J. C. SHERMAN.

INSTRUMENT FOR MAGNETICALLY RECORDING SOUND VIBRATIONS.

APPLICATION FILED NOV. 21, 1908.

1,123,147.

Patented Dec. 29, 1914.

6 SHEETS—SHEET 1.

Fig. 1.

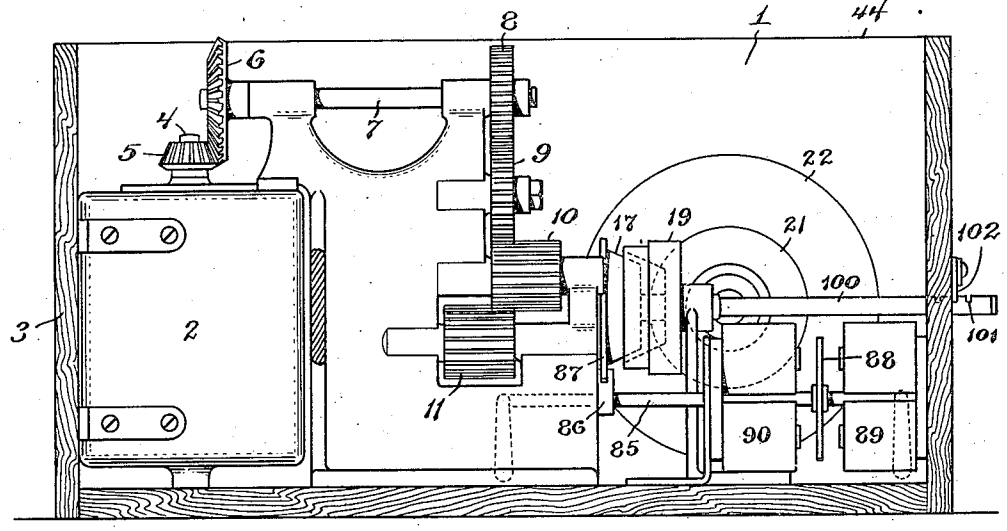
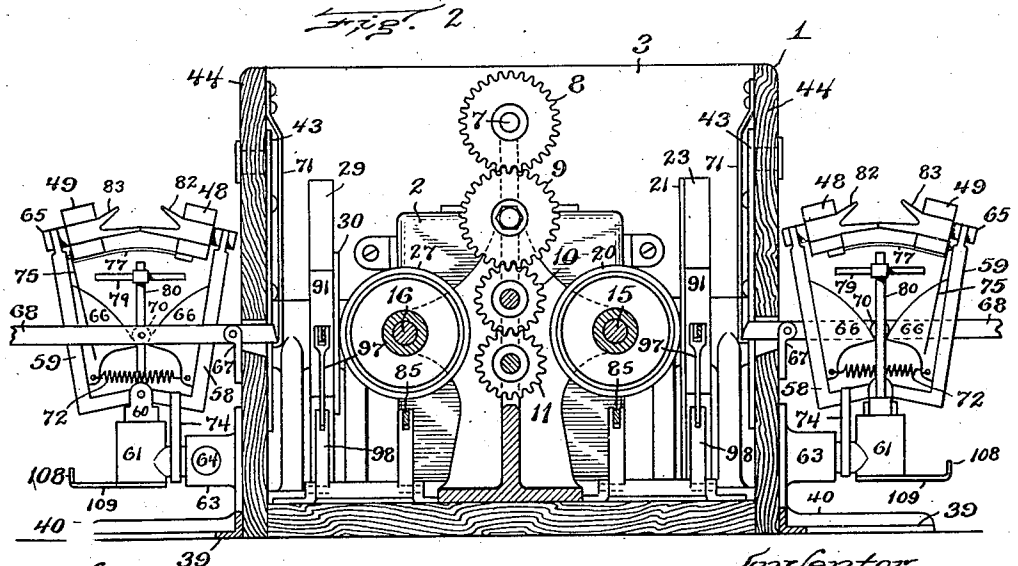


Fig. 2.



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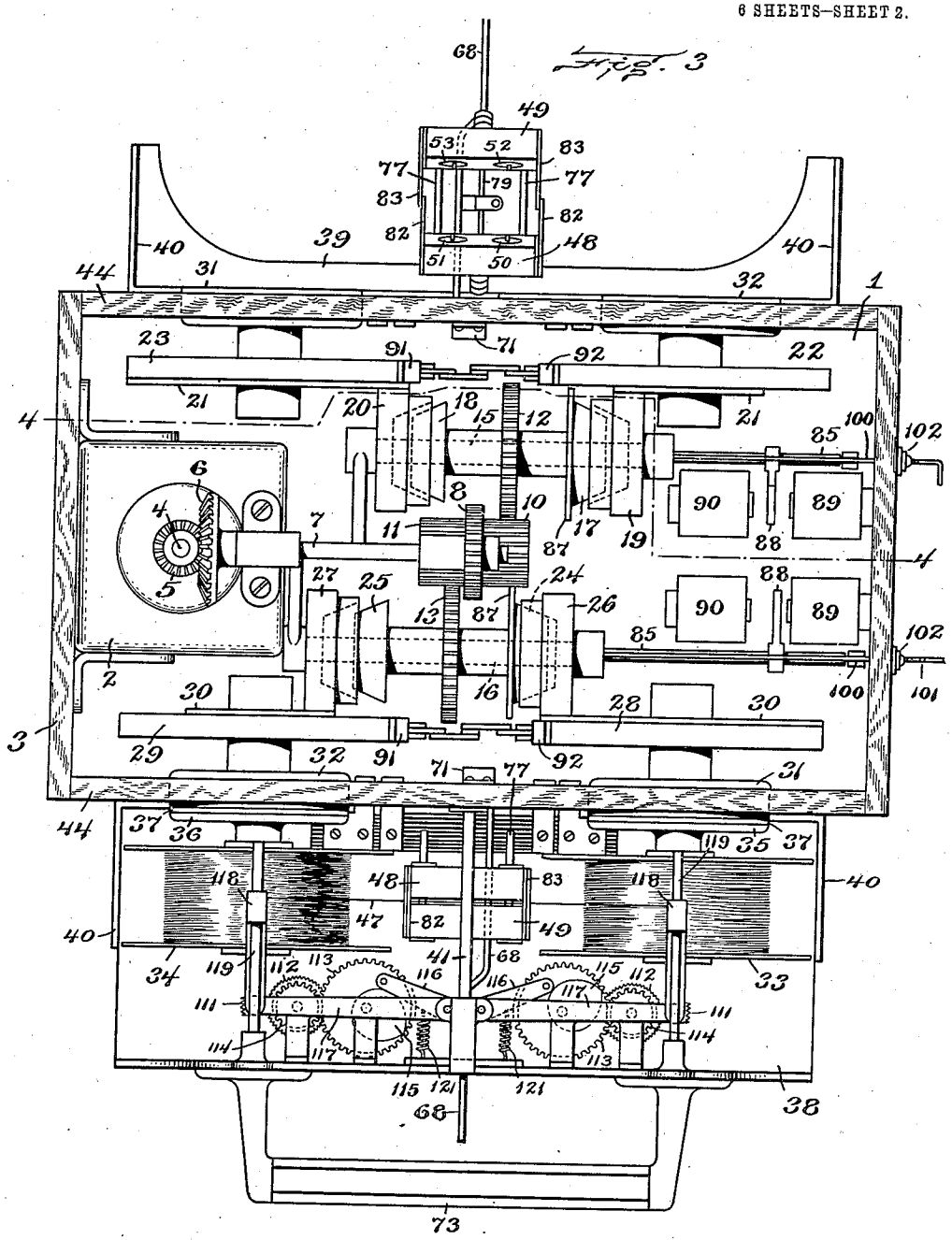
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6 SHEETS—SHEET 2.

