No. 702,339. Patented June 10, 1902.

S. G. BROWN.

TELEGRAPHIC APPARATUS.

(Application filed Jan. 30, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

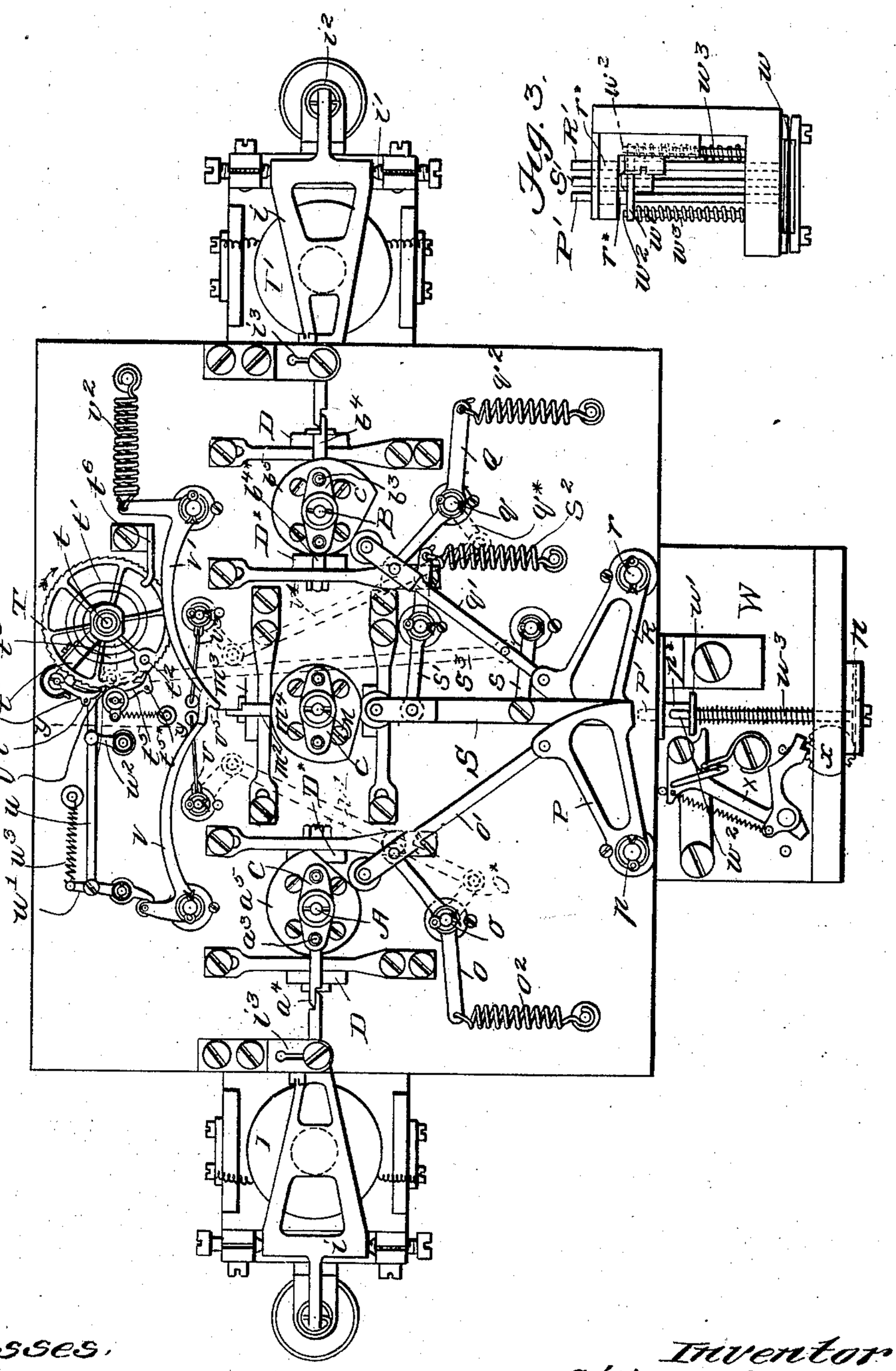

Fig. 3.

