod 36 is provided with a grip portion 44 and the previously mentioned pin 39 cooperates with a slotted detent or latch member 45 (Fig. 2). The pin 39 moves in an elongated longitudinal slot 46 in the latch member 45 when

a cylinder 28 is to be lifted from the brackets 32 and 33 by engagement of the tapered centers 35 and 42 with its shaft 29 into operative position for scanning. In order to hold the rod 36 in its retracted position after the cylinder has been released, the pin 39 may be caused to engage either of the edges 47 formed at or adjacent the end of the detent member 45, by rotating the rod 36 a small amount in either direction after the pin 39 has been withdrawn from the longitudinal slot 46.

The threaded shaft 23 and the cylinder driving shaft 43 are driven from the motor 48, which is preferably some form of synchronous or speed regulated motor. Driving power from the motor is imparted to the shaft 43 through a speed reducing drive 49 of suitable character. The threaded shaft 23 is driven from a pinion 50 on the shaft 43 through a gear train composed of an idler gear 50' and pinion 50'', the latter meshing with a gear 50''' secured to the threaded shaft 23. The gear ratios of the gearing just described are selected so that the rate of longitudinal travel of the scanning assembly and the peripheral speed of rotation of the cylinder 28 cooperate to produce the desired helical scanning of the subject matter on the mandrel 28. Excellent results are secured in practice for message transmission by selecting these relative speeds so that as the mandrel rotates once, the scanning assembly will move longitudinally a distance of one one-hundredth of an inch.

To provide for a positive but automatically engageable driving connection between the driven shaft 43 and the cylinder 28, a resilient dog clutch is provided which comprises the radially extending pin 51 which projects from the shaft 29 of each cylinder 28 adapted for use in the device, and the driving member 52 pivoted to the shaft 43 (Fig. 2). The driving member 52 is urged against a stop 53 by means of a spring 54, the said spring for the sake of compactness of design partly encircling the shaft 43. It will be understood that the member 52 if rigidly secured to the shaft 43 may be of a yielding nature, thus making it unnecessary to use the spring 54. As the cylinder 28 is brought into its operative position between the centers 35 and 42, the end of the pivoted member 52 engages the pin 51 and ensures positive rotation of the cylinder 28. Shock of the sudden engagement of the arm 52 with the pin on the cylinder shaft is absorbed by the spring 54 which permits the arm to yield momentarily.

Each cylinder 28 is preferably provided with a mark located with respect to the pin 51 or other portion of the clutch so that the spaced or overlapped edges of a message blank can be positioned near this mark. With motors at both stations in synchronism, and in phase or isochronism, the message copy and the message blank will have the same angular position with respect to the sending and receiving scanners. This result is accomplished without use of complicated phase adjusting mechanism.

The scanning assembly mounted upon the longitudinally movable base 19 comprises a photoelectric pickup arrangement of the kind disclosed and claimed in the copending application of R. J. Wise, Ser. No. 57,019, filed December 31, 1935. In accordance with the present invention the elements of the apparatus disclosed in the application just referred to and other parts operating in conjunction therewith are compactly but accessibly assembled in a manner now to be

described. A casing 55 mounted on the base plate 19 encloses the part of the amplifying apparatus and transformers diagrammatically shown in Fig. 9 which is enclosed in the dotted rectangle.

5 The vertical plate 56 (Figs. 5 and 6), forming the end wall of the casing, supports an independent stylus 57, as will be hereinafter described, and the principal parts of the optical scanning arrangement. The stylus 57 is available for transmitting or recording. A housing 58, provided with a section 59 hinged at 59' (Fig. 4) to afford convenient access to the parts of the optical scanning arrangement, encloses a part of the lens tube assembly 61 and the photo-cells 62 and 15 63. Details of the lens tube assembly are shown on an enlarged scale in Fig. 7. The entire housing 58 is connected to the plate 56 by a post 64 and may be removed bodily from the apparatus by unscrewing the thumb nut 66. A lamp 67 is enclosed in a housing 68, the latter being secured to the plate 56 by suitable means.

