

Nov. 1, 1932.

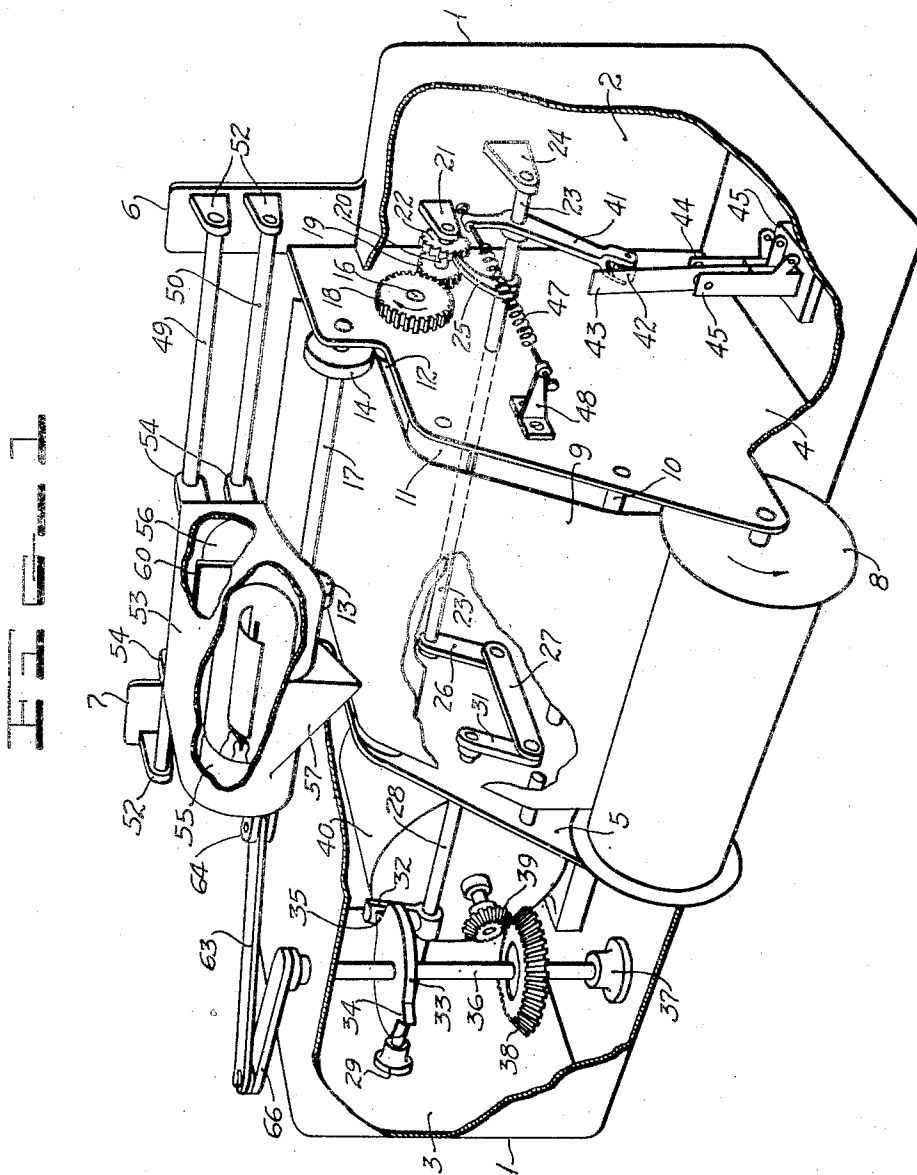
C. W. HOUGH

1,886,189

FACSIMILE SYSTEM

Filed Oct. 7, 1930

3 Sheets-Sheet 1



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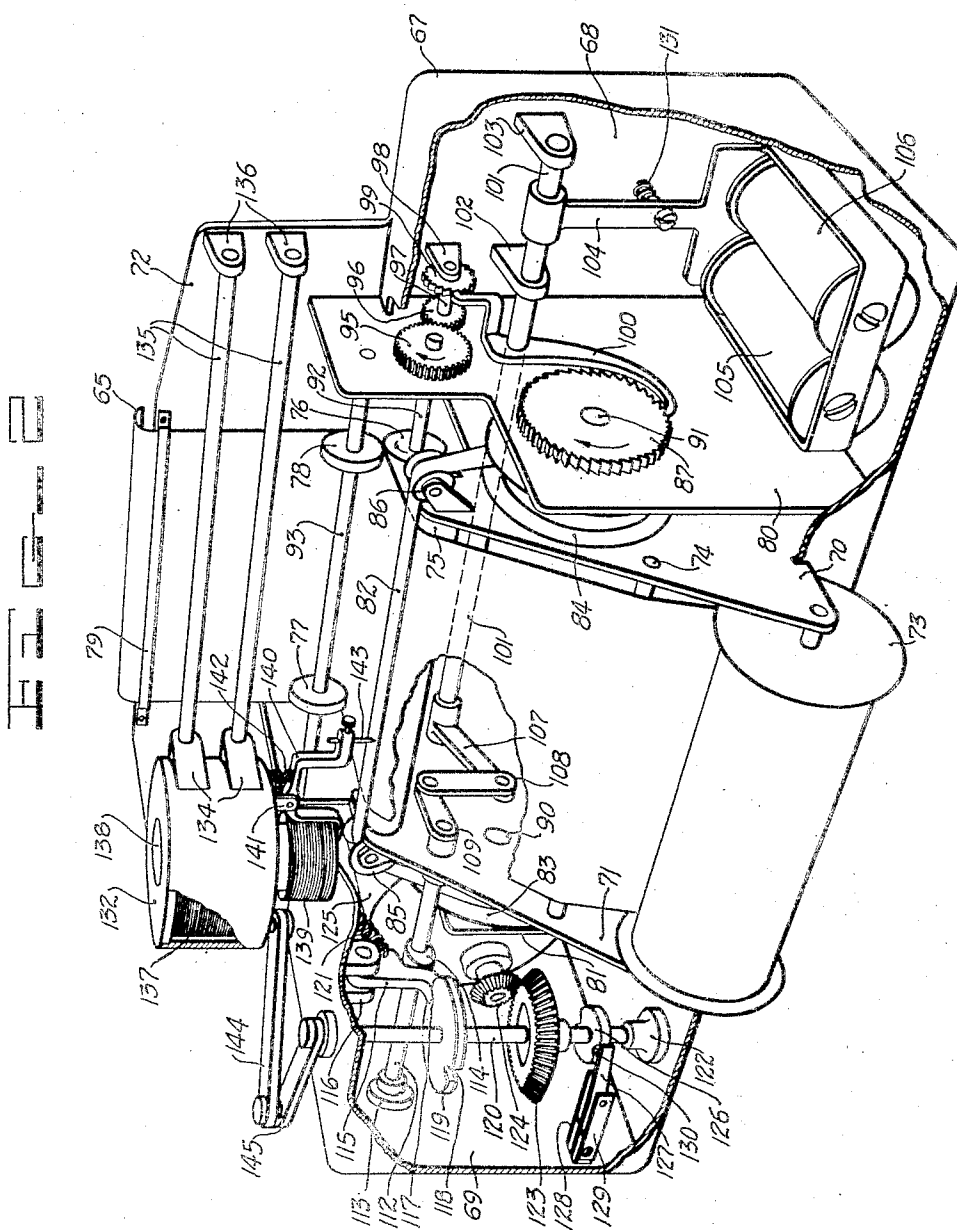