Witnesses.
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Fig. 5

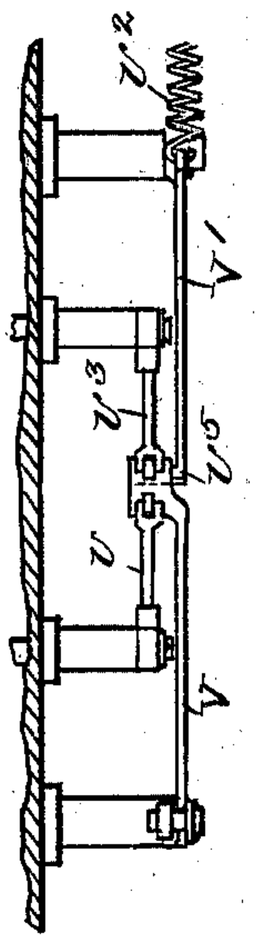


Fig. 2.

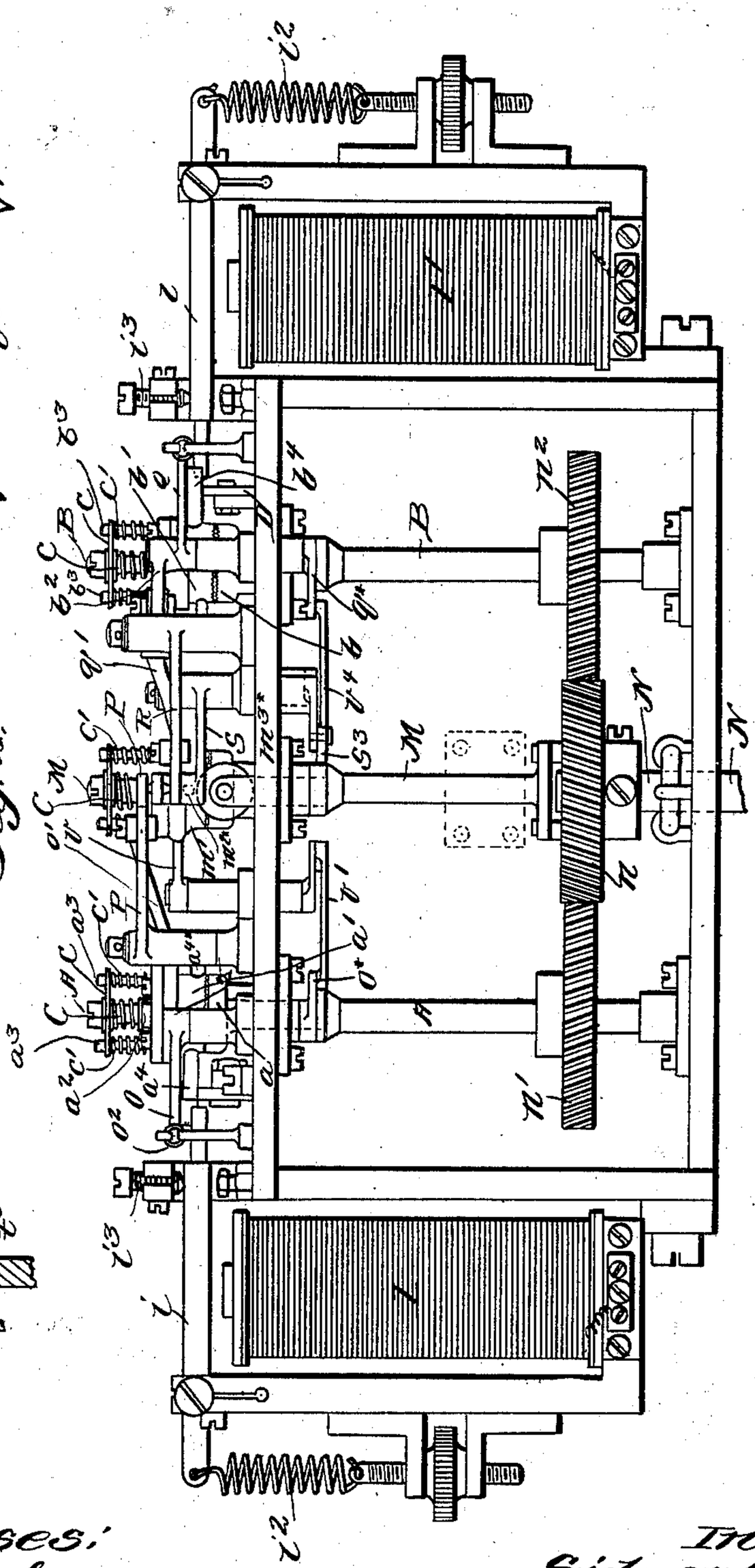
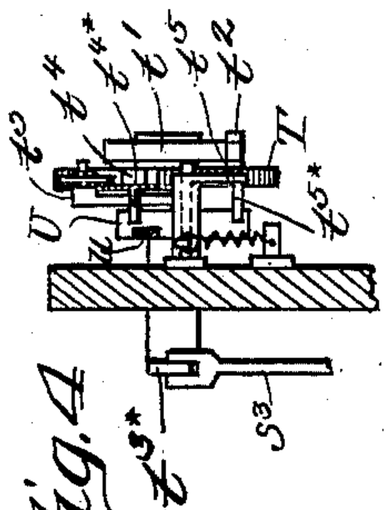


