

C. G. ASHLEY & J. B. CRIPPEN.
 PRINTING TELEGRAPH SYSTEM AND ALPHABET.
 APPLICATION FILED JUNE 17, 1909.

1,126,339.

Patented Jan. 26, 1915.

4 SHEETS—SHEET 1.

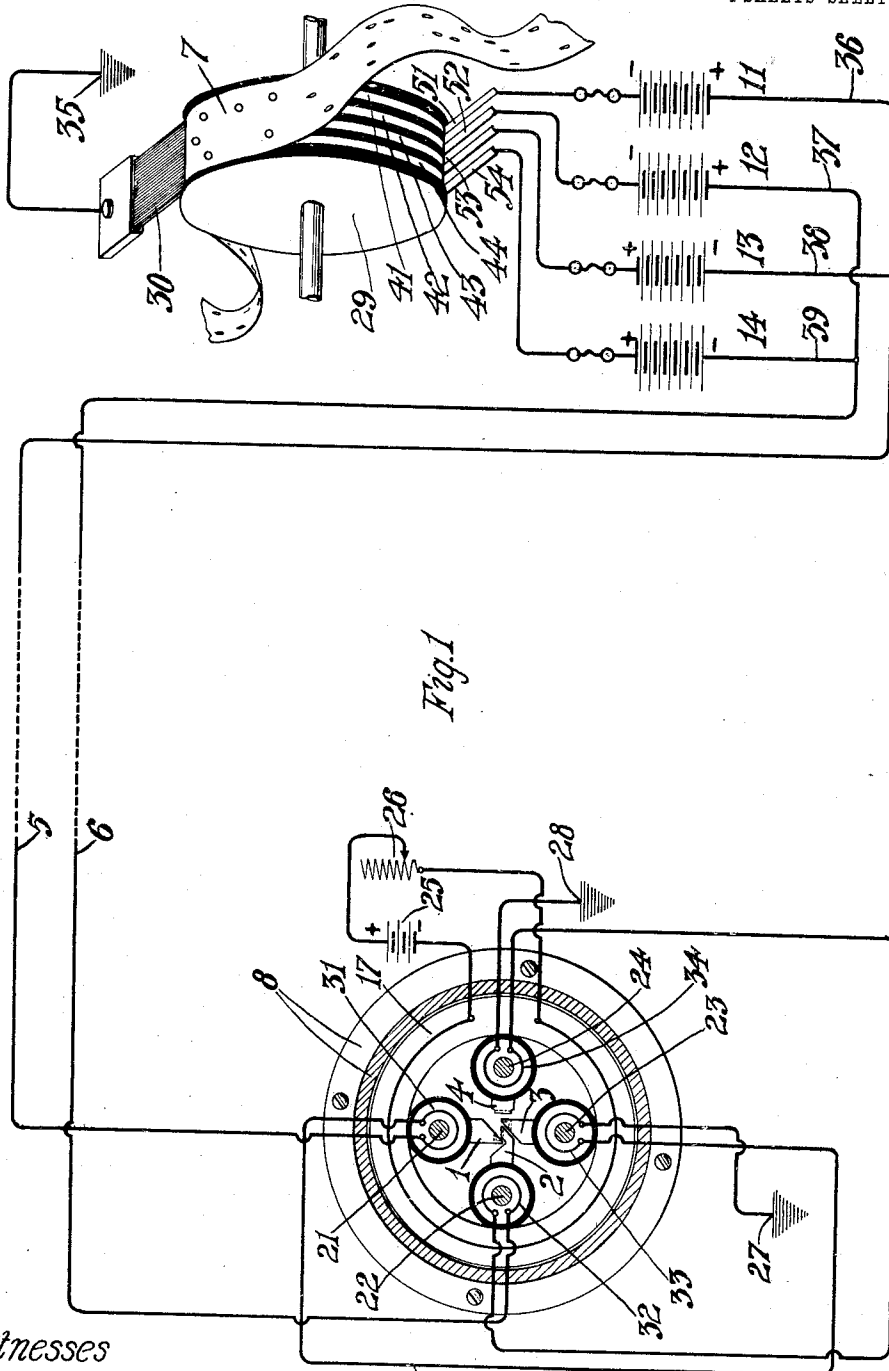


Fig. 1

Witnesses

David S. Kulfish
Wm. Berghahn

Inventors { *Charles G. Ashley*
 and *James B. Crippen*
 By *McMurry & Miller*
 Attys.

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4 SHEETS—SHEET 2.

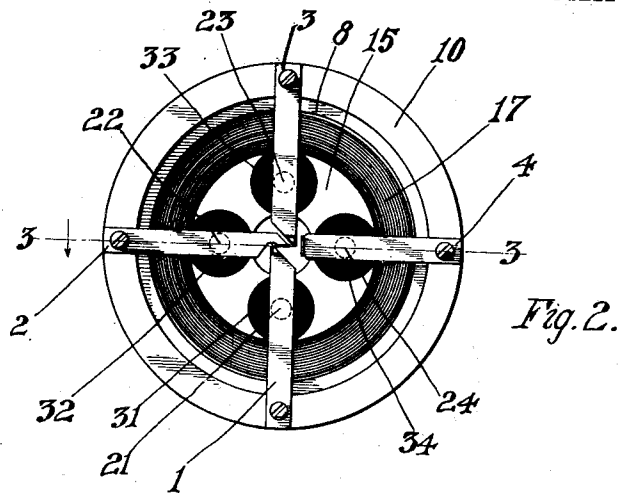


Fig. 2.