Fig. 3



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6 SHEETS—SHEET 3.

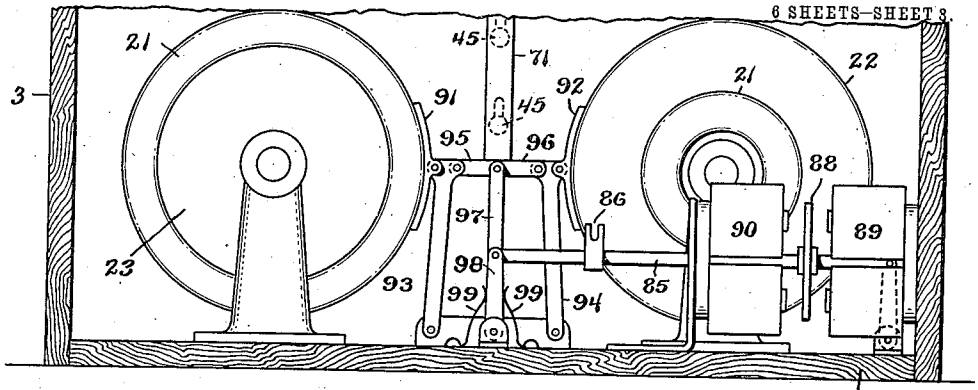


Fig. 4

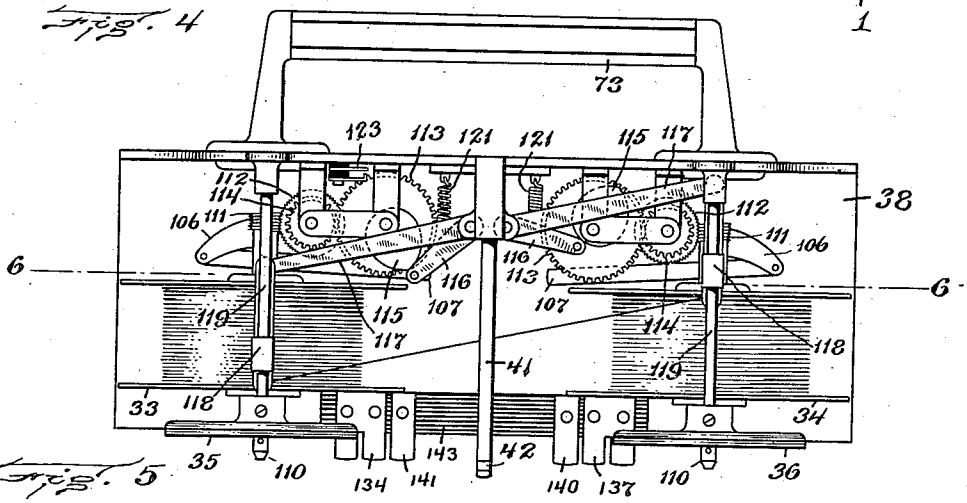


Fig. 5

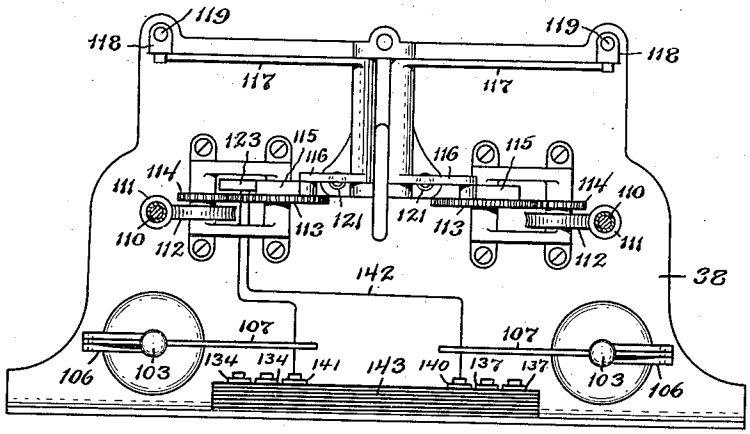


Fig. 6

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6 SHEETS—SHEET 4.

Fig. 9

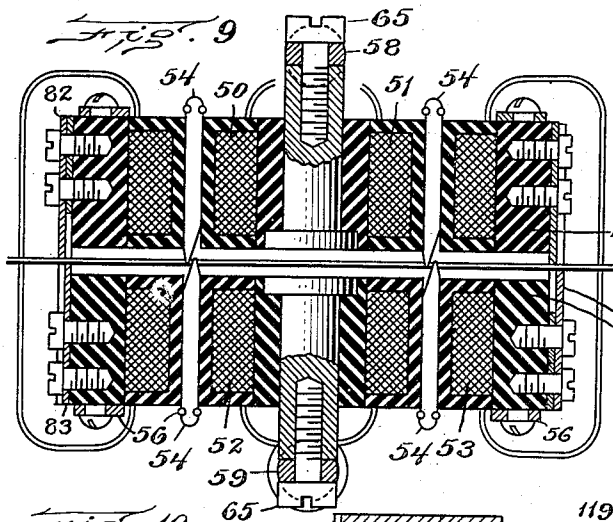


Fig. 8

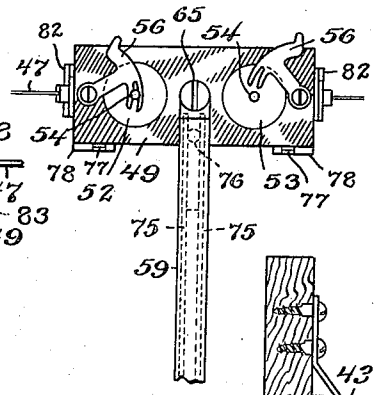


Fig. 10

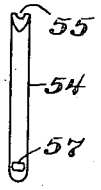


Fig. 11

Fig. 7.

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Fig. 14

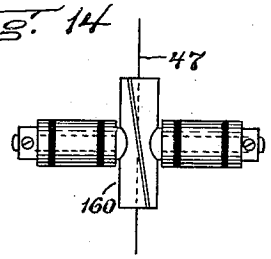


Fig. 15

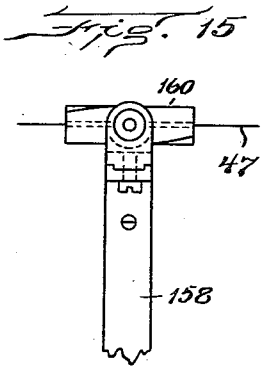
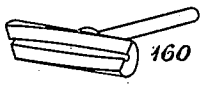


Fig. 16



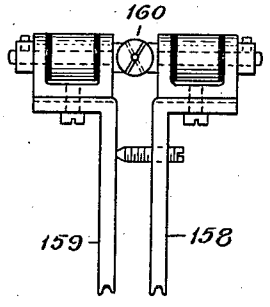
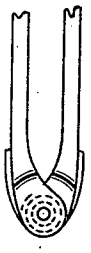
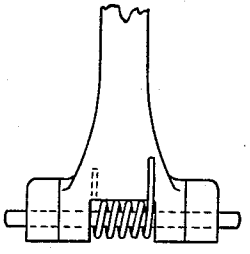