Fig. 4



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UNITED STATES PATENT OFFICE.

SIDNEY GEORGE BROWN, OF PUTNEY, ENGLAND.

TELEGRAPHIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 702,339, dated June 10, 1902.

Original application filed March 29, 1900, Serial No. 10,656. Divided and this application filed January 30, 1901. Serial No. 45,384. (No model.)

To all whom it may concern:

Be it known that I, SIDNEY GEORGE BROWN, electrician, a subject of the Queen of Great Britain, residing at 7 Putney Hill, Putney, in the county of Surrey, and lately residing at Van Buren, Poole road, Bournemouth, in the county of Hants, England, have invented certain new and useful Improvements in Telegraphic Apparatus, of which the following is a specification.

This invention relates to improvements in electric-telegraph apparatus and refers to an automatic tape-punching instrument adapted to be operated by the signaling-currents received from a cable or line for punching signaling-holes in a tape.

The arrival currents from a long cable-section worked at fast siphon-recorder speed are of such a nature that when working over a long cable-section if a succession of impulses of the same polarity and of equal strength and duration be applied to one end of such section the first of such impulses will carry the tongue of the relay situated at the opposite end of such section against its "marking-stop" or contact. The variation in the strength of the received current due to the remainder of said succession of impulses is, however, so small that the said tongue is not permitted to fall away from its marking-stop and break contact between the succeeding impulses of the same polarity and of equal strength and duration, as it ought to do in order to correctly reproduce the original signals. When the polarity of the current sent is reversed, the tongue of the relay responds readily, however, and is carried over to its opposite "stop" or contact, where it again remains without breaking contact between successive impulses of the same polarity and of equal strength and duration.

This invention has for its object punching apparatus which is adapted to be automatically operated by signaling impulses received at siphon-recorder speed from a cable or line section in such manner as to punch signaling-perforations in a tape after reinserting or interpolating the impulses that have been lost, as aforesaid, so as to assure accuracy in the reproduction of the signals.

According to my invention one or other of a pair of electromagnets is energized by the received signaling-currents, accordingly as such currents are of positive or negative polarity. The electromagnet thus energized attracts one of a pair of armatures. The armature thus attracted is adapted to release one of a pair of clutch-sleeves, which released sleeve is then thrown into gear with a rotating spindle. The clutch-sleeves are frictionally attached to the rotary spindles. A third rotary spindle is similarly provided with a clutch-sleeve and is placed between the two aforesaid spindles. The two side sleeves when released by the armatures disengage and stop the central clutch-sleeve and operate the punches for making the perforations corresponding to the positive and negative impulses and at the same time make a central row of perforations in the tape. The central sleeve operates a punch for perforating the paper strip of tape with a central row of spacing-holes when no signaling impulses are received. To prevent an inconvenient length of blank tape being manufactured by the central clutch and punch when no signals are received, a stopping device is arranged to come into operation, so as to disengage and stop the said clutch and punch after a definite number of central holes have been punched in the tape. Upon the receipt of a signal this stopping device is thrown out of action, and the stop is set back to zero. These clutch-sleeves are adapted when thrown into gear with the rotating spindles to operate the punches at the same rate as that at which the contact-levers of the original transmitting instrument are oscillated, so that the number of signaling perforations punched in the tape will correspond to the number of impulses sent by the original transmitter, notwithstanding the fact that the variation in the strength of the received current due to a series of impulses of the same polarity and of equal strength and duration may be insufficient to release the armature, and thereby arrest the clutch-sleeve during the space of time between each of such series of impulses.