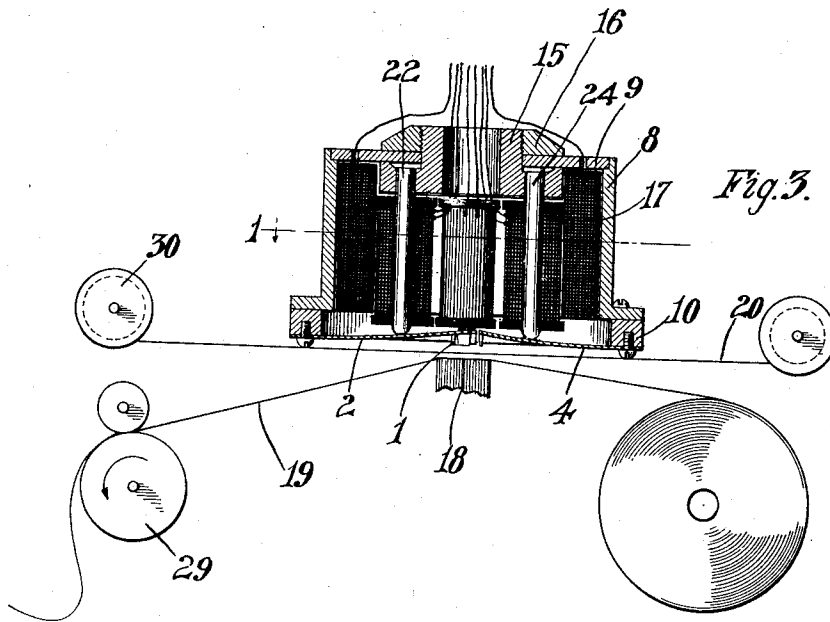


Fig. 3.

Witnesses:

David S. Hulfish
 Wm. Berghahn

Inventors:

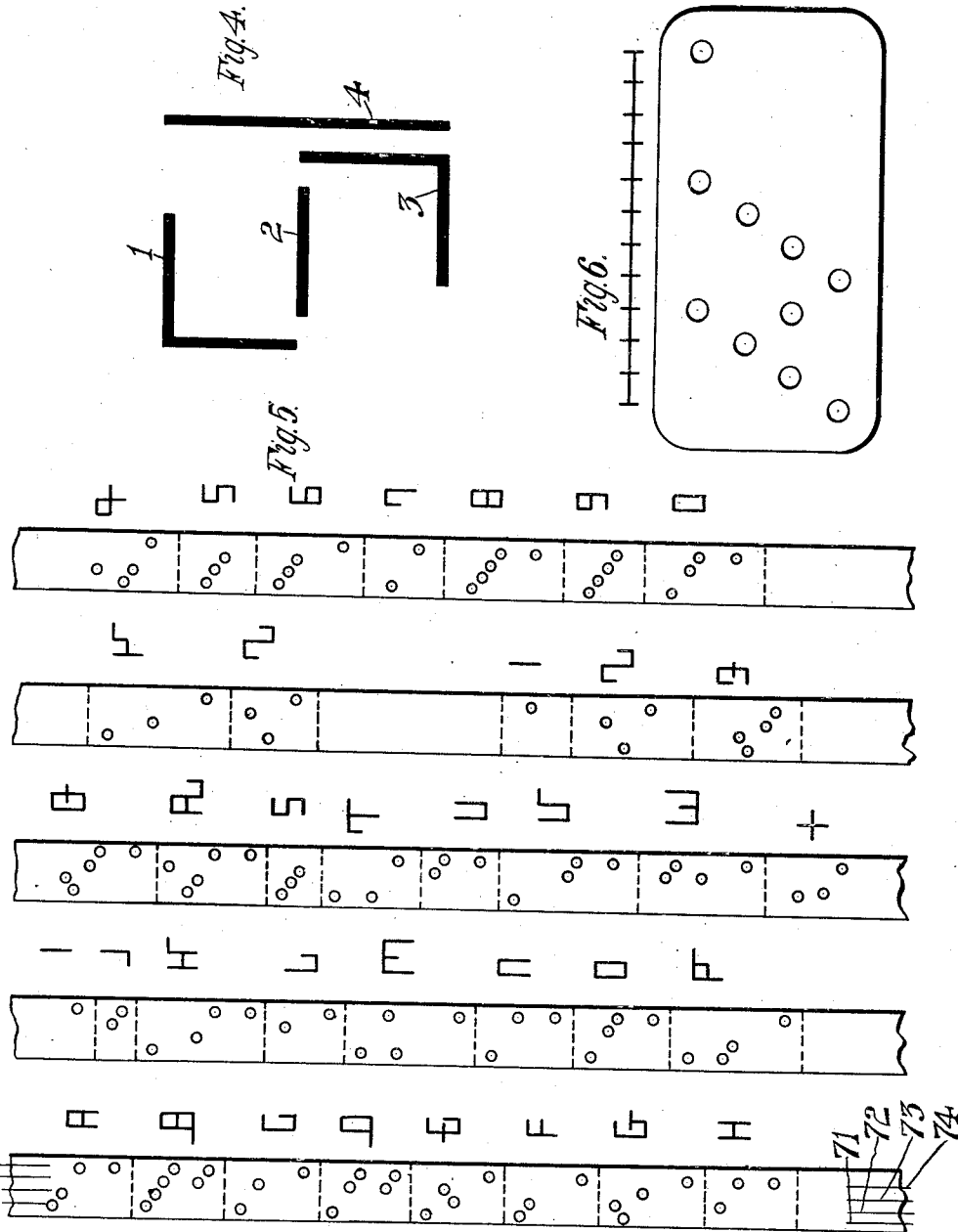
Charles G. Ashley
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4 SHEETS—SHEET 3.