Fig. 13





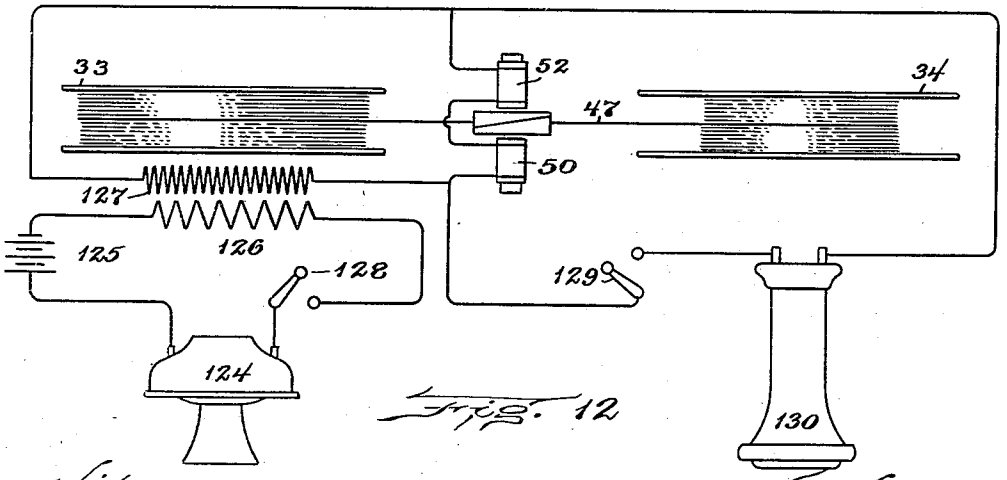


Fig. 12

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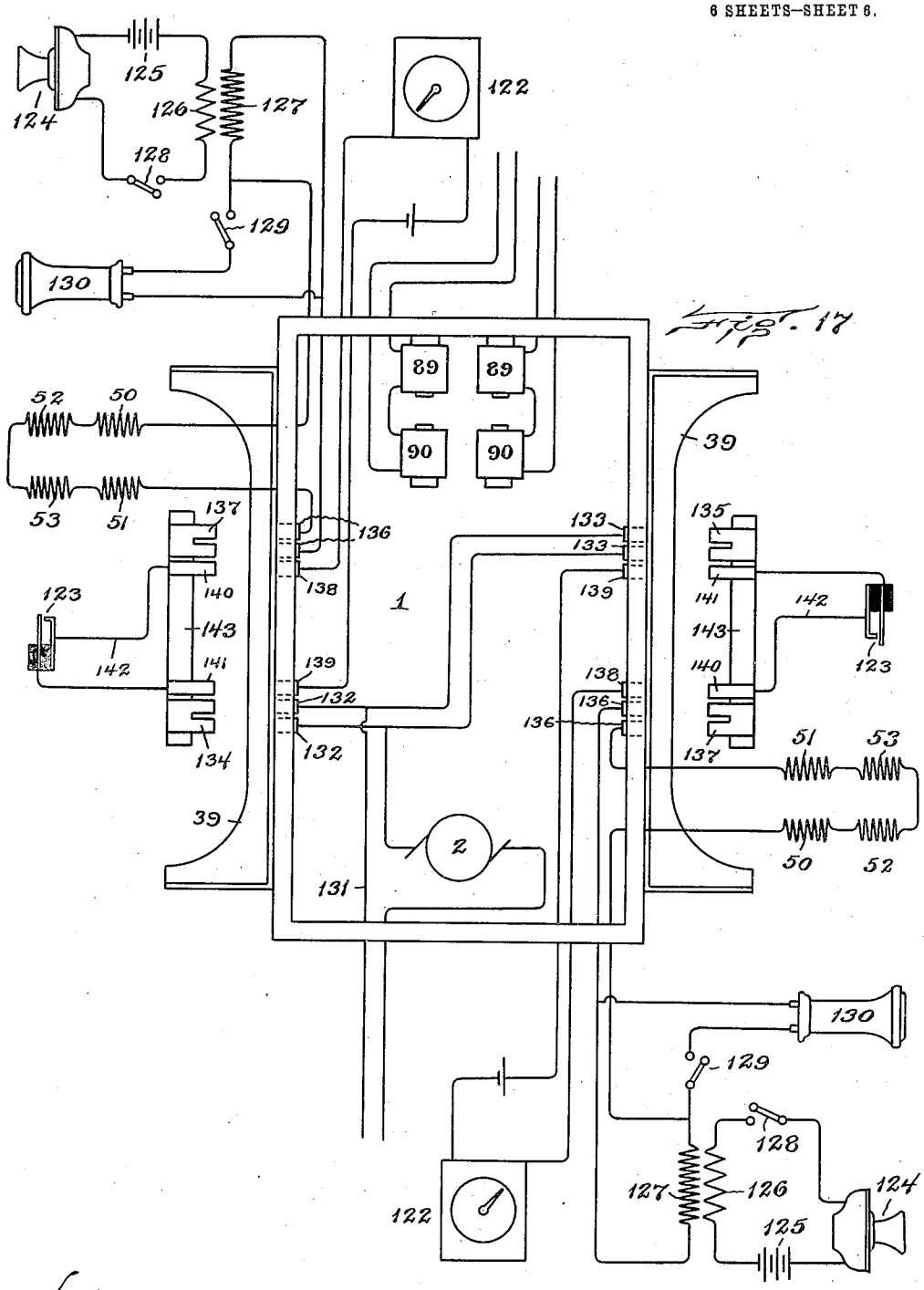
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1,123,147.

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6 SHEETS—SHEET 6.



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INSTRUMENT FOR MAGNETICALLY RECORDING SOUND VIBRATIONS.

1,123,147. Specification of Letters Patent. Patented Dec. 29, 1914.

Application filed November 21, 1908. Serial No. 463,737.

To all whom it may concern:

Be it known that I, JOHN C. SHERMAN, of Brookline, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Instruments for Magnetically Recording Sound Vibrations, of which the following is a specification.

This invention relates to instruments by which articulate speech and other sounds are recorded by producing in a record element varying degrees of magnetization corresponding to the sound vibrations.

In particular, the invention relates to the type of instrument known as the telegraphone, in which the record is produced upon a steel wire which passes between electro-magnets of which the coils are in circuit with a sound-transmitting circuit, whereby the strength of the magnets is continually varied in proportion to the amplitude of the sound vibrations.

Such machines of this character as have been constructed up to the present time are operated and controlled entirely by electrical devices which, with their numerous circuits, are very complicated and liable to derangement. The slight shocks incident to ordinary handling of such devices will frequently derange some of the delicate adjustments and repairs to any one part which may be out of order cannot be made without affecting other parts, and requiring an overhauling of the entire system. In particular, the connections and controlling relays for the motor which causes feeding of the steel recording wire are so intimately associated with the recording circuit wires which control reproducing, erasing and recording functions that any slight disarrangement of parts in either set or system of wires is readily felt in the others.

In the present type of machine also, it is impracticable to remove a partly used record wire and permit substitution of another record without coiling the entire length of wire upon one of the drums by which it is held, either by re-coiling it upon the drum from which it is fed, or by winding it up on the receiving drum, and drawing the end of the wire through the bushings and guides which retain it in place between the magnet cores. It is frequently necessary in using these instruments to substitute one record for another, so that wires which are used for dictation, for instance, may be kept distinct from those for recording telephone conversations, and so that different classes of records may be kept together in an orderly classified system. Whenever such a substitution of records is made, however, the wire is commonly withdrawn endwise as before stated, to clear it from the magnets, and a clamp placed over the coiled wire to keep it from unwinding. Then the substituted wire or the removed wire, when it is replaced, commonly has its forward loose end threaded through the recording magnet cores and the bushings and guides, and fed along to the point at which the previous record ends before it is used for taking the further records which are to be put upon it. As the wire itself carries no tallying device, there is no way to tell when the point at which renewed record taking may begin has come to the magnets, except by listening to the previous record and thus exploring the wire. All of this, the re-coiling of the removed record, threading of the substitute record through the magnets, and finding the place on this substitute record at which to resume dictation, consumes a great deal of time, and requires much patient labor, for the threading of the wire through the magnet cores, guides and bushings is itself a delicate and tedious operation.