The clutch-sleeves are provided with teeth which are adapted to gear with similar teeth carried by collars on the rotary spindles. Suitable springs tend to force the clutch-

sleeves into gear with the collars. The clutch-sleeves are also provided with laterally-projecting pins, which rest upon the fixed lifting-rollers or equivalent devices when the said sleeves are at rest, and thereby raise the sleeves (against the pressure of springs) out of gear with the rotary spindles. When the armatures are attracted by their magnets, they release the pins of the side sleeves, whereupon the latter are thrown into gear with the rotary spindles by means of the springs. The pins of the central clutch-sleeve are automatically engaged by a stopping device when either of the side clutch-sleeves are rotating and also after a given length of blank tape has been punched when no signals are received. The clutch-sleeves are provided with cams or their equivalent for operating the punches.

The spindles are caused to continuously rotate by any convenient means, such as by an electromotor provided with a governor to keep its speed constant.

Referring to the drawings, Figure 1 is a plan, and Fig. 2 is a side elevation, of the apparatus with the punches removed. Fig. 3 is a side view of the punches. Fig. 4 is a section on the line $y\ y$ of Fig. 1. Fig. 5 is a view of the levers V V′ v v^3, at right angles to the view shown in Fig. 1.

A and B are rotary spindles provided with fixed toothed collars a and b.

a' b' are rotary clutch-sleeves mounted loosely on the spindles A B and provided with teeth adapted to engage with the teeth of the collars a b.

a^4 $a^{4\times}$ are pins projecting from the sleeve a'.

b^4 $b^{4\times}$ are pins projecting from the sleeve b'.

D D and D$^\times$ D$^\times$ are fixed lifting-rollers which project into the path of the pins a^4 $a^{4\times}$ and b^4 $b^{4\times}$ and lift the sleeves a' b' lengthwise of the spindles A and B and out of gear with the collars a and b when the pins a^4 b^4 and $a^{4\times}$ $b^{4\times}$ strike the said rollers as the spindles A and B rotate. The pins $a^{4\times}$ $b^{4\times}$ are shorter and are arranged on a lower level than the pins a^4 b^4, the rollers D and D$^\times$ being so arranged that during the revolution of the sleeves a' b' the pins a^4 b^4 pass over the rollers D$^\times$ D$^\times$ without striking them and that the pins $a^{4\times}$ $b^{4\times}$ pass between the rollers D D and the spindles A B.

a^5 b^5 are cams carried by the sleeves a' b'.

C C are springs the ends of which bear, respectively, upon shoulders a^2 b^2 on the spindles A B and upon washers on the under side of plates c c, which fit loosely on the spindles A B and are retained in position by washers and nuts.

a^3 a^3 and b^3 b^3 are vertical pins which project from the clutch-sleeves a' b' and pass loosely through the plates c c.

c' c' are springs which have their opposite ends bearing, respectively, on the sleeves a' b' and upon the plates c c. The springs c' c' tend to press the sleeves a' b' into engagement with the collars a b, and the springs C form a frictional connection between the spindles and the sleeves.

I I are electromagnets through the windings of which the signaling-currents from a cable or line are led. i i are the armatures of these magnets and are pivoted at i' i'. When no signaling-currents are received, these armatures are raised out of contact with their electromagnets by springs i^2 i^2, so that they project into the paths of the pins a^4 b^4 and by coming into contact with said pins hold the said pins stationary on the rollers D D, the clutch-sleeves a' b' being thus held out of gear with the collars a b.

i^3 i^3 are stops to limit the upward movement of the armatures. One of the said electromagnets is adapted to be energized by positive and the other by negative signaling-currents.