Witnesses:

David S. Bulfinch

Wm. Berghahn.

Inventors:

Charles G. Ashley
 and James B. Crippen

By *McMurry & Co.*
 Attys.

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4 SHEETS-SHEET 4.

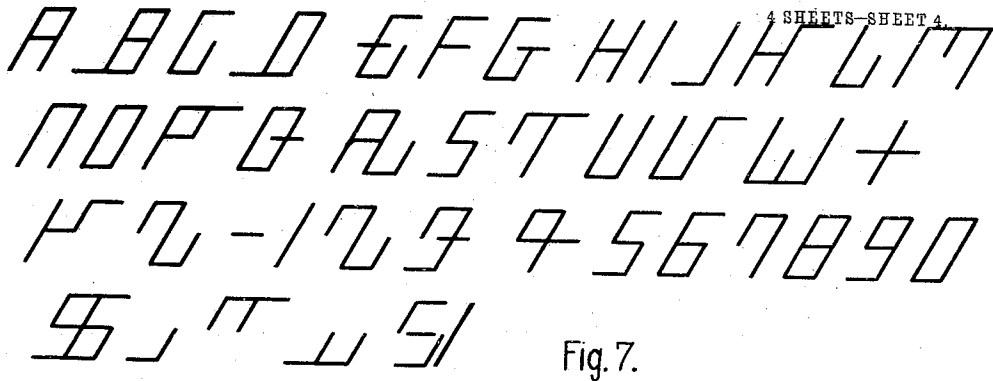


Fig. 7.

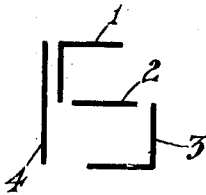


Fig. 8.

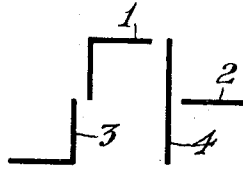


Fig. 9.

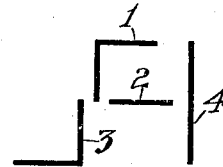


Fig. 10.

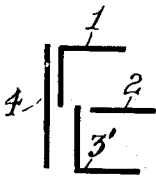


Fig. 11.

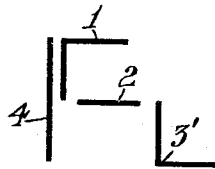


Fig. 12.

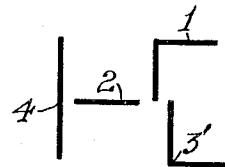


Fig. 13.

Witnesses:

David S. Hulfish
 Wm. Berghahn.

Inventors:

Charles G. Ashley
 and James B. Crippen
 By *McMullen & Miller*
 Attys.

UNITED STATES PATENT OFFICE.

CHARLES G. ASHLEY AND JAMES B. CRIPPEN, OF CHICAGO, ILLINOIS, ASSIGNORS, BY
MESNE ASSIGNMENTS, TO GENERAL ENGINEERING AND CONSTRUCTION COMPANY,
LIMITED, A CORPORATION OF ONTARIO.

PRINTING-TELEGRAPH SYSTEM AND ALPHABET.

1,126,339.

Specification of Letters Patent.

Patented Jan. 26, 1915.

Application filed June 17, 1909. Serial No. 502,684.

To all whom it may concern:

Be it known that we, CHARLES G. ASHLEY and JAMES B. CRIPPEN, citizens of the United States of America, and residents of Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Printing-Telegraph Systems and Alphabets, of which the following is a specification.

10 Our invention embodies an improvement in automatic rapid printing telegraph systems of the class using printed letters or characters which, from the nature of their making, may be termed composite characters.

15 Printing telegraph systems considered in regard to the method of producing the printed characters may be divided broadly into two classes: The first of these classes includes systems employing a plurality of printing type faces, each type face representing a complete letter or character and controlled electrically over the telegraph transmission conductors so as to be operated singly and successively to print on the receiving surfaces. The action of the receiving devices in this class of printing telegraphs may be likened to the action of an ordinary typewriter.

20 The second class of printing telegraph systems includes systems having a comparatively small number of printing types or equivalent devices, each of such types representing one or more component parts or elements, each common to a number of letters or characters. In such systems the greater number of letters and characters are produced by printing, in proper relation, a plurality of the smaller number of component printing types, representing the respective component parts or elements of the complete characters. The systems differ in themselves in the number of printing types in the conformation of the printing faces thereof and in the methods of combining the component strokes to form a complete letter or character.

25 Our invention pertains to the second of these classes of systems; and entirely aside from the mechanical and electrical means by which the various printing elements are actuated to produce a legible received record, an important part of our invention consists in the manner of forming all the

letters of a complete alphabet with numerals and other necessary characters from a minimum number of printing type, each of great simplicity of form. Our alphabet and its associated numerals and the characters, as we have illustrated it herein, is particularly designed for recording intelligence in any language using Roman characters and for making all of the necessary letters, numerals and other characters by combining the imprints of four fundamental shapes of types.