It is the object of the present invention to overcome these and other practical defects of the telegraphone as now constructed for commercial use, by providing, first, a direct drive for feeding the wire, which does not require to be reversed in direction and is operated without relay parts or circuits, and which may be quickly removed from the telegraphone box without the slightest disturbance of, or disarrangement in, the recording or erasing or reproducing system of the instrument; second, by mounting the bobbins, drums or reels which carry the record wire upon a separate removable drum or bobbin carrier which can be readily connected to and disconnected from the body of the instrument to permit immediate substitution of one record for another, and by so arranging the recording magnets that they will permit insertion and removal of the record wire without requiring it to be withdrawn or threaded into the same endwise, and so without requiring any alteration of the position of the wire on its bob-

bins as a preliminary to its removal or use after being replaced; third, by providing a wire-tallying instrument which may be kept at a distance from the telegraphone and is actuated progressively as the record wire is fed, to indicate the proportion of the wire which remains unused and the points at which any separate records or parts of a record begin and end, so that any particular part may be found without auditorily exploring the wire; and by other improvements hereinafter described in full detail and particularly pointed out in the claims.

In the drawings which illustrate an instrument embodying the essential principles of the improvements which constitute my invention, Figure 1 represents a longitudinal section of the main portion of the instrument showing particularly the driving means for feeding the record. Fig. 2 represents a cross-section with the record holders removed. Fig. 3 represents a plan view showing the instrument with one of the record holders in place and the other removed. Fig. 4 represents a cross-section on line 4—4 of Fig. 3. Fig. 5 represents a plan view of one of the record holders detached from the instrument. Fig. 6 represents a sectional view of the same on line 6—6 of Fig. 5. Fig. 7 represents a cross-section of one of the record holders. Fig. 8 represents an elevation of one of the sets of magnets. Fig. 9 represents a sectional view of a set of magnets on an enlarged scale. Fig. 10 represents a plan of one of the magnet cores. Fig. 11 represents a fragmentary sectional elevation of part of the swiveled and pivoted holder for the recording magnets. Fig. 12 represents a diagrammatic view illustrating the electric circuits for recording and reproducing sound. Fig. 13 represents an elevation of a different arrangement of recording magnets and magnet holders. Fig. 14 represents a plan, and Fig. 15 represents a side elevation of the same. Fig. 16 represents a perspective view of one of the pole pieces for this type of magnet. Fig. 17 represents a diagram showing the electrical connections for the several parts of the instrument.

The same reference characters indicate the same parts in all the figures.

The apparatus as here embodied, comprises a central box or casing 1 in which is contained a motor 2 fastened to an end panel 3 of the casing. The motor has a vertical shaft 4 on which is a bevel gear 5 driving a gear 6 on the shaft 7. From this shaft the bobbins or reels which hold the record wire are driven in either direction through driving connections consisting of the gears 8 and 9 and the wide faced pinions 10 and 11, the latter being in mesh respectively with gears 12 and 13 mounted upon shafts 15 and 16 which are movable endwise for a purpose hereinafter explained, the extra width of the pinions 10 and 11 permitting this movement without interrupting the engagement of the gears and pinions.

The shaft 15 carries friction clutch members as cones 17 and 18 which are adapted to enter and engage complemental clutch members, such as loose drums 19 and 20, having recesses to receive said cones, and themselves bearing against frictional surfaces 21 on the faces of disks 22 and 23 and so drive the latter frictionally. The cones 17 and 18 constitute clutch members which are engaged alternately by endwise shifting of the shaft 15 with the drums 19 and 20, and thus drive either the disk 22 or 23 according as one or the other of the clutches is connected. The other shaft carries corresponding clutch cones 24 and 25 which engage drums 26 and 27 alternately and drive disks 28 and 29 through the friction surfaces 30. These disks are mounted on studs which carry disks 31 and 32 projecting through the side of the box 1 and adapted to drive the reels or bobbins on which the record wire is wound. Fig. 3 shows one pair of these bobbins in operative relation to the driving mechanism, such bobbins being represented by 33 and 34, and having connected with their shafts the disks 35 and 36 which carry facings 37 of frictional material to bear against the outer faces of the disks 31 and 32 and effect a frictional clutching engagement.

The wire drums 33 and 34 are mounted in a separate carrier or holder 38 which is removable from the body of the telegraphone and is adapted to be connected thereto in such a way that the record wire is carried from one drum to the other between the recording magnets, as will be presently described. When in place, the inner end of the carrier 38 rests upon a narrow shelf 39 of which there is one projecting from each of the wider sides of the box 1, and is held between the end flanges 40 of this shelf. It is locked in place by a bar 41 on its upper part which projects through a hole in the side of the box 1 and which has a notch 42 receiving a locking plate 43. As shown in Fig. 7, this locking plate is mounted on the inner surface of the side wall 44 of the box in such a manner that it can slide vertically through a slight distance, being held by screws 45 passing through vertical slots in the plate. There is also a hole 46 through which, when the plate is elevated, the end of the bar 41 may pass, and it is the portion of the plate above this hole which enters the notch 42 of the bar to lock the same in position. When the bobbin holder 38 is thus attached to the telegraphone casing, the record wire 47 passes between the recording magnets which are mounted on the outside of the box, one on each side thereof.

As shown in Fig. 9, a set of magnets consists of two pairs mounted in holders 48 and 49 arranged on opposite sides of the record wire. The magnets are represented by 50 51 52 53, those numbered 50 and 52 constituting one pair arranged oppositely, and 51 and 53 the other pair similarly arranged. The magnets have central pole pieces 54 of which those of each pair are approximately in line and embrace the record wire between them. The form of each pole piece is shown in detail in Fig. 10, being beveled to an edge at the end which is next the wire, and having a notch 55 to receive and partially surround the wire. By reason of this construction the poles of each pair of magnets surround the wire and produce a magnetic field of equal intensity on all sides thereof. The pole pieces are of such construction, being round bars, that they can be easily slipped out whenever this may be required, and when in place are removably held by pivoted locks 56 having fingers which embrace the end of the poles and enter grooves 57 therein. These grooves are parallel and in opposite sides of the pole, so that the fingers when embracing them, prevent the pole from rotating.

The magnet holders are carried by angular arms 58 and 59 which are pivoted to a stud 60 swivelly mounted in a sleeve 61, which in turn has a stud 62 entering a socket 63 which is fast to the outer side of the wall 44, in which socket the stud 62 is secured by a thumb-screw 64. Each magnet holder is attached to its respective arm at a single point through a screw 65, so that it can turn rotarily about the axis of the screw, and at the same time both magnet holders and the arms on which they are mounted can swivel about the vertical axis of the stud 60. Thus the magnets are enabled to adjust themselves to the varying directions in which the record wire may extend, and need not deflect it from the straight line between the devices which lay it upon the drums. For instance, as the wire is wound upon one drum and unwound from the other, it constantly travels back and forth from side to side of the drum, and lies at varying angles, as will be understood by comparing Figs. 3 and 5, and the swivel mounting of the magnets allows them to follow the angular movements of the wire.