The scanning head 69 which is a part of the lens tube assembly previously mentioned, is detachably secured to the plate 56 by means of 25 screws 71 or equivalent fastening means. The scanning head is provided with a detachable portion 72 having an arcuate face 73 which is substantially concentric with the centers 35 and 42. Other replacement portions 72 having arcuate 30 faces of a different radius of curvature may be substituted when desired. A lens tube 74 contains two lenses 76 and 77 and an apertured plate 78 designed and positioned with respect to each other and the lamp 67 so that light from the lamp 35 is concentrated in a spot on the periphery of the drum 28. The approximate configuration of the resulting pencil or beam of light is indicated by the dash lines on Fig. 7 of the drawings. It will be noted that the beam is focused on the aperture 40 in the aperture plate 78 and on the surface of the drum 28. The telescoping sections of the tube 74 provide for focus adjustments. A lens tube 79 contains lenses 81 and 82 for directing the beam of light reflected from the periphery of 45 the drum 28 onto an aperture 83 formed in the end of the cap 84 which telescopes over the end of the tube 79. Like the tube 74, the tube 79 is made up of telescoping sections which provide for focus adjustments. The photo-cell 62, which 50 is supported from the base plate 19 on a suitable rigid pedestal or bracket, is surrounded by a shield 86 apertured as indicated at 87 to admit the reflected beam of light from the tube 79.

A light chopper 88, interposed between the 55 photo-cell 62 and the aperture 83, is secured upon a rotatable shaft 89 which is driven through a resilient driving connection 91 by motor 92. The shaft 89 is journaled freely in a tubular shaft 94 which in turn is frictionally held in a divided 60 bearing bracket made up of two like parts 96 (Figs. 3 and 4) secured to the plate 56. The securing screws 97 for the parts 96 also serve to secure the vertical flange of an elongated motor supporting bracket 98 to the plate 56. The motor 65 92 is secured to and rests upon the horizontal flange of the bracket 98. Clamping screws 99 permit adjustment of the frictional grip of the parts 96 upon the sleeve 94. For a purpose to be described, the sleeve 94 is provided with a conveniently disposed handle 100.

The light chopper 88 is in the form of a disc, as illustrated, having a series of equally spaced opening or notches 101 adjacent its outer edge. The number of notches in the disc and the speed 75 of rotation of the disc may vary within wide

limits, depending on the desired rate of scanning, the constants of the communication circuits employed between stations, and other factors. An auxiliary lamp 102 for illuminating the previously mentioned photo-cell 63 is mounted in a housing 5 102' carried at the end of an arm 103 extending radially from the sleeve 94. The position of the auxiliary source 102 with respect to the chopper teeth or notches is adjustable by means of the handle 100 already described. In this manner the 10 auxiliary source may be accurately positioned so that its light is cut off by the chopper 88 when the reflected beam from the light source 67 impinges upon the photo-cell 62.

In order that the device may be utilized for 15 recording, the previously mentioned independent stylus 57 is so positioned that it may, when desired, be brought into contact with the surface of a cylinder 28 or a message positioned thereon. To support the stylus a bracket 104, Figs. 1 and 8, 20 is secured to the plate 56. The horizontal flange of the bracket 104 is provided with threaded apertures in one of which is engaged a screw 106. The adjustable supporting base 107 to which the stylus is secured, pivots in a vertical plane about 25 the shank of the screw 106 and its upward movement is yieldably and adjustably resisted by a spring 108 which surrounds a screw 109. Downward movement of the support 107 is limited by a screw 111 which is threadably engaged in an 30 aperture in the bracket 107.