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5 Sheets-Sheet 2



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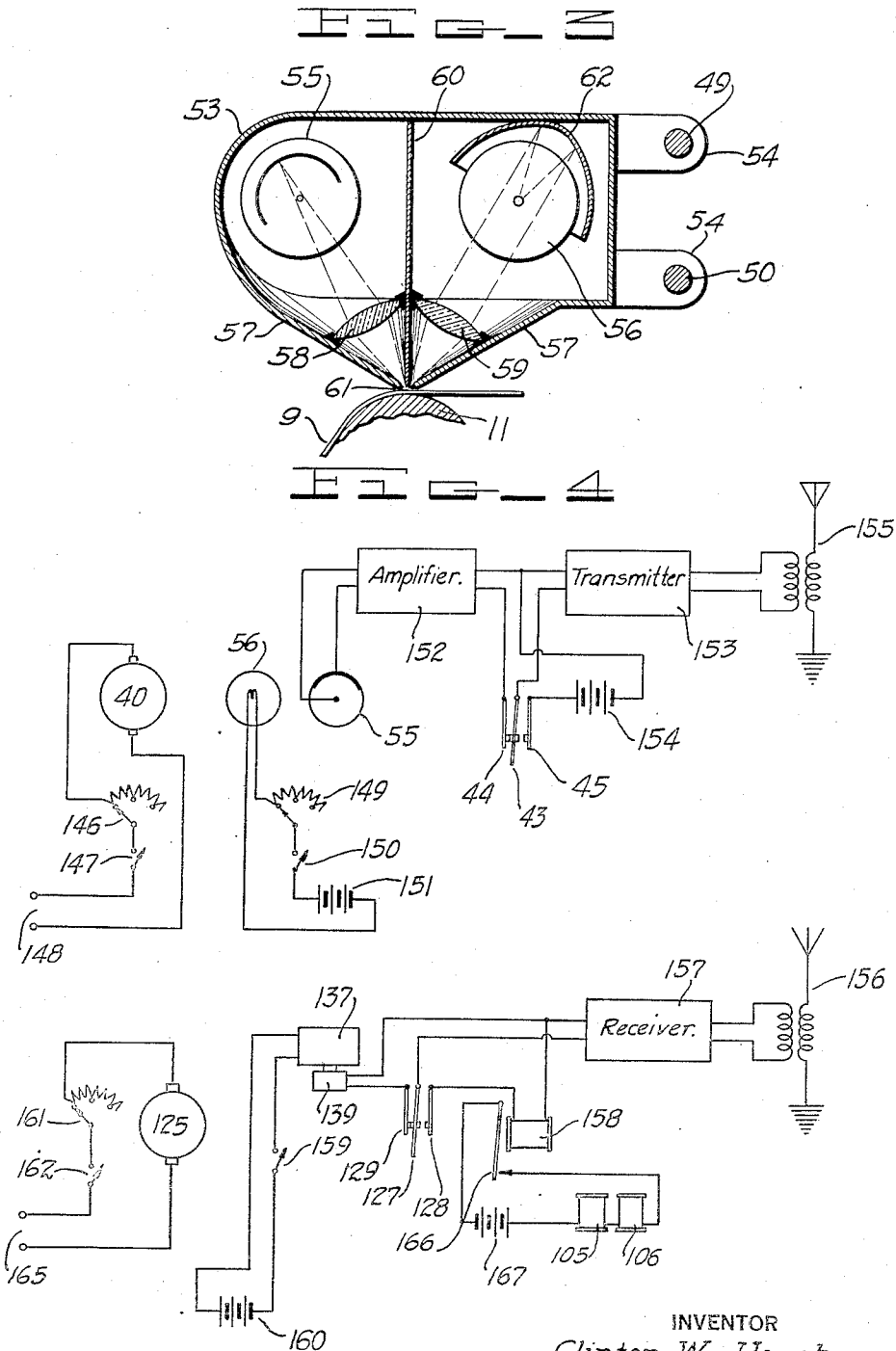
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3 Sheets-Sheet 3