A feature of the individual printing types of our improved system is that some of them are in themselves composed of a plurality of elements, as by combining two straight-line elements to form an angular type face. It is not essential however, that the elements be straight-line elements.

When a type carrying a plurality of elements is printed, all of the elements are impressed upon the receiving surface even though the character to be composed does not require all of these elements. In such an event the element not required may be permitted to remain as an unnecessary appendix upon the completed character. In other instances a superfluous element may be concealed in the received printed record by printing another element upon it. By the invention and use of compound printing pens comprising more than one element, some of which may overlap or obliterate each other in forming some characters, or be permitted to exist as useless but harmless appendices in forming other characters; by the design of the alphabet and other characters which we employ; and by the peculiar relative timing with respect to the movement of the receiving tape and the impact of the printing types or pens, we are enabled to reduce the number of printing pens or types required to four.

With reference to the method of combining the component types, systems of the second class may be subdivided into those systems in which each type may appear but once in the resultant letter or character, and those systems in which each component may be printed a plurality of times in different positions in the resultant character.

The alphabet and the component symbols going to make up the alphabet in our improved system are applicable to either of the

subdivisions above defined. Its simplest form is found in the second subdivision, namely, that in which the same printing pen may be used repeatedly in the same character, this application permitting the reduction of the number of printing pens to four. With such a system, the receiving tape or receiving devices may move intermittently in step-by-step fashion, or it may move continuously, the strokes of the printing types being properly timed to secure their relation to each other.

In our improved system constructed for printing upon a surface moving with respect to the type faces, we provide four printing pens, each of which prints an element or a combination of elements, each representing a component part of a plurality of letters, and in connection with the four pens we provide a system for operating them and for moving the receiving surfaces as well, whereby the component imprints are selected and are placed properly upon the receiving surfaces to combine into letters and characters, forming intelligible records.

Inasmuch as each printing type or pen in a printing telegraph system must be operated selectively from the transmitting station, a reduction in the number of such pens will result in a corresponding reduction of the line control requirements and in consequent simplification of the transmitting circuits and devices of the system. By thus minimizing the number of movable pens or type faces necessary to record intelligence in the English language, we are enabled therefore to accomplish a great simplification of the electrical system of control and of the machinery involved, which system and machinery also form important parts of our invention.

Our system comprises as a whole, (1) a punching device for perforating transmitting tape in accordance with a predetermined code; (2) an electrical transmitter or contact-making device which makes and breaks electrical circuits in accordance with the holes punched in the transmitting tape; (3) a transmission line and a return conductor which may be the earth, connected with a proper source of electric current; (4) an electromagnetic receiving device comprising four printing pens and four electromagnets, each of which controls a printing pen, each of the magnets being operable selectively over the line; (5) mechanical means for moving the receiving tape continuously in front of the printing pens, a moving surface thus being presented for printing.

The punch for perforating the tape, we have not illustrated. Such devices are well known, and may be adapted to our system by a proper arrangement of cutting parts.

Furthermore, our system may be operated by tape punched manually with a device such as conductor's ticket punch. The remaining elements of our improved system we have shown or indicated in the following drawings, which accompany and form a part of this specification.

Figure 1 shows the circuits and some detail of the devices of our complete system, including a sectional view of the receiving device taken on the line 1—1 of Fig. 3. Fig. 2 shows view of the under side of the receiving or printing device. Fig. 3 shows a vertical section of the receiving device on the line 3—3 of Fig. 2. Fig. 4 shows an arrangement of the printing faces of the receiving device, and illustrates the monogram resultant from impressions of all of the types upon a stationary receiving surface. Fig. 5 shows the required tape perforations for a specific application of our invention and shows also the alphabet when composed of rectangular characters. Fig. 6 shows diagrammatically an arrangement of the cutting parts of a tape punching device desirable for perforating the transmitting tape. Fig. 7 shows an alphabet in which the angles are acute and obtuse instead of rectangular, a more pleasing record being thus obtained. Figs. 8, 9 and 10 show other arrangements of pens for printing the elements of Fig. 4. Figs. 11, 12 and 13 show variant arrangements of another set of elements embodying the same principles but differing in detail from the set of Fig. 4.

Referring to Fig. 1, conductors 5 and 6 are the transmission line conductors. At the right are the transmitting devices, and at the left are the receiving devices, shown in such a view as will make clear the electrical circuits. Electrically considered, the object of the system of Fig. 1 is to control selectively the operation of printing pens 1, 2, 3, 4, of the receiving device, by means of circuits closed through holes punched in the transmitting tape 7, the controlling circuits being formed over the conductors 5 or 6 and earth, the actuating electromotive force being supplied by the batteries 11, 12, 13 and 14.

Describing first the receiving device, reference is made to Figs. 2 and 3 as well as Fig. 1, in all of which like reference numerals denote like parts. A magnetic cup is formed by cylindrical part 8, disk 9, and ring 10. Within this cup are mounted four magnetic cores, 21, 22, 23, 24, the cores being set in the nonmagnetic block 15, held by lock ring 16. The four pens 1, 2, 3, 4, are, in the construction shown, of spring steel, secured adjustably by screws upon ring 10, and each pen projecting over the free end of its corresponding core as indicated by the units digit of the core's reference number. These pens may be of other forms and of other

suitable material provided with magnetic armatures.