M is a rotary spindle fixed to a shaft N.

m is a toothed collar fixed to the spindle M.

m' is a clutch-sleeve provided with laterally-projecting pins m^2 $m^{2\times}$ and mounted frictionally on the spindle M by means of springs C c' and a plate c in the same manner as the clutch-sleeves a' b' are mounted on the spindles A and B.

m^3 $m^{3\times}$ are fixed lifting-rollers which are arranged in the path of the pins m^2 $m^{2\times}$ and engage with said pins to raise the clutch-sleeve m' out of gear in the same manner as above described with reference to the sleeves a' b' and the pins a^4 $a^{4\times}$ and b^4 $b^{4\times}$.

m^4 is a cam carried by the sleeve m'.

O is a crank-lever fixed to a pivot o, which passes through the base-plate of the apparatus and carries an arm $o^\times$ below said plate. One arm of the lever O is connected to a rod o', and its other arm is connected to a spring o^2. One end of the rod o' carries a roller which bears on the cam a^5. The other end of the said rod is connected to a striker P, pivoted at p. The spring o^2 tends to hold the roller on the rod o' in contact with the cam a^5 and also tends to withdraw the striker P into the position shown in Fig. 1.

Q is a crank-lever fixed to a pivot q, which passes through the base-plate of the apparatus and carries an arm $q^\times$ below said plate. One arm of the lever Q is connected to a rod q' and its other arm is connected to a spring q^2. One end of the rod q' carries a roller which bears on the cam b^5, and its other arm is connected to a striker R, pivoted at r. The spring q^2 tends to hold the roller on the rod q' in contact with the cam b^5, and also tends to withdraw the striker R into the position shown in Fig. 1.

S is a striker which is situated between the strikers P and R and which carries a roller at one end, which bears upon the cam m^4.

s is a lever which is pivoted to the bed of the instrument in a similar manner to the levers O and Q and has one arm connected to the striker S.

s' is a lever which is pivoted to the bed of

the instrument and has one arm connected to the striker S and its other arm connected to a spring s^2. The spring s^2 tends to hold the roller on the striker S in contact with the cam m^4. The strikers P, S, and R respectively operate the punches P′ S′ R′ of the punching apparatus.

T is a ratchet-wheel which is mounted loosely on a stud or axle t, journaled in the instrument frame or bed, and is provided with a coiled spring t', which tends to rotate the said ratchet-wheel in the direction of the arrow in Fig. 1.

t^2 is a stud which projects from the wheel T.

t^3 is a lever which is fixed on the stud t and carries a spring-pawl t^4, adapted to engage with the teeth of the wheel T.

$t^{3\times}$ is a lever connected below the base-plate of the apparatus to the stud t and connected by a link s^3 to one arm of the lever s, also situated below the base-plate.

t^5 is a spring-pawl which engages with the ratchet-wheel T and is adapted when in such engagement to prevent any return movement of the said wheel.

t^6 is a fixed stop arranged in the path of the stud t^2. The pawls t^4 t^5 are provided with pins $t^{4\times}$ $t^{5\times}$, which project into the path of a bar U. The bar U is fixed to one end of a rod u, which has its opposite end connected to one end of a pivoted lever u' and is supported from the bed of the instrument by a link u^2.

u^3 is a spring which tends to draw the rod u and bar U toward the wheel T and also presses the other arm of the lever u' against a roller carried by one arm of a pivoted lever V.

V′ is a pivoted lever one arm of which is secured to a spring v^2 and the other arm of which carries a projection v^5, upon which one arm of the lever V bears.

v is a pivoted lever one arm of which is situated above the base-plate and carries a roller-bearing upon one end of the lever V. The other arm of the lever v is below the base-plate and is connected by a link v' to the arm $o^\times$ of the lever O.

v^3 is a pivoted lever one arm of which is situated above the base-plate and bears on one end of the lever V. The other arm of the lever v^3 is situated below the base-plate and is connected by a link v^4 to the arm $q^\times$ of the lever Q. The projection v^5 is adapted to be moved into the path of the pin m^2, as hereinafter described.