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FACSIMILE SYSTEM

Application filed October 7, 1930. Serial No. 486,923.

My invention pertains to systems for the electrical transmission of images, known as facsimile systems.

One of the objects of my invention consists in providing a facsimile system for reproduction of images at a distance by means of an efficient and practical type of facsimile transmitter and receiver.

Another object of my invention consists in producing a facsimile system employing a transmitter having photosensitive means which explore an image sheet and which control a reproducing stylus adapted to traverse a recording sheet in synchronism with the photosensitive means.

Another object of my invention comprises producing a facsimile system having receiving means employing an inked ribbon and an electromagnetically actuated stylus for reproducing transmitted images.

Other objects reside in the construction and arrangement of mechanical and electrical parts, as will be apparent from the following, reference being had to the accompanying drawings in which like reference numerals designate corresponding parts throughout and in which:

Fig. 1 is a perspective view of one embodiment of the transmitting apparatus of the facsimile system of my invention;

Fig. 2 is a perspective view of one embodiment of the receiving apparatus of the facsimile system of my invention;

Fig. 3 is a sectional view of a movable housing employed in the transmitter of Fig. 1;

Fig. 4 is a schematic representation of the electrical circuits employed in my facsimile system.

My invention contemplates providing images to be transmitted, such as printed matter, drawings, and photographs, upon an elongated sheet. A light source and photoelectric cell are arranged to be moved transversely across this elongated image sheet so that a narrow transverse strip of the image to be transmitted is resolved by the photoelectric cell into a sequence of electrical impulses, the amplitudes of which are dependent upon variations of the intensity of

light reflected by the light and dark areas of the image. The image sheet is moved a step longitudinally each time the photoelectric cell is moved transversely, thereby accomplishing a complete exploration of the image on the sheet and resolving the entire image into a series of electrical impulses. These electrical impulses are transmitted to an electromagnetically actuated stylus which is arranged to move transversely across an elongated recording sheet upon which the images are to be reproduced. An inked ribbon is provided between the stylus and the recording sheet so that the depressions of the stylus, under control of the sequence of electrical impulses, will make a visible record thereon. As the stylus is moved back and forth transversely in synchronism with the transverse movement of the photoelectric cell of the transmitter, the recording sheet is advanced longitudinally step-by-step in synchronism with the movement of the image sheet of the transmitter. The transmitted image is thereby reproduced upon the recording sheet by the impulse controlled stylus in a simple and effective manner.