In operation with the stylus in contact with a message blank on the cylinder 28, gases may be evolved during a chosen recording process and to facilitate their removal a conduit 112 is provided 35 which has a suitable nozzle 113 positioned above the stylus. The conduit 112 is supported by the walls of the casing 55 and is placed in communication with an exhaust fan or other suction device by means of a suitable pipe or hose 114. 40

In order to prevent axial movement of the base 19 when the machine is idle, the base and the parts thereon may be tilted bodily about the previously mentioned supporting bearing blocks 20. This is conveniently done by a handle 116 which 45 extends forwardly into a position conveniently reached by an operator. A latch 117 is adapted to engage any suitable or convenient projection 118 upon the base 19 so as to retain the carriage in its tilted inoperative position. 50

Fig. 10 of the drawings illustrates a prepared message or a message blank made up of a suitable sheet of paper 128 formed into a tube which fits nicely over a cylinder 28. The seam of the tubular form is preferably gummed or otherwise 55 adhesively joined so that blanks 128 may be made up in advance of their use. It is also within the scope of the present invention to apply message sheets or blanks in any other manner to the cylinders; for example, by elastic bands. 60

Fig. 9 of the drawings shows diagrammatically the wiring system for interconnecting the amplifiers of the combined transmitter and receiver. The line L, which may be any type of communication channel extending to a remote transmitter 65 and/or receiving station, is connected to one set of contacts of a pair of double pole switches 119 and 121. The remaining points or sets of contacts of the switch 121 are connected by conductors 122 to a two-stage amplifier 123 which serves to am- 70 plify the output of the previously mentioned photo-cells of the scanning device. The movable switch arms of the switch 121 are connected to a push-pull amplifier 124 and the output circuit of this amplifier is connected to the switch blades 75

of the switch 119. The remaining points of the switch 119 are connected through a suitable coupling transformer to a push-pull amplifier 125, the output circuit of which is connected to a receiving transformer 126. It will be understood that switches 119 and 121 may be combined in a single structure and that the switch blades thereof may be operated from a remote point by any suitable means known in the prior art. It is to be noted that with the switch blades of both switches occupying the positions shown in Fig. 9, the apparatus is ready for transmission. Transmission will then take place by way of the amplifier 123, conductors 122, the switch 121, the amplifier 124 and the switch 119.

With the position of the switch blades reversed, the apparatus is in condition for receiving messages from a distant point by way of line L, contact points of switch 121 marked R, amplifier 124 in cascade with the amplifier 125 and by way of conductors 120 to the receiving transformer 126. The secondary of this transformer is in communication with the stylus 57. It will be understood, however, that the secondary of the transformer 126 may be connected with a neon lamp or any other type of recorder which may be used. Effective shielding of the coupling transformer 123' and the amplifier 123 is provided by mounting these parts in the casing 55. Also, the necessity for long leads between the photo-cells and the amplifier is eliminated.

In operation of the apparatus described above and assuming that it is desired to transmit a message or series of messages, the message sheet as prepared is formed in the manner indicated in Fig. 10 and is applied to one of the cylinders 28 which is placed in the notches of the brackets 31 and 32. Prior to this, motor 43 will have been started so that it is running in synchronism with a like motor at the distant station. The conical center 35 is moved toward the left, as viewed on Fig. 1, by releasing the pin 39 from the surface 47 with which it is engaged, so that it can travel longitudinally in the slot 46. When this occurs, the mandrel shaft will be lifted from the brackets 32 and the cylinder will be properly positioned with respect to the part 72 of the lens tube. Upon completion of transmission, the conical point 35 may be withdrawn by moving the rod 36 to the left and again engaging the pin 39 with the edge 47 of the latching plate. The cylinder 28 may then be readily removed and another cylinder with a prepared message thereon may be quickly substituted. At this time or upon completion of scanning of the message, the carriage may be disengaged by raising the handle 116 which disengages the half-nut from the propelling screw and permits the carriage to be returned to its left hand or starting position.