The punches are carried by a suitable frame W, which latter also carries a slot or guide w for the paper tape. The central punch S′ is fixed to a plate w', adapted to slide on guide-rods w^2 w^2.

w^3 w^3 are springs which surround the guide-rods and tend to withdraw the punches from the tape.

The punches P′ and R′ pass loosely through the plate w', but carry fixed collars $p^\times$ $r^\times$, which bear upon said plate. When the central punch S′ is operated by the striker S, as hereinafter described, it punches a central hole in the tape, and the punches P′ R′ remain inoperative. When either of the punches P′ or R′ is operated, it punches a hole on one or other side of the central longitudinal line of the tape and also moves the plate w' and punch S′, thereby also punching a central hole in the tape. When the plate w' is moved by one or other of the punches, it operates the spring-pawl X, (of well-known construction,) which in turn actuates the star-wheel x for feeding the paper tape forward by a step-by-step movement.

When the electromagnet I is energized by the currents received from the line or cable sections and moves its armature i out of the path of the pin a^4, the clutch-sleeve carrying the cam a^5 is thrown into gear with the collar a on the spindle A. The cam a^5 then rotates once for every signaling impulse transmitted to the first line or cable section. At each revolution the cam a^5 operates the striker P through the link o', causing said striker to operate the punch P′, and with it the punch S′, thus perforating the tape with a hole corresponding to a positive impulse and also making the central perforation. For signals of opposite polarity the cam b^5 is similarly released by the electromagnet I′ and, rotating, operates the link q' and striker R, causing the said striker to operate the punch R′, and with it the punch S′, thereby perforating a hole on the opposite side of the tape corresponding to an impulse of opposite polarity and at the same time making the necessary central hole.

When the striker P is operated as above described, the arm $o^\times$ of the lever O moves the link v' and rocks the lever v. The lever v moves the levers V and V′, thereby causing the projection v^5 to be moved into the path of the pin m^2 and to thereby arrest the cam m^4 and also rocking the lever u' against the tension of the spring u^3, so as to draw the rod u and the bar U away from the wheel T, thus causing the bar U by engaging the pins $t^{4\times}$ $t^{5\times}$ to lift the pawls t^4 t^5 out of engagement with the wheel T. When thus disengaged from its pawls, the wheel T is returned in the direction of the arrow by the spring t' until the stud t^2 strikes the stop t^6.

When the striker R is operated, the levers V and V′ are operated in the same manner through the intervention of the arm $q^\times$ of the lever Q, the link v^4, and the lever v^3.

When no signals are received, the strikers P and R and the various levers connected therewith are returned to the positions shown in Fig. 1 by the springs o^2, u^3, v^2, and q^2, the projection v^5 being moved out of the path of the pin m^2.

During the intervals between the receiving of impulses or series of impulses the cam m^4 rotates and at each revolution operates the striker S, thereby causing the punch S′ to continue to perforate the central line of holes

in the tape, and thus obtain the correct spaces between the impulses or signals. Every time the cam m^4 operates the striker S the lever s (through the link s^3 and lever $t^{3\times}$) turns the pivot t about its axis, and thereby operates the pawl t^4, thus moving the wheel T in the opposite direction to that indicated by the arrow in Fig. 1, the pawl t^5 preventing any return movement of the wheel T. After a definite number of strokes of the striker S (which number will correspond to the number of teeth on the wheel T) have been given the stud t^2 will strike the arm of the lever V', which is arranged to lie in its path, thereby moving the projection v^5 into the path of the pin m^2, so as to stop the cam m^4 and prevent an inconvenient length of blank strip or tape being manufactured after the cessation of the receipt of signals. As previously described, when the first signal is received the pawls will be released from the wheel T, and the stud t^2 will then be returned to the stop t^6 by the spring t'.