Referring to the drawings in detail, and particularly to Fig. 1, a housing 1 is provided and which has two end compartments 2 and 3 formed by plates 4 and 5, respectively. A pair of upright members 6 and 7 are disposed on top of the housing 1, upon either side of the plates 4 and 5. A reel 8 is rotatably mounted between projecting ends of the plates 4 and 5. An image sheet 9, having images thereon, such as printed matter and illustrations, is stowed upon the reel 8 and fed over a rod 10 and platen 11 mounted between the plates 4 and 5, as shown. The sheet 9 is frictionally secured between a lower driven roller 12 and two upper idler rollers 13 and 14. The roller 12 is rigidly mounted upon a shaft 16 rotatably mounted in the plates 4 and 5, while the rollers 13 and 14 are rigidly mounted upon a shaft 17, also rotatably mounted in the plates 4 and 5. A spur gear 18 is mounted upon the shaft 16 and meshes with a smaller spur gear 19 mounted upon a spindle 20 which is rotatably mounted between the plate 4 and bracket 10

21 perpendicularly secured to one wall of the housing 1. A ratchet wheel 22 is rigidly mounted on the spindle 20 at a point between the bearing 21 and gear wheel 19. A shaft 23 is rotatably mounted in plates 4 and 5 and in a bracket 24 perpendicularly secured to one wall of the housing 1. A pawl 25 is rigidly mounted upon the shaft 23 so as to engage with the teeth of the ratchet 22. An arm 26 is rigidly secured to the shaft 23 at a point adjacent the plate 5. This arm 26 is pivotally connected to a link 27. A shaft 28, in compartment 3, is rotatably mounted at one end in bearing member 29 mounted on the housing 1, and at the other end in plate 5. An arm 31 rigidly secured to the shaft 28 is pivotally connected to the link 27. A follower-arm 32 is rigidly mounted upon the shaft 28 and peripherally engages a disk 33 having peripheral cam projections 34 and 35 angularly displaced from each other by 180 degrees. The disk 33 is rigidly mounted upon a shaft 36. The shaft 36, positioned in the compartment 3 at right angles to the shaft 28, is rotatably mounted in bearing member 37 and the top of the housing 1. A bevel gear 38 rigidly mounted on the shaft 36 at a point between the disk 33 and the bearing member 37, meshes with a smaller bevel gear 39. The bevel gear 39 is rigidly mounted on the armature shaft of an electric motor 40. The motor 40 is preferably of the synchronous type adapted to maintain a constant speed of rotation.

It will be evident that when the motor 40 rotates the shaft 36 by means of the gears 38 and 39, the disk 33 will impart a reciprocative movement to the follower-arm 32 at every 180 degrees of revolution. This reciprocative movement is transmitted by the link 27 to the shaft 23. The pawl 25, secured to the shaft 23, advances the ratchet wheel 22 one tooth each time one of the projections 34—35 engages the follower-arm 32. This step-by-step rotation of the ratchet wheel 22 causes the spur gear 19 to impart a reduced step-by-step rotation to the roller 12 by means of the spur gear 18. The image sheet 9 is thereby longitudinally advanced by a small increment every 180 degrees of rotation of the disk 33.

An arm 41 is rigidly mounted on the shaft 23 at a point between the pawl 25 and bracket 24. A roller 42, composed of insulating material, is rotatably mounted in the forked end of the arm 41. This roller 42 engages with a spring contact 43 interposed between two shorter spring contacts 44 and 45. These contact springs are mounted insulated from each other upon an insulating base 45. When one of the cam projections 34—35 is in engagement with the follower-arm 32, the arm 41 will be extended so that the roller 42 presses the contact spring 43 into electrical

contact with the contact spring 45. When projections 34—35 are not in engagement with the follower-arm 32 the arm 41 will be moved into a position such that the spring 43, by virtue of its own resiliency, will be in electrical contact with the contact spring 44. It is evident that these contact springs form a single-pole double-throw switch the purpose of which will be more fully described later. A helical tension spring 47 is provided between a projecting end of the arm 41 and a bracket 48 so as to cause the follower-arm 32 to be in continual engagement with the periphery of the disk 33.

A pair of guide rods 49 and 50 are positioned between mounting brackets 52 which are secured to the upright members 6 and 7. A light-tight housing 53 is provided with bearing members 54 which are slidably mounted, as shown, upon the guide rods 49 and 50. The housing 53 is thereby adapted to reciprocatively move transversely with respect to the image sheet 9. The housing 53 is provided with a photoelectric cell 55 and a light source such as an incandescent lamp 56. The exact construction of the housing 53 will be better understood by reference to Fig. 3 in which it will be seen that the housing 53 is divided into two compartments by a light-tight partition 60. The photoelectric cell 55 is mounted in one compartment while the incandescent lamp 56 is mounted in the other compartment. A funnel shaped extrusion 57 is provided in the lower part of the housing 53 (see Fig. 1). Two lenses 58 and 59 are provided within the extrusion 57 upon either side of the partition 60. An aperture 61 is provided at the lower extremity of the extrusion 57. This aperture is immediately above the image sheet 9 on the platen 11. A parabolic reflector 62 is provided behind the lamp 56 to direct substantially parallel rays of light to the lens 59. This lens 59 focuses the light rays upon an extremely small area of the image sheet 9 from whence the light rays are reflected to the lens 58 which focuses upon the cathode of the photoelectric cell 55. The intensity of the reflected light is governed by the degree of absorption of light by the particular area of the image on the sheet 9 upon which a light is directed. That is, the photoelectric current produced by the photoelectric cell 55 will be substantially proportional to the light and dark tones of the image.