Assuming that it is desired to receive a message or series of messages, a prepared blank formed as shown in Fig. 10 is placed upon a cylinder 28 in the same manner as for the transmission of messages. In the event that a plurality of messages are to be received in succession, a plurality of cylinders will be supplied in advance with blanks. The stylus 57 is adjusted so that it engages the surface of the blank when the cylinder is in position between the centers 35 and 42. The procedure just outlined for transmission is then followed and as explained in connection with Fig. 9 of the drawings, switches 119 and 121 will be moved to their receiving positions.

From the foregoing complete description of the apparatus and its operation, it will be seen that a

compact and efficient combined transmitter and receiver is provided by the invention for transmission and reception of messages in facsimile.

While the invention has been explained and described in detail in connection with an illustrative embodiment thereof, it is to be understood that the invention may be embodied in other forms and, therefore, the invention is not limited except as indicated by the terms and scope of the appended claims.

What is claimed is:

1. In apparatus for facsimile telegraphy, the combination of a copy holder having provision for receiving a blank in a given phase position thereon, a member operating continuously at a desired scanning speed, a movable support adapted to receive said holder, and driving means associated with said member and adapted to engage said holder when said holder is operatively received by said member and said support upon movement of the latter.

2. In apparatus for facsimile telegraphy, the combination of a subject matter holder, means to support said holder prior to a scanning operation, said holder having concentric support engaging means, supports for supporting said holder during a scanning operation adapted to cooperate with said support engaging means on said holder to thereby remove said holder from said first named supporting means, and driving means including means adapted to engage said holder to impart driving movement thereto.

3. The combination defined in claim 2 wherein said subject matter holder is in the form of a cylinder removable from the said apparatus and interchangeable with like cylinders.

4. In apparatus for facsimile telegraphy, the combination of a removable message cylinder having provision for receiving a blank in a given phase position thereon, driving means including a member operating continuously at a desired scanning speed, a movable support for said cylinder, said driving means adapted for engagement with said cylinder when said cylinder is operatively received by said support upon movement thereof.

5. In apparatus for facsimile telegraphy, the combination of a removable message cylinder having provision for receiving a blank in a given phase position thereon, a member operating continuously at a desired scanning speed, supporting and driving means associated with said member, said driving means adapted to couple said cylinder to said member when said cylinder is operatively received by said supporting means.

6. In apparatus for facsimile telegraphy, the combination of a removable message cylinder, a stationary supporting means to receive said cylinder before and after a scanning operation, a member operating continuously at a desired scanning speed, driving means associated with said member and supporting means for holding said cylinder in position during a scanning operation, said driving means adapted to couple said cylinder to said member when said cylinder is operatively received by said second named supporting means in preparation for a scanning operation.

7. In apparatus for facsimile telegraphy, the combination of a removable message cylinder, a stationary supporting means to receive said cylinder before and after a scanning operation, a member operating continuously at a desired scanning speed, a clutch member resiliently mounted on said member, said member being

formed at its end to support said cylinder in position during a scanning operation, and a clutch pin on said cylinder to cooperate with said clutch member when said cylinder is operatively supported by said first named member in preparation for a scanning operation.

8. A facsimile telegraph transmitter-receiver comprising message cylinder supporting and driving means designed to receive interchangeable message cylinders, a scanning device, guide means, said device being supported thereon in a manner to permit tilting movements thereof and movement in a direction longitudinally of a cylinder operatively positioned by said first named means, screw means to propel said scanning device, and a resiliently mounted screw threaded member secured to said scanning device and engageable with said screw means upon tilting of said device into its operative position.

9. In a facsimile telegraph transmitter, a supporting base, a photo-electric pickup device comprising a casing secured to said base and having a wall, a housing secured to said wall, a photo-sensitive device in said housing, an exciting lamp secured to said wall, a scanning head secured to said wall, and a pair of light conducting tubes extending from said scanning head to communicate with said exciting lamp and said photo-cell, respectively, a serrated light chopper within said housing and a driving motor for said chopper secured to said base.

