No. 688,554. Patented Dec. 10, 1901.

J. F. SKIRROW.

CIRCUIT MAKING AND BREAKING DEVICE.

(Application filed Feb. 4, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

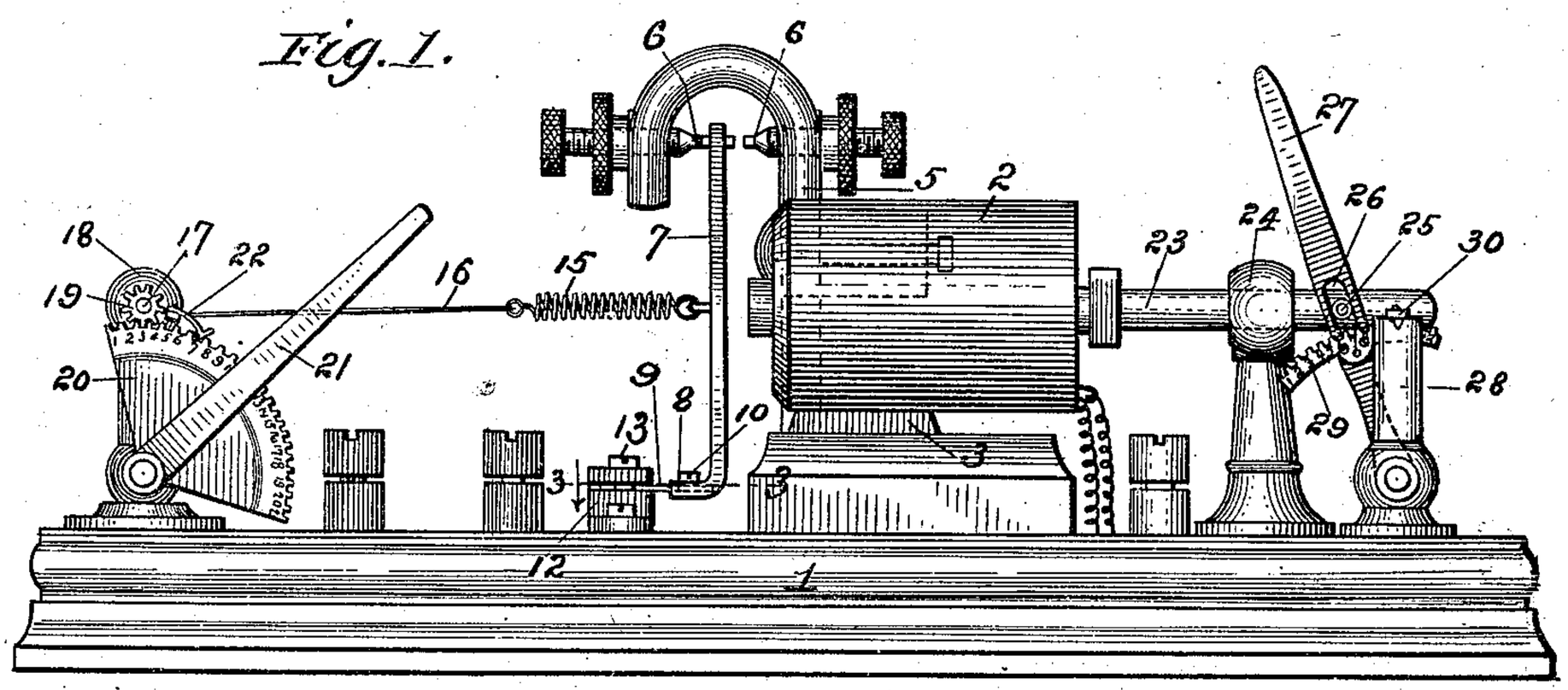

Fig. 2.