Operating windings 31, 32, 33, 34, are placed upon the cores mentioned, and the electromagnets thus formed, are the operating magnets for controlling the spring printing pens. An additional helix 17 is placed within the magnetic cup, and serves to polarize the entire magnetic system and to maintain an initial magnetic field. The initial magnetic field secured by current through the winding 17 will cause the four cores to attract the four pens continuously. By passing a current through an operating electromagnet in such direction as to neutralize the permanent field in that electromagnet, the pen held by that core will be released and will spring from the face of the magnet by reason of its own spring tension. Anvil 18 is placed opposite the printing faces of the pens. Paper tape 19 lies upon the surface of the anvil, inked ribbon 20 being placed between the pens and the paper 19 so that by the release of any pen a stroke is made upon the paper 19, printing by means of the inked ribbon 20, the letter component which is presented at the printing face of the pen. Battery 25 and rheostat 26 provide an energizing current of adjustable strength for the constant field of the receiving device.

Line conductor 5 is taken through winding 31, counter clockwise as viewed in Fig. 1, thence through winding 33, clockwise, and to earth at 27. Line conductor 6 is taken through winding 32 counter clockwise, through winding 34, clockwise, and thence to earth at 28. The rollers 29 and 30 of Fig. 3 revolve continuously drawing the tape 19 and ribbon 20 continuously forward over the anvil 18. Roller 30 preferably moves much slower and independent from roller 29.

The transmitting device illustrated comprises a continuously revolving cylinder 29, carrying four conducting rings 41, 42, 43, 44, each moving in continuous contact with its brush of the four brushes 51, 52, 53, 54. Brush 30 is adapted to make contact with all four of the conducting rings, but normally is held out of contact with more than one at a time by the perforated transmitting tape 7. The transmitting tape 7 permits contact of brush 30 and therefore earth 35 with one of the rings, the contact being selective in two functions, first in selecting the proper conducting ring and second in selecting the proper instant with reference to contacts made previously or to be made subsequently. A time relation exists between the speed of the transmitting tape 7, and the speed of the receiving tape 19. These speeds need not be identical, but the placing of the printed characters upon the receiving tape 19 will at all times bear a relation to the spacing of the perforations

in the transmitting tape 7, that relation being the ratio of the speeds of the two tapes.

It will be understood of course that the transmitting tape 7 of Fig. 1 and the receiving tape 19 of Fig. 3 are moved longitudinally in any well-known manner. We prefer to employ small electric motors driving rollers such as 29 which serve to pull the tape at uniform and proper speeds through the transmitting and receiving devices respectively.

Control of the printing pens 1, 2, 3 and 4 by perforation in the tape 7 is as follows: The perforations in the tape 7 are confined to four rows, corresponding to the four contact rings 41, 42, 43, 44. Any perforation in the tape 7 will permit the brush 30 to close electrical contact with one of the contact rings. In the specific arrangement of parts making up the complete transmission system shown in the drawings, contact may not be made simultaneously through perforations to rings 41 and 43, nor to rings 42 and 44, since those pairs of rings pertain each to a single line conductor, but contact may be made simultaneously to rings 41—42, 41—44, 42—43, or 43—44, since by so making contacts, circuits are closed over both line wires simultaneously in independent circuits. In the arrangement of printing pens illustrated, the proper operation is attained only by closing one circuit at a time over one or the other of the line wires.

When the circuit is closed through tape 7 by a perforation over ring 41, current flows from the plus side of battery 11 over conducting elements 36, 5, 31 counter clockwise, 40, 33 clockwise, 27, earth 35, 30, 41, 51, to minus side of the battery 11. The strength of current from battery 25 is adjusted by rheostat 26 to produce a polarization of core 21 which shall be approximately neutralized by the current just mentioned through winding 31. Core 21 is neutralized while core 23 is not, and printing pen 1 is released. When circuit is closed through tape 7 to ring 43, current flows from the plus side of battery 13 through conducting elements 53, 43, 30, 35, earth, 27, 33 counter clockwise, 40, 31 clockwise, 5, 38, to minus side of battery 13. Core 23 is neutralized and core 21 is not. Pen 3 is released. In similar manner contact through tape 7 upon ring 42 will neutralize core 22, and release pen 2, while contact through tape 7 upon ring 44 will permit a flow of current, which will neutralize core 24 and release pen 4. In every instance, the pen is reattracted by the magnetism produced in the core by winding 17 after the circuit controlling hole has passed the brush 30. The duration of the current through any perforation of tape 7 is desirably more brief than the period of a single vibration of the controlled pen. It is obvious that any desired arrangement

upon the printing surface of impressions from pens 1, 2, 3, 4, may be obtained by a proper arrangement of perforations in the tape 7 except that in some arrangements of

5 line control the simultaneous printing of certain pairs of pens controlled over the same line conductor may not be attempted.

It remains to disclose a method of combining the elemental imprints of the pens 1, 2, 3, 4, to produce an intelligible record.