Mounting the magnets as described upon pivoted arms 58 and 59 enables them to be widely separated to permit the ready insertion and removal of the wire from between them. In order that there may be no danger of damage being done to the wire or the magnets upon removal of a bobbin holder from the instrument, I provide means for separating the magnets before it is possible to remove the holder 38, and for retaining them separated until one of the holders is replaced upon the instrument. To do this, I attach plates 66 on the arms 58 and 59, respectively which plates project toward each other and have inclined cam surfaces which form a V-shaped opening between them. I pivot to a bracket 67 mounted on the wall 44, a lever 68 which has a stud 69 provided with a roll 70 entering the V-shaped space between the cam plates. The short arm of the lever projects through the wall 44 and engages the lower end of the locking plate 43. This lever constitutes the only means by which the locking plate may be raised to release the bobbin holder. Therefore before the bobbin holder may be removed from the instrument, the outer arm of lever 68 must be depressed. This causes the stud 69 to be carried downward and to bear against the cam plates, separating them and thereby moving the magnets apart to release the wire. By the time the locking plate is raised sufficiently to unlock the bar 41, the magnets are far enough separated to permit the wire to be readily removed, this position being illustrated in Figs. 2 and 3. As soon as the bar 41 is withdrawn, a spring 71 which has a hook at its lower end, catches under the inner arm of lever 68 and holds it in the last position. This position is retained until a bobbin holder is replaced upon the instrument, when the bar 41 passing through the hole 46 in the locking plate strikes the spring 71 and releases it from the lever 68. Thereupon a spring 72 which is connected to the cam plates, draws the magnets and cam plates together, causing the outer end of lever 68 to rise and allowing the locking plate to drop and engage the notch in bar 41. The lever projects near a handle 73 by which the record holder 38 is grasped, so that at the same time that this handle is grasped, the lever may be engaged by the thumb of the operator and depressed. Whenever the magnets are freed from the wire they are restored to a position in which their pole pieces are parallel to the transverse plane of the instrument, by means of the springs 74 mounted upon the stud 62 which embrace one of the magnet-holding arms, as 58. Rotation of the magnet holder 48 about its pivot stud 65 is resisted by a spring rod or wire 75 which passes through the cam plate 66 and has parallel legs embracing at their ends a stud 76 on the magnet holder (Fig. 8), and the holder 48 is compelled to partake of the movements of the holder 49 and be maintained in line therewith by spring rods 77 carried by the holder 49 and passing through a sleeve 78 on the holder 48. Movement of the magnets near enough to one another to press the pole pieces too firmly against the record wire is prevented by a cross bar 79 mounted so as to be vertically adjusted on a post 80, and arranged so that its ends will

be engaged by the arms 58 and 59 when the latter are drawn together by spring 72. When the magnets are brought together to inclose a wire, the latter is positioned properly with respect to the pole pieces by means of finders 82 and 83 carried at the opposite ends of the magnet holders 48 and 49, and having diverging fingers. These finders overlap one another, as shown in Fig. 7, and the crotch between the fingers ends on the line of the notches 55 in the pole pieces.

From the foregoing it will be understood that when a holder 38 carrying one of the pairs of wire-holding bobbins is connected and locked to the body of the instrument, the record wire is properly engaged with the magnets, and the bobbins engage with the disks 31 and 32 previously described frictionally, so that they can be driven to feed the wire past the magnets.

The disk 28 on the shaft of disk 31 is employed for forward driving during the recording and reproduction of the sound, and the disk 29 is used for re-winding the wire previous to reproducing a record. To diminish the time of re-winding, the drive drum 27 is placed nearer to the center of disk 29 than the drum 26 is to the center of disk 30. The drums are also arranged on opposite sides of the centers of the disks, that is, they are between the centers, so that while the drums both rotate in the same direction, the disk will be driven in opposite directions. Thus the motor is enabled to feed the wire forward and re-wind it without being itself reversed in direction, and there is no necessity for the additional circuits and relays which would have to be employed if the motor were to be reversed. A similar relation exists between the drums 19, 20, and the disks 22, 23.

For shifting the clutches and thus effecting reversal of the wire drive, I provide an endwise movable rod 85 carrying a notched shipper 86 which engages a flange 87 on the clutch cone 24. This clutch-shifting rod carries an armature 88 between two pairs of electro-magnets 89 and 90 by which it is moved. Current being supplied alternately to the electro-magnets, causes the disks 28 and 29 to be alternately connected with the motor for forward and reverse driving. I provide brakes for arresting the movement of the disks and wire-holding bobbins between the reversals thereof, and to hold them stationary as long as the clutches are not connected with either of the driving disks. These brakes consist of shoes 91 and 92 between the disks 28 and 29 which bear against the peripheries thereof and are supported by pivoted arms 93 and 94. Between the brake shoes are toggle levers 95 96 to the knuckle of which is connected the upper member of a second pair of toggle members 97 98. This toggle exerts its thrust transversely to that of the toggle 95 96 and this knuckle is connected to the clutch shipper rod 85. The arrangement is such that when the shipper is in mid-position, as shown in Fig. 4, the brakes are set, but when it is in either of its extreme positions, so as to connect either of the clutches, the toggles are broken and the brakes released. Any suitable means, such as the springs 99, bearing on opposite sides of the toggle link 98, may be employed for returning the parts to mid-position when both of the electro-magnets are deënergized. I also provide mechanical means for shifting the clutches. This consists of a bar 100 passing through the stud on which the friction wheel 26 is loosely mounted, and connected directly with the cone 24. This bar 100 passes through the end wall of the casing where it may be grasped and operated, and has a number of notches 101 in its upper edge which may be engaged by a latch 102 to hold it and the clutches in their extreme or mean positions. There is also an automatic contrivance for braking the wire bobbins when the latter are removed from the machine, and preventing the resiliency of the wire from uncoiling it. This consists of a spring plunger 103 contained in a tubular bracket 104 on the interior of the bobbin carrying frame 38, there being one for each of the bobbins, and these plungers being pressed toward the bobbins by springs 105. Each of the tubular brackets has a lateral extension 106 to which is pivoted a lever 107 passing transversely through the shank of plunger 103. The levers from the two brackets extend toward one another, and their ends are engaged by the laterally extending arms or wings 108 of a stop 109 which projects from the socket 61. This engagement is effected whenever the bobbin holder is attached to the frame of the instrument so that when in this relation, the bobbins are released and are free to turn. But as soon as the bobbin holder is removed, the brakes are applied to the bobbins and the wire held in its tightly coiled condition ready for use.

The wire is laid in regular convolutions during its winding upon the bobbins by the following mechanism: On the shaft 110 of each bobbin is a worm 111 which meshes with a worm wheel 112, the latter driving a spur gear 113 through a pinion 114. This gear carries a cam 115 which bears upon the arm 116 of a bell-crank lever, the other arm 117 of which is attached to a slide 118 which travels upon a transverse guide rod 119 and has an eye 120 (Fig. 7) to receive the wire. A spring 121 holds the arm 116 against the cam. The construction of this mechanism is most clearly shown in Fig. 5, from which it will be seen that the cam moves the wire-guiding eye outward and the spring draws it

inward, the rate of movement being such as to lay the coils of the wire closely side by side without leaving spaces between them or allowing them to over-ride. The wire-laying mechanism is all mounted upon the bobbin holder 38 so that it is removed from the telegraphone therewith and always is maintained in correct relation with the wire on the bobbins. One of the defects of the telegraphone as hitherto constructed is that in removing the bobbin from the apparatus the wire must be disengaged from the laying or guiding mechanism, and its proper reëngagement therewith can be effected only with difficulty. Consequently, in replacing a pair of bobbins in the machine, the wire-laying devices are frequently wrongly connected, and the convolutions of the wire caused to ride over each other.