Referring to Fig. 2, the shaft N is caused to continuously rotate, preferably by an electromotor provided with suitable means for regulating its speed, such as a centrifugal governor arranged to break the electrical circuit of the motor except through a shunt of suitable resistance or by any other convenient device. n is a gear-wheel, which is mounted on the shaft N and gears with other gear-wheels n' n^2, mounted, respectively, on the spindles A and B. As the shaft N rotates, therefore, the spindles A and B and the spindle M are caused to continuously rotate in the required direction.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. An electric-telegraph apparatus, comprising constantly-rotating spindles, clutch-collars fixed to said spindles, clutch-sleeves mounted on said spindles, means for moving the clutch-sleeves along the spindles out of gear with the clutch-collars once during every revolution of the clutch, means operated by the clutch-sleeve for punching signaling-perforations in the tape, means for normally holding the clutch-sleeves out of gear with the clutch-collars, and means for releasing the clutch-sleeves when signaling-perforations are to be punched, substantially as described.

2. In an electric-telegraph apparatus, the combination of punches for perforating signals in a tape, a punch for perforating spacing-holes in said tape, means operated by received signals from a line or cable section for actuating said punches, and means for limiting the length of blank tape perforated by the spacing-punch when no signals are received, substantially as described.

3. Electric-telegraph apparatus comprising constantly-rotating spindles, clutch-sleeves adapted to be moved lengthwise of said spindles, means operated by signals received from a cable or line which normally engage and hold said clutch-sleeves stationary but release the said sleeves when signaling-currents are received, means for moving the clutch-sleeves into engagement with the rotary spindles when thus released, means operated by said clutch-sleeves for punching perforations in a signaling-tape, and means for limiting the length of blank tape passed through the apparatus after the cessation of signals, substantially as described.

4. Electric-telegraph apparatus comprising constantly-rotating spindles, clutch-collars fixed to said spindles, clutch-sleeves mounted on said spindles, cams carried by said clutch-sleeves, pins projecting laterally from said clutch-sleeves, means arranged in the paths of said lateral pins and adapted to lift the clutch-sleeves out of gear with the clutch-collars during part of the revolution of the clutch-sleeves, means operated by said cams for punching signaling-perforations in a tape, means engaging with the lateral pins for normally holding the clutch-sleeves out of gear with the spindles and means for releasing the lateral pins when signaling-perforations are to be punched, substantially as described.

5. Electric-telegraph apparatus comprising constantly-rotating spindles, clutch-collars fixed on said spindles, clutch-sleeves mounted loosely on said spindles, cams carried by the clutch-sleeves, springs which tend to force the clutch-sleeves into gear with the clutch-collars, pins projecting laterally from the clutch-sleeves, rollers arranged in the paths of the lateral pins and adapted to lift the clutch-sleeves out of gear with the clutch-collars during part of the revolution of the clutch, means operated by the cams for punching signaling-perforations in a tape, means for normally engaging the lateral pins for holding the clutch-sleeves out of gear with the clutch-collars, and means for releasing the lateral pins for punching perforations in a tape, substantially as described.

6. Electric-telegraph apparatus comprising constantly-rotating spindles, clutch-collars fixed on said spindles, clutch-sleeves mounted loosely on said spindles, cams carried by the clutch-sleeves, springs which tend to throw the clutch-sleeves into gear with the clutch-collars, pins projecting laterally from the clutch-sleeves, rollers arranged in the paths of the lateral pins and adapted to lift the clutch-sleeves out of gear with the clutch-collars during part of the revolution of the clutch, means operated by the cams for punching perforations in a tape, armatures for normally engaging with the lateral pins so as to hold the clutch-sleeves out of gear with the clutch-collars, and electromagnets adapted to be energized and to move the armatures so as to release the lateral pins to record received signals, substantially as described.

7. Electric-telegraph apparatus comprising three continuously-rotating spindles, clutch-sleeves mounted on said spindles, cams on said clutch-sleeves, strikers operated by said cams two of which strikers are adapted to operate

lateral punches for perforating lateral signaling-holes and also a central punch for perforating central holes in a tape, and the third of which punches is adapted to operate the central punch, means for normally holding the clutch-sleeves for operating the lateral punches out of gear with their rotary spindles, means for throwing the clutch-sleeve for separately operating the central punch out of gear after the cessation of signals and when a definite length of tape has passed through the apparatus and means for throwing the clutch-sleeves for operating the lateral punches into gear with their spindles for perforating signals, substantially as described.