Referring again to Fig. 1, a connecting link 63 is pivotally connected at one end to a bracket 64 on the housing 53. The other end of the connecting link 63 is pivotally connected to a crank-arm 66 rigidly mounted on one end of the shaft 36. Rotation of the crank-arm 66 imparts a reciprocative movement to the housing 53 along the guide rods 49 and 50 in a manner such that the extrusion 57 passes back and forth transverse-

ly across the image sheet 9. The follower-arm 32 is actuated by the cam projections 34 and 35 at the precise moment when the housing 53 reaches the limit of movement in either of its two directions of linear movement. It is evident, then, that the sheet 9 is moved forward one step, and that the contact spring 43 is momentarily disconnected from the contact spring 44 and connected to the contact spring 45 when the housing 53 reaches the limit of movement in either direction.

Referring to Fig. 2, which is a view of one embodiment of the receiving apparatus of my facsimile system, a housing 67 is provided and has two end compartments 68 and 69 formed by the plates 70 and 71, respectively. Two additional plates 80 and 81 are provided parallel to the plates 70 and 71 within the compartments 68 and 69 respectively. A mounting plate 72 is provided on top of the housing 67 directly behind the plates 70 and 71. A reel 73 is rotatably mounted between projecting parts of the plates 70 and 71. A recording sheet 65, preferably paper, is stowed upon the reel 73 and is fed over a guide rod 74 and a platen 75 which are mounted between the plates 70 and 71. A lower driven roller 76 and two upper idler rollers 77 and 78 frictionally engage the recording sheet 65 which extends under a bar 79 mounted at the top of the plate 72. The sheet 65 may be torn off against the bar 79, as desired, after transmitted images have been reproduced thereon.

The roller 76 is rigidly mounted on shaft 92 while the rollers 77 and 78 are rigidly mounted on shaft 93. The shafts 92 and 93 are rotatably mounted in plates 80 and 81. A spur gear 95 is rigidly mounted upon shaft 92 and meshes with a smaller spur gear 96.

The spur gear 96 is rigidly mounted on a spindle 97 which is rotatably mounted in the plate 80 and a bracket 98 perpendicularly positioned on one wall of the housing 67. A ratchet wheel 99 is rigidly mounted on the shaft 97 at a point between the spur gear 96 and bracket 98.

An inked ribbon 82, similar to those employed in typewriting machines, is provided between an idler reel 83 and a take-up reel 84 rigidly mounted on spindles 90 and 91 which are rotatably mounted in the plates 71 and 81, and 70 and 80, respectively. The ribbon 82 extends from the reel 83 over an idler pulley 85 transversely across the recording sheet 65 and over idler pulley 86 to take-up reel 84. A ratchet wheel 87 is rigidly mounted on the spindle 91 which extends through the plate 80.

A double pawl 100 is rigidly mounted on a shaft 101 which is rotatably mounted in bearing members 102 and 103 and in plates 70, 71, 80 and 81. An armature-arm 104 is rigidly mounted on shaft 101 between bearing members 102 and 103. A pair of electromag-

nets 105 and 106 are positioned within the compartment 68 in a manner such that their poles are proximate to the armature-arm 104.

An arm 107 is rigidly mounted on shaft 101 adjacent plate 71 and is pivotally connected to link 108. The link 108 is pivotally connected to an arm 109 which is rigidly mounted on a shaft 112. The shaft 112 is rotatably mounted in bearing member 113 and plate 71 and is provided with a centrally positioned cam 114. The cam 114 peripherally engages a detent member 115 pivotally mounted in yoke 116 secured to the housing 67. This detent member 115 is shaped to engage in two indents, or notches, 117 and 118, provided in a disk 119. The indents 117 and 118 are angularly displaced by 180 degrees. A helical tension spring 121 is provided between the detent member 115 and housing 67 so as to hold the detent member 115 continuously in engagement with the cam 114. The disk 119 is rigidly mounted on a shaft 120 which is rotatably mounted in bearing member 122 and the top of the housing 67. A bevel gear 123 rigidly mounted on the shaft 120 meshes with a smaller bevel gear 124. The bevel gear 124 is rigidly mounted on the armature shaft of an electric motor 125. The motor 125 is preferably of the synchronous type adapted to maintain a constant speed, similar to motor 40 in Fig. 1. A disk 126, composed of insulating material, is mounted upon shaft 120 and is provided with two indents, or notches, angularly displaced by 180 degrees. A contact spring 127 positioned between two shorter contact springs 128 and 129, is provided with a projection 130 which peripherally engages with the disk 126. The contact spring 127 is formed so as to cause the projection 130 to continuously engage the periphery of the disk 126. When the projection 130 is in engagement with one of the indents of the disk 120, the contact spring 127 will make contact with the contact spring 128, but will otherwise make contact with contact spring 129. Such an arrangement of contact springs forms, in effect, a single-pole double-throw switch, the purpose of which will be more fully described later.