The apparatus here illustrated is duplex, having two sets of sound-recording devices, of which each is the duplicate of the other, and the description hereinbefore given of one set of such devices applies correspondingly to both, similar characters of reference being applied in the drawings to both sets.

In addition to the tallying or registering device which is ordinarily connected directly to the bobbins by gearing more or less like that which actuates the wire-laying mechanism, to show what proportion of the wire has been wound upon either bobbin, it is convenient to have a tally at a distance to indicate the same thing, and also show at what points particular parts of the record may be found, such as certain letters which may have been dictated. Such a tally is shown diagrammatically in Fig. 17, and designated by 122. It is operated electro-magnetically in a separate circuit which contains the normally separated contacts 123 which are carried by the removable bobbin holder. These contacts are engaged and brought together by the cam 115 in each of its rotations, so that for each double layer of wire wound upon the bobbin, there is one actuation of the indicator of the tally.

The circuit which controls the recording magnets is illustrated diagrammatically in Fig. 12. Here there is shown a mouth-piece 124 in circuit with a battery 125 and a primary coil 126 of a transformer. A secondary coil 127 is in circuit with the windings of the recording magnets 50 and 52. When the switch 128 is closed and sound vibrations are directed into the mouth-piece 124, induced currents are sent through the windings of the magnets, causing variations in the strength of the magnetic field through which the record wire passes, and thus magnetizing the latter in varying degrees, according to the character of the sound waves. These sounds are reproduced by closing the switch 129 of another circuit, which is connected in parallel with the magnets and contains a receiver 130, the diaphragm of which is vibrated, as in a telephone, by the varying magnetic influence exerted on the magnet poles by the magnetized wire.

As illustrated in Fig. 17, the magnet circuits are distinct from the circuit 131 of the motor, and also from the circuits of the electro-magnets and the wire tally, and the circuits are also of a very simple character. All of these circuits have separated terminals which are so arranged that the circuits are broken whenever the bobbin holder is removed from the body of the instrument, but which are closed when the bobbin holder is placed in operative position. In an instrument adapted for two sets of bobbins, there are two separate talking and tallying circuits combined with a single motor, which, however, has two sets of separated terminals connected in the motor circuit in such a way that the circuit cannot be closed to drive the motor when both of the sets of record bobbins are removed, but can be so closed when either set is coupled to the instrument. In the motor circuit 131 there are connected in parallel two pairs of terminals 132 and 133, the terminals of each pair being separate from one another. The bobbin holders carry coöperating contacts, one of which is represented by 134 and the other by 135. These contacts are either in one piece or more pieces electrically connected together, so as to bridge the gap between the terminals of each pair. Thus, when the holder carrying the contact 134 is in place, the contacts 132 are connected and the motor circuit is in condition to carry a current upon closing of the switch controlled by the operator. A similar effect takes place when the bobbin holder carrying the contact 135 is in place, but when both contacts are removed, the motor cannot be operated.

Each magnet circuit terminates in contacts 136 which are separate from each other but are bridged by the complemental contacts 137 carried by the bobbin holders. Thus it is impossible to send a current through the magnets except when the bobbin holders are in place. The circuit for the tally also ends in separated terminals 138 and 139 with which are adapted to contact the terminals 140 141 of a circuit 142 carried by the bobbin holder in which are the contacts 123, which, as shown in Fig. 17, are insulated from each other and normally separated. When the bobbin holder is in place, the circuit 142 is connected with the tally circuit, and may be closed when the contacts 123 are brought together, as previously described. The character of the contacts is illustrated in Fig. 7, which shows an insulated bar 143 on which these contacts 134 137 140 141 and any others which may be employed are mounted. These are simply spring tongues which enter slots 144 in the

wall 44 of the box and bear against the springs of which the contacts 132 136 138 and 139 are made.

In Figs. 13 to 16, is illustrated a modified construction of recording magnet and holder therefor. The modification consists partly in a difference in shape of the arms which support the magnet, these arms being 158 and 159, respectively. The main difference, however, is in the construction of the pole pieces, these having lateral extensions which together form a tube 160 surrounding the record wire. The division between the pole pieces is a helicoidal surface which enables the pole pieces to overlap and entirely surround the wire.

The sound-recording instrument above described is of the utmost simplicity, and is of such a character that none of its parts or electrical circuits need interfere or affect in any way the others. The greater part of the apparatus is mechanical, and is of such a character as not readily to get out of order. Any necessary repairs, however, may be easily effected without impairing the efficiency of the other parts. The motor may be removed bodily to be repaired or have another one substituted, by simply removing the end panel 3 of the box. The arrangement of the bevel gears 5 and 6 permits this to be done readily without deranging any of the other parts. Similarly, the electromagnets may also be made accessible by removing the panel at the opposite end of the box, this panel carrying the magnets 89 and leaving the magnets 90 readily accessible.

I claim:—

1. In a telegraphone having bobbins upon which a recording element is wound, a motive mechanism comprising a motor of uniform speed and direction and means for transmitting the power of the motor to the bobbins, in combination with a panel or section of the containing box or frame, said motor and said panel being detachable together from the box and being also relatively separable.

2. In a telegraphone, the combination of a motive mechanism, forward and reverse driving appliances in connection therewith, a single lever for operating the same, recording-wire-holding bobbins, and mechanically operated brakes which may interrupt the rotation of the bobbins during the operation of said motive mechanism.

3. In a telegraphone, a motor, two wire-holding bobbins in a pair, and a separate holder in which said bobbins are mounted, said pair of bobbins constituting a separately removable unit, and said separately removable unit being removable quickly and replaceable during the operation of the motor.

4. An instrument for recording articulate sounds, comprising motive mechanism, recording magnets, a wire holder including a frame and a pair of wire carrying bobbins rotatable on said frame bodily separable from the remainder of the instrument, and mechanical driving connections between said motive mechanism and wire carrying bobbins.

5. An instrument for recording articulate sounds, comprising motive mechanism, recording magnets having pole pieces adapted to receive between them a recording wire, a wire holder bodily separable from the remainder of the instrument, and a lock preventing removal of the wire holder until the said magnets have been disengaged from the wire.

6. An instrument for recording articulate sounds, comprising motive mechanism, recording magnets having pole pieces adapted to receive between them a recording wire, and being movable apart to permit insertion and removal of the wire, a wire holder bodily separable from the remainder of the instrument, a lock for securing said holder to the body of the instrument, and a member constituting the sole means for releasing said lock, having provisions for simultaneously moving the magnets apart, whereby removal of the wire holder previous to disengagement of the wire from the magnets is made impossible.

7. In a telegraphone, the combination of motor mechanism, bobbins arranged in pairs, and mechanical driving connections between said motor mechanism and bobbins, with a device for laying wire on said bobbins in smooth rows; said laying device being in constant relation to the wire and removable from the telegraphone jointly with said wire, and without interference with the motive mechanism of the telegraphone.

8. An instrument for magnetically recording sound vibrations, comprising motive mechanism, recording magnets, a removable bobbin holder, bobbins rotatably mounted therein and containing the record wire, means for transmitting rotary motion from the motive mechanism to the bobbins when the holder is in operative relation to said mechanism, and wire-laying devices operated synchronously with the bobbins for laying the wire thereon in smooth rows, said devices being carried by the bobbin holder and maintained in correct relation with the wire.