Fig. 4 shows the arrangement of the printing faces of the pens 1, 2, 3, 4, the imprints being shown as printed upon a stationary receiving surface or as though all
15 four pens were imprinted simultaneously. Other arrangements of these elements may be made, some possible arrangements being shown in Figs. 8, 9 and 10. Arrangements of a similar set of symbols embodying the
20 same fundamental principle, but with a different detail of arrangement are shown also in Figs. 11, 12 and 13. With the printing elements shown in Figs. 4, 8, 9 and 10, an alphabet may be produced which is shown in Fig. 5. In Fig. 5 is shown also an arrange-
25 ment of perforations in the tape 7 suitable for transmission from a transmitting device, such as shown at the right-hand of Fig. 1, to a receiving device, such as is shown at the left of Fig. 1, the pens of which are arranged according to Fig. 4. The four positions for perforations upon the tape 7 are shown by the lines 71, 72, 73, 74. The perforations positioned in the tape at transverse
35 positions corresponding to each of these lines produce, at the receiving end, impressions of the correspondingly numbered pens, and the longitudinal position of the imprints upon the receiving tape are determined by the longitudinal positions of per-
40 forations in the tape 7.

The tape 19 progresses toward the left as the symbol is viewed in Fig. 4 at a speed which may be represented as requiring four
45 time units for a travel equal to the length of the symbol 2. The distance unit may be taken as one fourth of the length of symbol 2, whereby the distance unit along the tape is equivalent to the travel of the tape in a
50 time unit.

To understand the production of a simple letter composed of two type-face impressions, it will be noted that it is necessary only to imprint the two pens with the
55 proper number of time units between the instants of printing, the distance and consequently the number of time units being dependent upon the result desired. To produce the letter J, the pen 4 is imprinted, and
60 when the receiving tape bearing this imprint has moved to the left one distance unit, (namely, requiring the lapse of one time unit) the pen 3 is imprinted. The resulting J is shown in Fig. 5 and the two
65 perforations controlling the successive op-

eration of the pens 4 and 3 are shown in the tape opposite the J, the longitudinal displacement of the two perforations from each other being the unit of the transmitting tape. The speed of the transmitting tape, 70 in transmitting, is such as to move the distance unit of the tape in the time unit required to produce the proper distance unit upon the receiving tape. This requirement merely places a required ratio upon the two 75 speeds and the receiving tape speed may be adjusted to fit a transmitting tape speed and the required ratio by an inspection of the work done.

If, after the printing of the element 4, 80 a delay of five time units had elapsed before the printing of the element 3, the imprint of element 4 would have traveled five distance units to the left, being then opposite the lower left hand end of the ele- 85 ment 3, and the element 3 would have been imprinted upon the tape with the two elements in that relation. This produces the letter L, as shown in Fig. 5, and the longitudinal separation of the perforations by 90 five distance units of the tape 7 is shown in the tape opposite the letter L. The letter U is produced by printing character 4, and after a lapse of four time units again print- 95 ing the character 4, and after a lapse of one additional time unit printing the character 3. The letter H is produced by imprinting the character 4, and after a lapse of four time units again imprinting the character 4, and after a lapse of two ad- 100 ditional time units imprinting the character 2. The composition of any of the letters or characters shown in Fig. 4 may be determined by the holes punched in the tape shown adjacent thereto. 105

In forming the letter J, and also the letter U, as well as many others of the alphabet shown in Fig. 4, the vertical part of the angular pen 3 coincides with the long vertical character 4. A distinguishing charac- 110 teristic of the method of building up our improved alphabet, is the fact that the vertical part of either angular pen may be printed to coincide with the long vertical element. It is this system of overlapping 115 the chosen elements which renders it possible to build up, with as few as four characters, so complete an alphabet.

Figs. 4, 8, 9, and 10 show different arrangements of the same elements. In Figs. 120 11, 12, and 13, the element 3 is replaced by an element 3'. All the fundamental features of the alphabet just described appear when the elements of Figs. 11, 12, 13 are used, but the resultant alphabet is some- 125 what different. In Fig. 7, also, a variation in design of element is shown, the vertical strokes of the elements being slanted and the angles being obtuse and acute instead of rectangular. This produces a more 130

pleasing printed page, but does not differ in any fundamental detail from the rectangular alphabet offered before.

In order that a punching device for perforating the transmitting tape may be produced as simply as possible, the forms of the composite letters have been so designed as to require as small as possible a number of different perforation positions in the tape when considered letter by letter, in order that the number of cutting devices in a tape-perforating machine may be a minimum. A die plate is shown in Fig. 6, containing ten holes occupying twelve time positions and four key selecting positions. The alphabet of Fig. 5 may be printed by control of transmitting tape perforated by a perforating device of ten punches arranged as shown in Fig. 6, the proper punches of the ten being selected and operated to cut the tape to determine the resultant character.

While we have illustrated specifically in Fig. 3 a method of marking with the pen the receiving tape 19 involving the use of an inked ribbon 20 interposed between the anvil 18 and the movable pens, it is obvious that if a chemically sensitized receiving tape 19 be employed, the inked ribbon 20 may be dispensed with and the pens allowed to impinge directly upon the tape leaving marks thereon by virtue of electrolytic action between the pens and the tape in accordance with the well-understood methods of chemical recording largely employed in printing telegraph systems. When the inked tape is thus dispensed with the printing pens are connected with one terminal of a battery or other source of electricity and the anvil 18 with the other, so that conditions for electrolytic action between the pens and the moistened tape are present whenever a pen strikes upon the tape. This manner of printing by electrochemical action rather than by an inked tape is so obvious from the above description that we have not deemed it necessary to specifically illustrate it.