The indents in the disk 126 are of a shape such that the projection 130 will enter therein before either of the indents 113—114 are directly opposite the detent member 115, and will not leave the same until the indents 113—114 have rotated beyond the detent member 115. In other words, the contact spring 127 will engage with contact spring 128 for a time duration which begins before and ends after the detent member 115 engages the indents 113—114.

When the electromagnets 105 and 106 are excited, the armature arm 104 will be attracted towards the electromagnets into a position such as shown in Fig. 2. This angular move of the armature arm 104 causes a correspond-

ing angular move of the shaft 101 which transmits motion through the link 108 to rotate the shaft 112 which brings the cam 114 into full engagement with the detent member 115, as shown. The detent member 115 is thereby forced into one of the indents 117—118. At the same time, the pawl rotates the ratchet wheels 87 and 99 one tooth. The ratchet wheel 87 thereby advances the reel 84 so as to transversely move the ribbon 82 across the recording sheet 65 while the ratchet wheel 99 rotates the spur gear 96 so as to move the roller 76 by means of the spur gear 95. This movement advances the recording sheet 65 longitudinally by a small increment. A helical tension spring 131 is provided between housing 67 and the armature arm 104 so as to cause the armature arm 104 to be withdrawn from the poles of the electromagnets 105—106 when their current supply is interrupted.

A cylindrical casing 132 is provided with bearing members 134. The bearing members 134 are slidably mounted upon guide rods 135 which are secured in mounting brackets 136 pendicularly mounted upon the mounting plate 72. A field coil 137 is mounted within the casing 132 and is disposed about a pole piece 138. A movable coil 139 is also disposed about the pole piece 138 at a point below the field coil 137. Comparatively weak variable currents in the movable coil 139 affect the steady field set up by the coil 137 in a manner such as to produce appreciable movement of the coil 139 in accordance with the variable current. Such an arrangement is widely used in loud speakers for radios, and is well known in the art. A stylus arm 140 is pivotally mounted between a forked bracket 141 secured beneath the casing 132. One end of the stylus arm 140 is secured to the movable coil 139 so as to be influenced by the movement thereof. A helical tension spring 142 is provided between the casing 132 and the stylus arm 140 so as to properly regulate the movement of the arm 140. A stylus needle 143 is mounted within the stylus arm 140 as shown. The stylus needle 143 is positioned adjacent the ribbon 82 so that movement of the movable coil 139 will cause a depression of the ribbon 82 upon the sheet 65 to make a visible record thereon.

A connecting link 144 is at one end pivotally connected to the casing 132 and at the other end is pivotally connected to a crank arm 145. The crank arm 145 is rigidly mounted upon shaft 120. Rotation of the shaft 120 by motor 125 will cause the crank arm 145 to impart a reciprocative movement to the casing 132 along the guide rods 135 so that the stylus, comprising the stylus arm 140 and the stylus needle 143, is moved back and forth transversely across the recording sheet 65 on a line along the ribbon 82.

Fig. 4 schematically represents the elec-

trical organization employed with the present embodiment of my facsimile system. The motor 40 is connected through a variable resistor 146 and switch 147 to terminals 148. The terminals 148 are connected to a suitable source of current supply for the motor 40. The lamp 56 is connected through a variable resistor 149 and switch 150 to battery 151 which serves as a source of filament supply for the lamp 56. The photoelectric cell 55 is connected to an amplifier 152. The amplifier 152 may be of any well known type adapted to amplify photoelectric currents, such as a resistance coupled multi-stage amplifier containing a proper source of current for the photoelectric cell 55. One side of the output from the amplifier 152 is connected to contact spring 44 while the other side of the output is connected to a transmitter 153. The transmitter 153 comprises means adapted to transmit, over distances, the output currents from the amplifier 152. Such transmitting means may comprise a space or wired radio transmitting organization, well known in the art.

A battery 154 is connected between one side of the input of the transmitter 153 and to contact spring 45. The other side of the input of the transmitter 153 is connected to the contact spring 43 adapted to make contact with either of the contact springs 44 or 45. The battery 154 serves as a source of current for synchronizing impulses more fully described later. In the present embodiment of my invention the output of the transmitter 153 is directed to an antenna system 155 for distribution to the facsimile reproducing receivers. However, it is obvious that the output of the transmitter 153 could be equally well distributed over wired radio or other channels.