9. An instrument for magnetically recording sound vibrations, comprising motive mechanism, recording magnets, a removable bobbin holder, bobbins rotatably mounted therein and containing the record wire, means for transmitting rotary motion from the motive mechanism to the bobbins when the holder is in operative relation to said mechanism, a wire-laying arm over each bobbin, and gearing operated by the ro-

tation of the bobbins for swinging said arms so as to lay the wire in smooth rows, said arms and gearing being mounted on the bobbin holder, whereby they remain in correct relation with the wire when the bobbins are removed from the instrument.

10. In a telegraphone, the combination of motor mechanism, bobbins in pairs, mechanically operated braking mechanism, and wire-laying devices in constant relation to said wire as wound on said bobbins, with an automatic braking device whereby said wire, when disconnected from the telegraphone, is prevented from uncoiling from its retaining bobbins through the holding power of said braking device upon said bobbins.

11. In an instrument for magnetically recording sound, a separate bobbin holder, wire-containing bobbins or reels rotatably mounted in said holder, and spring-pressed friction brakes arranged to bear against said bobbins when the holder is removed from the instrument.

12. In an instrument for magnetically recording sound, the combination with the main portion thereof, containing the motor and recording devices, of a separate bobbin holder, wire-containing bobbins or reels rotatably mounted in said holder, spring-pressed friction brakes arranged to bear against said bobbins when the holder is removed from the instrument, and means on the main portion of the instrument for releasing said brakes when the holder is in operative relation with the main portion.

13. In an instrument for magnetically recording sound, the combination with the main portion thereof having the motor and recording magnets, of a separate bobbin holder, wire-containing bobbins or reels rotatably mounted in said holder, driving disks connectible with the several bobbins for actuating them when the bobbin holder is in operative relation with the main portion, a shiftable clutch for transmitting motion exclusively to either of said disks, and a brake operable simultaneously with the shifting of said clutch to stop the rotation of the disks between engagements of the clutch.

14. In an instrument for magnetically recording sound, the combination with the main portion thereof having the motor and recording magnets, of a separate bobbin holder, wire-containing bobbins or reels rotatably mounted in said holder, driving disks connectible with the several bobbins for actuating them when the bobbin holder is in operative relation with the main portion, a shiftable clutch for making said disks active alternately in opposite directions, and brakes arranged to bear on said disks and connected with said clutch in such manner as to be engaged when the clutch is inactive, and released when the clutch is set to drive either disk.

15. In an instrument for recording sound, a main portion including a driving motor and sound recording devices, a separate carrier, a record element, a holder therefor mounted rotatively in said carrier, the latter being connectible with the main portion to place said record element in operative relation with said recording devices, and a coupling automatically connecting said rotary holder with said driving motor when the carrier is connected to the main portion.

16. In an instrument for recording sound, a main portion including a driving motor and sound recording devices, a separate carrier, a record element, a holder therefor mounted rotatively in said carrier, the latter being connectible with the main portion to place said record element in operative relation with said recording devices, reversible intermediate driving elements mounted in said main portion including shifting clutch members actuated by said motor, whereby reversal may be effected while the motor rotates constantly in the same direction, and motion-transmitting members connected respectively with said holder and driving elements, engageable with one another when the carrier is connected with the main portion.

17. In an instrument for recording sound, a main portion including a driving motor and sound recording devices, a separate carrier, a record element, a holder therefor mounted rotatively in said carrier, the latter being connectible with the main portion to place said record element in operative relation with said recording devices, reversible intermediate driving elements mounted in said main portion including shifting clutch members actuated by said motor, whereby reversal may be effected while the motor rotates constantly in the same direction, motion-transmitting members connected respectively with said holder and driving elements, engageable with one another when the carrier is connected with the main portion, and a brake mounted in the carrier arranged to engage and prevent rotation of the holder when the carrier is disconnected from the main portion and released when the carrier is connected thereto.

18. In an instrument for recording sound, a main portion including a driving motor and sound recording devices, a separate carrier, a record element, a holder therefor mounted rotatively in said carrier, the latter being connectible with the main portion to place said record element in operative relation with said recording devices, reversible intermediate driving elements mounted in said main portion including shifting clutch members actuated by said motor, whereby reversal may be effected while the

motor rotates constantly in the same direction, motion-transmitting members connected respectively with said holder and driving elements, engageable with one another when the carrier is connected with the main portion, and a brake operated simultaneously with said clutch for stopping the movement of the driving elements and holder whenever the clutch is shifted to effect reversal thereof.

19. In an instrument for recording sound, a main portion including a driving motor and sound recording devices, a separate carrier, a record element, a holder therefor mounted rotatively in said carrier, the latter being connectible with the main portion to place said record element in operative relation with said recording devices, reversible intermediate driving elements mounted in said main portion including shifting clutch members actuated by said motor, whereby reversal may be effected while the motor rotates constantly in the same direction, motion-transmitting members connected respectively with said holder and driving elements, engageable with one another when the carrier is connected with the main portion, and a brake operated simultaneously with said clutch for stopping the movement of the driving elements and record element holder whenever the clutch is out of its motion-transmitting position.

20. In a telegraphone, the combination of a constant-speed motive mechanism of uniform direction of rotation, and a braking device which operates without interrupting the rotation of the motor, with interchangeable pairs of wire-holding bobbins which may be quickly removed from said telegraphone and similarly replaced in relation thereto without interruption of said motor or said braking device.

21. In a telegraphone, the combination of separately applied and interchangeable bobbins in sets of two, each such set forming a winding and unwinding unit with its wire-laying and wire-tallying devices in permanent connection therewith and relation thereto, motive mechanism, a single member operable to throw said bobbins out of or into engagement with said motive mechanism in either forward or reverse direction, and brake shoes operable by said member to bring said bobbins to rest, during an intermediate stage between two successive engagements of the motive mechanism.

22. In an instrument for recording sound, a motor, driving clutches operated by said motor, a pair of disks arranged in one plane and connectible alternately with the motor by the shifting of said clutches so as to rotate respectively in opposite directions, brake shoes between said disks adapted to bear on their peripheries, toggle links between said shoes, adapted when in line to press the shoes against the disks, a second pair of toggle links pivoted to the knuckle of the first said links and arranged to thrust transversely to the first links, and a clutch shifter connected to the knuckle of said second pair of toggle links so arranged as to straighten the toggle when the clutch is out of engagement and to break the toggle when set to drive either disk, whereby the brakes are set when the drive is disconnected, and released when either disk is driven.

23. In an instrument for recording sound, a motor, driving clutches operated by said motor, a pair of disks arranged in one plane, friction drums bearing on the faces of the said disks on opposite sides of the centers of the latter and connectible alternately with the motor by the shifting of said clutches so as to drive the disks respectively in opposite directions, brake shoes between said disks adapted to bear on their peripheries, toggle links between said shoes adapted when in line to press the shoes against the disks, a second pair of toggle links pivoted to the knuckle of the first said links and arranged to thrust transversely to the first links, and a clutch shifter connected to the knuckle of said second pair of toggle links so arranged as to straighten the toggle when the clutch is out of engagement and to break the toggle when set to drive either disk, whereby the brakes are set when the drive is disconnected, and released when either disk is driven.

24. An instrument for recording sound, comprising a main frame, an electric motor mounted therein, sound-recording devices also mounted on said frame, a removable frame connectible with the main frame, a record element carried by said removable frame adapted to be placed in recording relation with said devices when the frames are connected, driving devices arranged to be put in connection with the motor at the same time, so as to feed said element past the recording devices, an open circuit for the motor, and a contact carried by the removable frame for closing said circuit.