It will be obvious from the foregoing description that our invention, so far as the design of the alphabet is concerned and so far as the formation of this alphabet by the striking of the pens upon the receiving tape is concerned, is not dependent on any particular system of electrical control or any particular number of line conductors; but that any means for causing the four elemental pens to impress these type faces upon a receiving tape in proper sequence and with the proper time intervals for producing legible characters of the kind described will lie within the scope of our invention. We show, however, a specific electrical circuit and transmitting and receiving devices for the telegraphic transmission

of intelligence and the recording of the messages by our improved system of printing pens, which telegraph system also is of our invention.

Our invention is also subject to many other modifications, all of which will be clear to one skilled in the art.

Having thus described our invention, what we claim as new and desire to secure by United States Letters Patent, is:

1. A receiving device for a printing telegraph system, a group of printing pens and electromagnetic means for selectively operating said pens, some of said pens being adapted to print two elemental lines joined at an angle, and others of said pens being adapted to print single elemental lines, said single elemental lines, in printing some of the characters, being superimposed upon and coincident with one of the elemental lines of said angle pens.

2. The method of forming the characters of an alphabet, in a printing telegraph receiver, which comprises first printing a portion of a character with one type face, then causing a relative movement between the receiving surface and the type faces, and then causing the imprint of a second type face in such manner that the two imprints will coincide throughout a portion of their length, thus obliterating a useless portion of one imprint.

3. The method of forming a letter in an alphabet for use in printing telegraphy which comprises the printing of a part of a letter by a recording type face, and the printing of another recording type face upon a portion of the imprint first made, thus extending the total imprint to modify the imprint first made.

4. The method of forming any character in an alphabet for use of printing telegraphic systems which consists in imprinting on a relatively moving surface from a group of type faces, a type face and after the lapse of a pre-determined time interval imprinting another of said type faces upon a portion of the imprint first made, thus extending the total imprint to modify the imprint first made.

5. The method of recording intelligible characters in response to electrical impulses, in a rapid printing telegraph system, which consists in causing one of a group of type faces to record its imprint on a relatively moving receiving surface and subsequently selectively causing others of said type faces to record their imprints on said surface to form by the combination of their imprints the various characters, the imprints of the earlier operated type faces being in part overlapped by imprints of the subsequently operated type faces in the production of certain characters.

6. The method of forming an alphabet,

for use in a printing telegraph system, which consists in employing one or more elements, selected from a plurality of elements, to form each individual letter or numeral, and in certain characters causing the overlapping of certain portions of the imprints of said elements to obliterate undesirable portions of their outline.

7. The method of forming an alphabet, for use in a printing telegraph system, which consists in employing one or more elements to form each individual letter or numeral, and in certain characters causing the overlapping of certain portions of the imprints of said elements to obliterate undesirable portions of their outline.

8. The method of forming the letters and characters necessary to record intelligence in a printing telegraph system, which consists in causing the imprinting of one of a group of four of partial character type faces to strike against and record its outlines on a continuously moving receiving surface and subsequently selectively causing other of the type faces to record their imprints upon said surface, the relative position of the type faces being so proportioned with respect to the speed of the receiving surface and to the time intervals between their impacts as to cause in some instances the imprints of different type faces to co-incide throughout portions of their length, thus obliterating the superfluous portion of one imprint, and the duration of the printing impact being so short with respect to the speed of movement of the receiving surface relative to the type faces as to permit of no appreciable drag of the type faces on the receiving surface during the period of impact.

9. In an electric rapid printing telegraph system, a set of pens having type faces so conformed as to produce, when operated in a predetermined sequence upon a moving tape, the various necessary characters of an alphabet, certain portions of the imprints of the various type faces overlapping in forming certain characters to extend previous impressions; a magnet for actuating each pen; means for selectively energizing said magnets, comprising a perforated tape having four rows of holes, one row for each pen; means for moving said tape; a set of brushes; one for each row of holes; a contact device; and a source of electrical energy, said brushes being adapted to engage said contact device as governed by the passage of the corresponding row of holes in said tape.

10. In a printing telegraph system, a set of four printing pens having printing faces formed of one or more elementary lines so shaped as to form compositely all the characters of the Roman alphabet; and means for controlling said pens from a distance.

11. In a printing telegraph system a re-

cording tape, four printing pens, two of which each print two lines joined at an angle and two of which print straight lines, said pens being so related with reference to a moving receiving tape as to be capable of printing compositely an alphabet suitable for recording the alphabet of a recognized language.

12. In a system of electric printing telegraphy, means for actuating selectively over a line circuit printing devices to produce a legible record; a plurality of printing devices thus to be actuated, and forming a complete set for producing a legible record, said devices and said actuating means being adapted to produce registration between some lines of some of the imprints of the devices in forming some parts of the record, said registration when such occurs obscuring part of the previous imprint.

13. In a system of rapid printing telegraphy, means for producing a legible character or letter of an alphabet, said means comprising printing devices for making imprints differing from each other, together with controlling devices whereby portions of the imprints may be printed in partial registration, to obscure part of the previous imprint.