10. A photo-electric pickup device for a facsimile telegraph transmitter comprising two similar light sensitive cells and circuits joining said cells to an output circuit, a source of light and means for modulating said light in accordance with given subject matter, means for projecting said modulated light onto one of said cells, a rotary light chopper comprising a notched disc for interrupting light from said source, a second light source for intermittently illuminating the other of said cells through said chopper and means for supporting said last named light source, said supporting means permitting adjustment of said source circumferentially of said disc whereby the time of interruption of light from said sources may be varied with respect to each other.

11. A photo-electric pickup device for a facsimile telegraph transmitter comprising a pair of similar photo-electric devices and means to combine their output, a light source and means for directing picture modulated light from said source on one of said devices, an auxiliary light for illuminating the other device, a light chopper comprising a circular member having circumferentially spaced openings to intermittently transmit light from said sources to said cells, a rotatable shaft on which said circular member is mounted, a support for said auxiliary light source sleeved on said shaft whereby to permit adjustment of said support circumferentially of said circular member.

12. In a system for facsimile transmission and reception, a message circuit, terminal apparatus utilizing said circuit comprising at each terminal station a pickup device and a recording device, means common to both said devices for producing scanning movement with respect to a message holder associated with said devices, a common amplifier for said devices, an additional amplifier for said receiving device, and switching means adapted to connect said message circuit to said pickup device through said first named amplifier for transmitting over said message circuit and to connect said message circuit to said

recording device through both said amplifiers for reception.

13. Facsimile telegraph apparatus comprising copy holder supporting means, a movable support and a scanning device on said support including photo-electric pickup means, means for moving said support to produce a scanning operation, a preamplifier carried by said support adjacent said pickup means and relatively short electrical conductors interconnecting said preamplifier and said pickup means to thereby facilitate effective shielding and eliminate the necessity for long leads susceptible to interference.

14. In a system for facsimile transmission and reception, transmitters and receivers adapted for interconnection by communication circuits, said transmitters and receivers each comprising a movable member, a removable message holder and a scanning device associated therewith, said movable members operating continuously in phase at a desired scanning speed, and driving means associated with each of said members and adapted to engage its associated message holder in a manner to insure a fixed position of said holder with respect to said member whereby messages secured to holders throughout the system will occupy the same relative position with respect to an associated scanner.

15. Facsimile telegraph apparatus comprising means to support a message sheet bearing a color changing substance, means to scan said sheet, said means being adapted to effect removal of a portion of said color changing substance during recording, and suction means disposed adjacent the scanning point of said scanning means on said sheet whereby to remove the substance released during scanning of the sheet.

16. In combination, a recording blank treated with a substance capable of changing color upon application of an electrical potential, an electrically conductive support for said blank, a stylus adapted to cooperate with said blank, means for progressively changing the location of the stylus on said blank, means to supply said stylus with potentials representing scanned subject matter, a conduit having an opening adjacent said stylus, and an air exhausting device in communication with said conduit whereby to remove fumes released during scanning of the blank by the stylus.

17. Facsimile telegraph apparatus comprising means to support and move a message blank bearing a color changing substance, a stylus and means to cause said stylus to scan said blank, means to supply said stylus with potentials representing the scanning of transmitted subject matter, a conduit having an opening adjacent the point of contact of said stylus on said blank and an air exhausting device in communication with said conduit whereby to remove fumes released during scanning of the blank by the stylus.

18. Facsimile telegraph apparatus comprising a rotatable copy holder, a recording blank on said holder treated with a substance capable of changing color upon application of an electrical potential, a movable support and a stylus on said support to contact said blank, means for moving said support to produce a scanning operation, a conduit having an opening adjacent the point of contact of said stylus on said blank, and an air exhausting device in communication with said conduit whereby to remove fumes released during scanning of the blank by the stylus.