25. An instrument for recording sound, comprising a main frame, an electric motor mounted therein, sound-recording devices also mounted on said frame, a removable frame connectible with the main frame, a record element carried by said removable frame adapted to be placed in recording relation with said devices when the frames are connected, driving devices arranged to be put in connection with the motor at the same time, so as to feed said element past the recording devices, contact pieces connected with different parts of the motor circuit and insulated from each other, and a bridge contact carried by the removable

frame arranged to make contact with said contact pieces and close the motor circuit when the removable frame is connected to the main frame.

26. In an instrument of the character described, a main frame, a plurality of removable frames each connectible independently with the main frame, rotatable record-element holders on the removable frames, an electric motor, connections through which said motor drives the record-element holders when the frames are operatively connected together, an electric circuit for the motor, a plurality of pairs of terminals connected in parallel in said circuit and insulated from each other, and a contact carried by each removable frame adapted to connect one pair of terminals electrically when such frame is connected to the main frame, whereby the motor circuit may be completed when either removable frame is attached to the main frame, and is broken when none of the removable frames is so attached.

27. An instrument for magnetically recording sound, comprising a body, a set of recording electro-magnets mounted thereon, a frame or carrier, and a pair of bobbins or reels mounted in said carrier and bearing a record wire, said frame or carrier being connectible to and disconnectible from said body and the wire being operatively engageable with the magnets when the carrier is so connected.

28. An instrument for magnetically recording sound, comprising a body, a set of recording electro-magnets mounted thereon having opposed pole pieces arranged to embrace a record wire and magnetize the same in varying degree according to the fluctuating strength of the magnet, a frame or carrier, and a pair of bobbins or reels mounted in said carrier and bearing a record wire, said frame or carrier being connectible to and disconnectible from said body and said magnets being separable, whereby the wire may be placed between said pole pieces while remaining undisturbed on the bobbins.

29. An instrument for magnetically recording sound, comprising a set of electro-magnets having pole pieces arranged to embrace a record wire and impart varying degrees of magnetization thereto, a pair of wire carrying bobbins on which the wire is wound and between which it extends, and holders on which the magnets are mounted with provision for movement apart so that they can be separated to permit insertion and removal of the wire in a direction transverse to its length, said holders being swiveled to permit automatic adjustment of the magnets to accommodiate the varying angles at which the wire lies in the course of its transferrence from one bobbin to the other.

30. In a telegraphone, the combination of recording magnets and a pair of bobbins, removable from the telegraphone without interruption of the motor or of the electrical circuit of said magnets, with a swiveled yoke or holder for said magnets by which said magnets are retained in proper relation to said wire when in use, and by which they may be caused to move away from said wire, said yoke having a hinge arranged to permit such movement of the magnets when the operation of removing said wire and said bobbins takes place, and by which said magnets may be restored to proper relation to said wire when the operation of replacing said bobbins and wire takes place.

31. In a telegraphone, the combination of recording magnets and a pair of bobbins, removable from the telegraphone without interruption of the motor or of the electrical circuit of said magnets, with a swiveled yoke or holder for said magnets by which said magnets are retained in proper relation to said wire when in use, and having a hinge permitting movement of the magnets away from said wire when the operation of removing said wire and said bobbins takes place, and by which said magnets may be restored to proper relation to said wire when the operation of replacing said bobbins and wire takes place; and forked wire-finding fingers attached to said yoke beside the magnets and moving with its hinged members.

32. In a telegraphone, the combination of motive mechanism, removable bobbins, said bobbins being arranged in pairs, a controlling shaft for connecting said bobbins to said motive mechanism, disconnecting them therefrom, reversing the direction of said bobbins, and applying brakes to said bobbin members at the proper time, wire-laying devices carried by said bobbins, recording magnets separate from the bobbins and removable at will from the said telegraphone with their electric terminals complete, a single fastening, and a compound electrical contact or plug switch member, said fastening and contact being respectively removable and detachable to permit such removal of said magnets.

33. An instrument for magnetically recording sound, comprising a set of electro-magnets having pole pieces arranged to embrace a record wire and impart varying degrees of magnetization thereto, pivoted holders on which the magnets are mounted so that they can be separated to permit insertion and removal of the wire in a direction transverse to its length, a separate bobbin holder, wire-carrying bobbins mounted on said holder, and capable of being placed so that the wire may extend between the poles of the magnets, and means carried by said bobbin holder whereby to separate said magnet holders and permit removal of the

wire from the magnets without altering its position on the bobbins.

34. An instrument for magnetically recording sound, comprising a set of electromagnets having pole pieces arranged to embrace a record wire and impart varying degrees of magnetization thereto, pivoted holders on which the magnets are mounted so that they can be separated to permit insertion and removal of the wire in a direction transverse to its length, plates attached to the respective holders having converging surfaces, a separate bobbin holder, wire-carrying bobbins mounted on said holder, and capable of being placed so that the wire may extend between the poles of the magnets, and a lever mounted on said bobbin holder and having a stud entering the V-shaped space between said plates, by manipulation of which the magnets may be separated and the wire inserted and removed without altering its position on the bobbins.

35. In a telegraphone, the combination of bobbins, a record element wound on said bobbins, a recording magnet past which said element is led, with a tallying indicator showing the proportion of the element wound on each bobbin, located preferably at a distance from the box and contact members carried and operated by said bobbins for electrically actuating said tallying indicator.

36. A telegraphone comprising, in combination, a motive mechanism, a holder therefor, a separate bobbin carrier, bobbins mounted rotatably on said carrier, means for detachably fastening the bobbin carrier to said holder, coöperating driving elements connected to the motive mechanism and bobbins respectively arranged to connect when the carrier is secured to the holder, whereby the bobbins are driven, an electro-magnetic sound recording device arranged adjacent to the wire wound on the bobbins for magnetizing the same, a telephone circuit in circuit with said sound recording device and having switch contacts in said holder, and a complemental contact or switch on the carrier arranged to make contact with said switch contacts and complete the circuit when the carrier is attached to the holder.

37. In an instrument of the character described, a bobbin holding frame or carrier, a pair of bobbins mounted thereon and rotatable to wind wire from one to the other, wire-laying mechanism to guide the wire progressively from end to end of the bobbins, a tallying device and coöperative contacts in the electrical circuit of said tallying device arranged to be brought into contact periodically by said wire-laying mechanism to cause registering of the length of wire used.

38. The combination, in an instrument for magnetically recording sound, of recording magnets, a record wire, a pair of bobbins or winding drums on which said wire is wound, an independent holder for said drums, means for securing said holder with the stretch of wire between the drums in operative relation with said magnets, and wire guiding mechanism for laying the convolutions of the wire in regular order on the drums, said mechanism being always in correct relation to the drums and wire.

39. The combination, in an instrument for magnetically recording sound, of recording magnets, a record wire, a pair of bobbins or winding drums on which said wire is wound, an independent holder for said drums, means for securing said holder with the stretch of wire between the drums in operative relation with said magnets, and wire guiding mechanism for laying the convolutions of the wire in regular order on the drums, said mechanism being mounted on said holder and thereby kept in correct relation to the drums and wire whether the holder is removed from or in operative relation with the instrument.

In testimony whereof I have affixed my signature, in presence of two witnesses.

JOHN C. SHERMAN.

Witnesses:

ARTHUR H. BROWN,

P. W. PEZZETTI.