14. In a system of rapid printing telegraphy a receiving surface, means for producing a legible character or letter of an alphabet thereon, said means comprising printing devices for making imprints differing from each other, together with electromagnetic devices controlled by line currents and controlling the printing devices, all of said parts being so constructed and related to each other and to the print-receiving surface that partially overlapping imprints may be produced, to obscure undesirable portions of a previous imprint.

15. In a system of rapid printing telegraphy a receiving surface, means for producing a legible character or letter of an alphabet thereon, said means comprising printing devices for making imprints differing from each other, together with electromagnetic devices controlled by line currents and controlling the printing devices, all of said parts being so constructed and related to each other and to said constantly moving print-receiving surface that partially registering imprints may be produced.

16. In a system of rapid printing telegraphy, a transmitting station and a receiving station and a line connecting them, a receiving surface at said receiving station, means at the receiving station and controlled over the line for imprinting marks of predetermined forms upon said receiving surface while in motion, and means at the sending station for so controlling the receiving devices as to cause the imprinting of a plurality of marks in lineal registry for a por-

tion only of their lengths, obscuring undesirable portions of the previous mark.

17. In a system of rapid printing telegraphy, a transmitting station and a receiving station and a line connecting them, a receiving surface at said receiving station, means at the receiving station and controlled over the line for imprinting marks of predetermined forms upon said receiving surface while in motion, and means at the sending station for so controlling the receiving devices as to cause the imprinting of a plurality of marks in lineal registry for a portion only of their lengths obscuring undesirable portions of a previous mark, said forms of marks being such as to produce a complete legible alphabet when properly combined.

18. A system of rapid printing telegraphy employing recording type faces, means for selectively obscuring some portions of the imprints thereof by coincidence with some portions of the imprint of another thereof to form some of the character or letters of a legible alphabet.

19. In a system of rapid printing telegraphy a moving record surface; a plurality of character recording members for recording characters or portions thereof upon said surface; and means for selectively actuating said members, one of said members producing an angular record, another of said members producing a straight line record, and the two of said members actuated in such relation that one side of the angular record coincides with a portion of the record of the other of the two members.

20. In a system of rapid printing telegraphy a moving record surface; a plurality of character recording members for recording characters or portions thereof upon said surface; and means for selectively actuating said members, one of said members producing an angular record comprising vertical and horizontal lines, another of said members producing a single line record and the two of said members actuated in such relation that the vertical side of the angular record coincides with a vertical portion of the record of the other of the two members.

21. In a system of rapid printing telegraphy, two angular recording type faces each comprising vertical and horizontal members, means for selectively printing the vertical portion of said type faces over an already existing vertical imprint of a vertical type face to form certain intelligible characters.

22. In a rapid printing telegraph system three recording type faces and selective means for making imprints therefrom overlap, another recording type face making an imprint at right angles to a vertical or overlapped imprint to form some of the characters of a legible alphabet.

23. In a system of rapid printing tele-

graphy, a group of recording type faces, means for selectively printing from three of said recording type faces, means for overlapping or registering the imprints of said types in various manners as determined by the character to be recorded, a horizontal type face and means for operating said horizontal recording type face so disposed as to always leave its imprint at approximately right angles to a vertical or overlapped record in order to complete the desired character of a legible alphabet.

24. In a rapid print telegraphic system and impulse transmitting device, a receiving device and a circuit connecting means at said receiving device, actuated by impulses from said impulse device for printing the following characters: C, D, I, J, L, M, N, O, T, U, V, W, Z, 1, 2, 7, 0, which comprises three recording type faces whose imprints may selectively by impulses from said circuits be made to overlap in the formation of said letters.

25. In printing telegraph systems, a monogram composed of four characters, two of which are each single elemental lines and two of which are each a compound of elemental lines, pens for printing the characters, and means for operating the pens from a distance.

26. In printing telegraphs, a plurality of printing pens, means for producing an initial magnetic field common to all of said printing pens, devices controlled by such field for holding the pens out of operation, and means for sending electrical impulses to cause the operation of the pens individually.

27. In a printing telegraph system, a set of four printing pens, having printing faces some formed of single elemental lines and others of a plurality of elemental lines so shaped as to form compositely all the characters of a recognized alphabet and means for controlling said pens from a distance.

28. In a printing telegraph system, a recording tape, four printing pens, two of which each print two lines joined at an angle and two of which each print straight lines, said pens being so related with reference to said recording tape as to be capable of printing compositely the alphabet of a recognized language.

29. In a printing telegraph system, two printing pens each adapted to print a single line and two additional pens each adapted to print compound lines, and means for operating said pens to print the characters of the recognized alphabet of a language by compounds of the lines represented in said four pens.

30. Means for producing a magnetic field, a series of pens restrained from operation by such field, and means for releasing the pens selectively from such field.

31. A magnet and source of electricity

connected thereto, a series of pens restrained from operation by the field produced by said magnet, a separate magnet associated with each pen, and means for operating the
5 separate magnets selectively to produce a selective operation of the pens. 15

32. In apparatus for printing Roman characters by the successive impressions of type containing elemental lines, a plurality
10 of such type, means for operating said type selectively and in succession, and means for producing such characters by four type,

which means consists of causing part of the line printed by a later type to linearly overlap and extend the line printed by an earlier type.

Signed by us at Chicago, county of Cook, and State of Illinois, in the presence of two witnesses.

CHARLES G. ASHLEY.
JAMES B. CRIPPEN.

Witnesses:

DAVID S. HULFISH,
HARRIET L. SMITH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."