A receiving antenna system 156 is provided as a source of input supply for receiver 157. The receiver 157 can be any organization well known in the art having suitable amplification stages for receiving and properly amplifying the impulses transmitted by the antenna system 155. One side of the output from the receiver 157 is connected to the movable coil 139, and to an electromagnet 158, and the other side of the output is connected to the contact spring 127. The electromagnet 158 is further connected to the contact spring 128, and the movable coil 139 is further connected to the contact spring 129 so that a circuit can be selectively completed, through contact spring 130, from the output of the receiver 157 to either the movable coil 139 or the electromagnet 158. The field coil 137 is connected through switch 159 to battery 160. The motor 125 is connected through a variable resistor 161 and switch 162 to input terminals 165. Input terminals 165 are connected to a suitable source of current supply for the motor 125. As the motors 40 and 125 are of the synchronous type adapted to keep in step with an alternating current, the input ter-

minals 148 and 165 can be connected to a similar current supply source to maintain substantial synchronism between the two motors.

5 The electromagnet 158 is positioned to act upon an armature 166 which completes a circuit from a battery 167 to the electromagnets 105 and 106. The armature 166 and electro-
10 magnet 158 comprise a relay which is acted upon by comparatively weak currents from the receiver 157 to control a larger current to excite the electromagnets 105 and 106.

The operation of the foregoing to transmit and reproduce an image is as follows:

15 As before stated, the image, or images, to be transmitted are provided upon the image sheet 9 of the transmitting apparatus of Fig. 1. These images may be in the form of
20 printed matter, such as newsprint, or may be line drawings, or half-tone illustrations such as photographs. To transmit these images, the circuit to the motor 40 is closed by means of switch 147 in Fig. 4. The rotation
25 of the motor 40 causes the shaft 36 to rotate to move the housing 53 back and forth transversely across the image sheet 9. As the housing 53 proceeds across the image sheet 9, a narrow transverse strip of the image there-
30 on is resolved by the photoelectric cell 55 into a sequence of electrical impulses which vary in intensity in accordance with the light from the lamp 56 reflected by the image. When the housing 53 arrives at the limit of
35 movement in one direction, a cam projection 34—35 will be in a position such as to actuate the follower-arm 32. The movement of the follower-arm 32 is transmitted through the link 27 to shaft 23. This movement
40 causes the pawl 25 to rotate the ratchet wheel 22 which causes the image sheet 9 to be advanced longitudinally by a small increment so that the photoelectric cell 55 will scan the adjacent transverse strip when moving
45 back in the opposite direction. At the same time that the pawl 25 actuates the ratchet wheel 22, the arm 41 causes the contact spring 43 to disengage from contact spring 44 and make contact with contact spring 45. Referring to Fig. 4 it will be seen that the out-
50 put from the amplifier 152 is thereby interrupted and that a circuit is completed from the battery 154 to the input of the transmitter 153 which produces a strong impulse to be transmitted for synchronizing purposes.
55 To scan the entire image the housing 53 is continuously reciprocated by the crank arm 66 while the image sheet 9 is longitudinally advanced a step each time the housing 53 arrives at the limit of movement in either di-
60 rection. The photoelectric cell 55 thereby explores the entire surface area of the image sheet 9, resolving the light and dark tones thereof into a sequence of electrical impulses having periodically interposed synchroniz-
65 ing impulses produced by momentary en-

gagement of contact springs 43 and 45. The entire series of impulses is transmitted by the impulse transmitter 153 through antenna sys-
tem 155.

The antenna system 156 directs received 70 impulses to receiver 157 where they are properly detected and amplified. The output of the receiver 157 is directed through contact springs 127 and 129 to movable coil 139. The impulses to the coil 139 affect the steady field 75 of coil 137 to produce an accentuated movement of the stylus arm 140 in accordance with the amplitude of these impulses. The circuit to the motor 125 is completed through switch 162 so that the motor 125 rotates in 80 approximate synchronism with motor 40 of the transmitting apparatus of my facsimile system. The rotation of the motor 125 causes the shaft 120 to impart a reciprocative movement to the casing 132 by means of crank 85 arm 145. This reciprocative movement of the casing 132 causes the stylus needle 143 to move back and forth along the ribbon 82 transversely across the recording sheet 65. The stylus needle 143 depresses the ribbon 90 82 against the sheet 65 in a manner such as to make a visible line across the sheet 65 and which corresponds to a similar transverse strip scanned across the image sheet 9 by the photoelectric cell 55. The width of the 95 transverse line scanned by the photoelectric cell 55 is substantially the same as the width of the visible line produced by the needle 143 through the ribbon 82. When the casing 132, in moving along the guide rods 135, arrives at a point just preceding the limit of movement in that direction, the projection 100 130 on the contact spring 127, in following the periphery of the disk 126, will cause the contact spring 127 to come into engagement with contact spring 128 thereby preparing a circuit for the electromagnets 105 and 106 (see Fig. 4). When the housing 53, in the transmitting apparatus of Fig. 1, is pre- 105 cisely at the limit of movement in one direction, one of the projections 34—35 will cause the arm 41 to interrupt the output of amplifier 152 and close contact springs 43 and 45 to momentarily produce a strong syn- 110 chronizing impulse. This synchronizing impulse when received by receiver 157 will then be directed through contact springs 127 and 128, which are now closed, to electro- 115 magnet 158. The electromagnet 158 causes the armature 166 to immediately complete a circuit from battery 167 to the electromag- 120 nets 105 and 106. The battery 167 excites the electromagnets 105 and 106 to momentarily attract the armature arm 104 which transmits an angular movement through the 125 link 108 to the shaft 112. The shaft 112 thereby causes the cam 114 to force the detent member 115 into one of the indents 117—118 in the disk 119, as shown in Fig. 2. The detent member 115 is formed to make a neat 130