8. Electric-telegraph apparatus comprising three continuously-rotating spindles, clutch-sleeves mounted on said spindles, cams on said clutch-sleeves, strikers operated by said cams two of which strikers are adapted to operate lateral punches for perforating lateral signaling-holes and also to simultaneously operate a central punch for perforating central holes in a tape, and the third of which strikers is adapted to operate the central punch only, means for normally holding the clutch-sleeves for operating the lateral punches out of gear with their rotary spindles, a stop operated by pawl and ratchet-wheel gear for throwing the clutch-sleeve for separately operating the central punch out of gear when a definite length of tape has passed through the apparatus after the cessation of signals, means for releasing the clutches for operating the lateral punches and for simultaneously releasing the pawls and permitting the said stop and ratchet-wheel to return to zero, and means for holding the clutch-sleeve for separately operating the central punch out of gear when the clutch-sleeves for operating the lateral punches are in action, substantially as described.

9. Electric-telegraph apparatus comprising three continuously-rotating spindles, clutch-collars fixed on said spindles, clutch-sleeves mounted loosely on said spindles, cams carried by the clutch-sleeves, springs which tend to throw the clutch-sleeves into gear with the clutch-collars, pins projecting laterally from the clutch-sleeves, rollers arranged in the path of the lateral pins and adapted to lift the clutch-sleeves out of gear with the clutch-collars during part of the revolution of the clutch, strikers operated by said cams two of which strikers are adapted to operate lateral punches for perforating lateral signaling-holes and also to simultaneously operate a central punch for perforating central holes in a tape, and the third of which strikers is adapted to operate the central punch only, means for normally engaging the lateral pins of and holding out of gear the clutch-sleeves which operate both the lateral and central punches, means for engaging the lateral pins of and holding out of gear the clutch-sleeve which operates the central punch when a definite length of tape has passed through the apparatus after the cessation of signals, means for releasing the clutch-sleeves which operate the lateral punches, and means for simultaneously engaging the lateral pin of and holding out of gear the clutch-sleeve which operates the central punch, substantially as described.

10. In electric-telegraph apparatus the combination of three continuously-rotating spindles, clutch-collars fixed on said spindles, clutch-sleeves mounted loosely on said spindles, cams carried by the clutch-sleeves, springs which tend to throw the clutch-sleeves into gear with the clutch-collars, pins projecting laterally from the clutch-sleeves, rollers arranged in the path of the lateral pins and adapted to lift the clutch-sleeves out of gear with the clutch-collars during part of the revolution of the clutch, strikers operated by said cams two of which strikers are adapted to operate lateral punches for perforating lateral signaling-holes and also to simultaneously operate a central punch for perforating central holes in a tape, and the third of which punches is adapted to operate the central punch only, means for normally engaging the lateral pins of and holding out of gear the clutch-sleeves which operate both the lateral and central punches, a lever carrying a projection adapted to be moved into the path of the lateral pin on the clutch-sleeve adapted to operate the central punch, a ratchet-wheel, spring-pawls adapted to rotate said ratchet-wheel by a step-by-step movement against the pressure of a spring, a pin carried by said ratchet-wheel, means operated by said central clutch-sleeve for operating the said pawls at every revolution of said sleeve, whereby the pin carried by the ratchet-wheel is caused to strike the lever carrying the projection and thus move said projection into the path of the lateral pin of the central clutch-sleeve after the central clutch-sleeve has made a definite number of revolutions, means for releasing the clutch-sleeves which operate the lateral punches when signaling-perforations are to be punched in the tape, and means operated by said lateral clutch-sleeves when thus released for releasing the pawls from the ratchet-wheel so as to permit said ratchet-wheel to return to zero under the influence of its spring, and means operated by the lateral clutch-sleeves when released for operating the lever carrying the projection so as to move said projection into the path of the lateral pin on the central clutch-sleeve, substantially as described.

In testimony whereof I have hereunto set my hand, in presence of two subscribing witnesses, this 1st day of January, 1901.

SIDNEY GEORGE BROWN.

Witnesses:
THOS. S. WARDLE,
WALTER J. SKERTEN.