fit with the indents 117—118 so that in engaging therewith it will bring the disk 119 and the mechanical movements associated therewith into exact synchronism with the disk 33 of the transmitting apparatus of Fig. 1.

It will be evident that the action of the disk 126, which is rotated, by motor 125, in approximate synchronism with disk 33, is to disconnect the movable coil 139 from the receiver 157 and connect the electromagnet 158 in preparation for the synchronizing impulse which brings the transmitting apparatus of Fig. 1 and the receiving apparatus of Fig. 2 into exact synchronism. This synchronizing impulse, in moving the armature arm 104, also causes the double pawl 100 to advance the ratchet wheel 99 thereby causing the roller 76 to longitudinally move the recording sheet 65 a small increment so that the stylus needle 143 moves back in the opposite direction over an adjacent transverse strip of the recording sheet 65. At the same time the pawl 100 actuates the ratchet wheel 87 so that the reel 84 longitudinally moves the ribbon 82. Such action causes a continual change of the ribbon area exposed to the needle 143 so that the useful life of the ribbon is substantially prolonged.

The stylus needle 143, in moving back and forth transversely across the sheet 65, depresses the ribbon 82 in accordance with the amplitude of the impulses under control of the photoelectric cell 55. The recording sheet 65 is moved longitudinally by a small increment each time the needle 143 changes the direction of its transverse movement so that a multiplicity of adjacent transverse lines are recorded by the needle 143 in accordance with the transmitted impulses. These adjacent transverse lines reconstruct the image of the image sheet 9 as scanned by the photoelectric cell 55, the receiving apparatus being brought into absolute synchronism at the limit of movement of the recording stylus in either transverse directions. The recording sheet 65, as the image is reproduced thereon, is fed through the bar 79, and may be torn off as desired.

It will now be obvious that the facsimile system of my invention has provided an extremely practical system for transmission and reception of images. While heretofore in the art it has been the practice to employ photosensitive recording papers which require developing or washing, as well as systems utilizing inking pens and spraying devices, it will be apparent that my invention employing an inked ribbon avoids the use of such arrangements and makes for a more practical method of facsimile transmission and reception. Although I have shown a preferred embodiment of my invention, it is, of course, to be understood that changes therein will readily occur to those skilled in the art but which will not depart from the intended

scope of my invention. I do not, therefore, desire to limit myself to the foregoing except insofar as may be pointed out in the appended claim.

What I claim as new and original and desire to secure by Letters Patent of the United States is:

A facsimile system comprising, an image sheet, a photoelectric cell, a source of light, a unitary housing for said photoelectric cell and said source of light constructed so that said light is directed to said image sheet and reflected therefrom to said photoelectric cell, mechanical means for relatively moving said housing and said image sheet whereby different areas of said image sheet are sequentially exposed to said photoelectric cell, means for transmitting electrical signals under control of said photoelectric cell, means controlled by said mechanical means for causing said last mentioned means to transmit a synchronizing impulse at predetermined times with respect to the relative movement of said housing and said image sheet, means for receiving said signals, a recording sheet upon which an image is to be recorded, a locally energized coil for producing a steady magnetic field, a moving coil positioned in the vicinity of said field and controlled by said signals transmitted under control of said photoelectric cell, an inked cloth ribbon mounted adjacent said recording sheet, a stylus actuated by said moving coil for depressing said ribbon upon said recording sheet for making a visible record thereon, a structure supporting said coils, means for relatively moving said structure and said recording sheet, means controlled by said transmitted synchronizing impulses for adjusting the movement of said last mentioned means, and means controlled by said transmitted synchronizing impulses for relatively moving said transfer ribbon and said recording sheet.

CLINTON W. HOUGH.