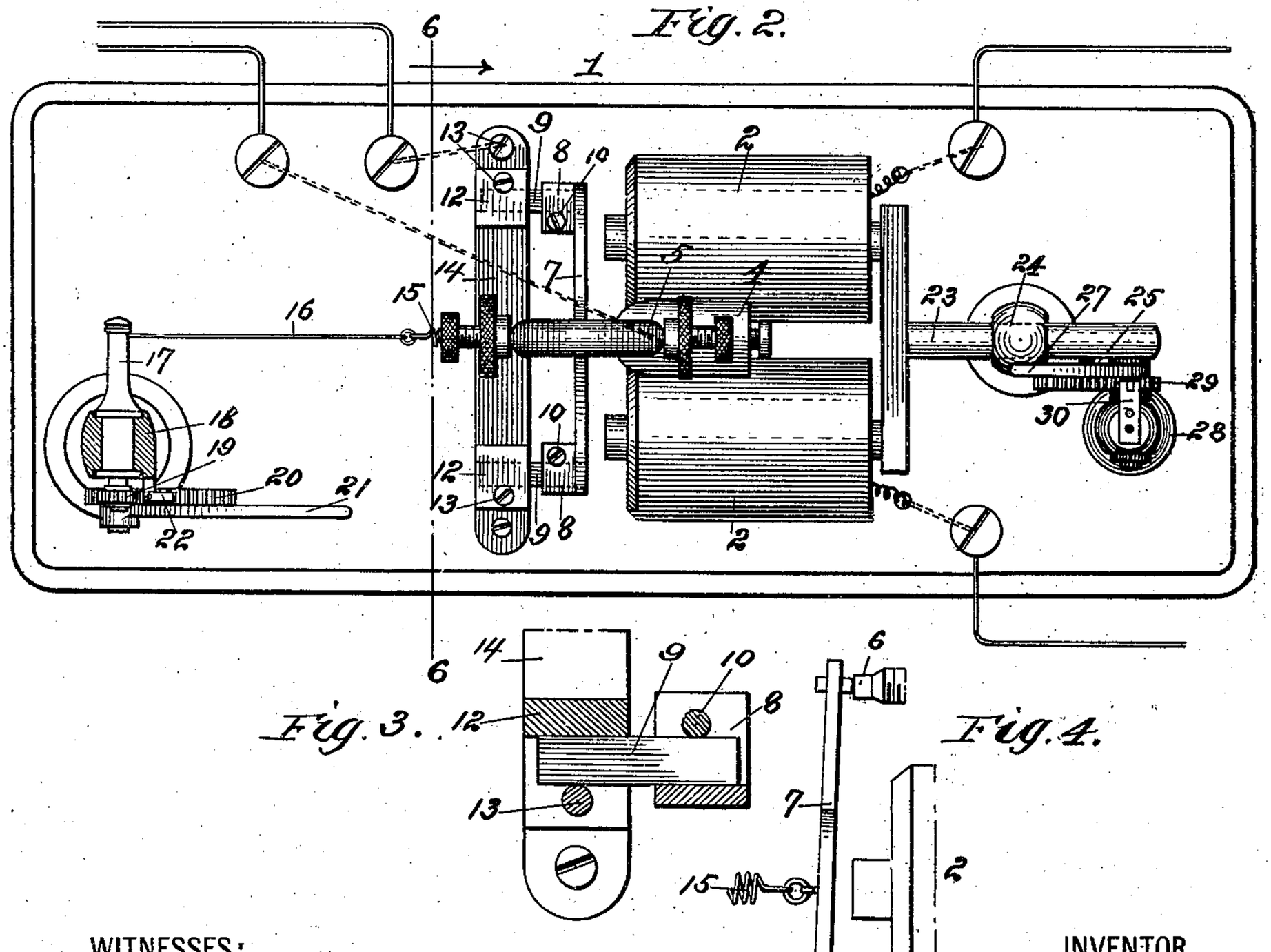

Fig. 3.

Fig. 4.

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Fig. 5.

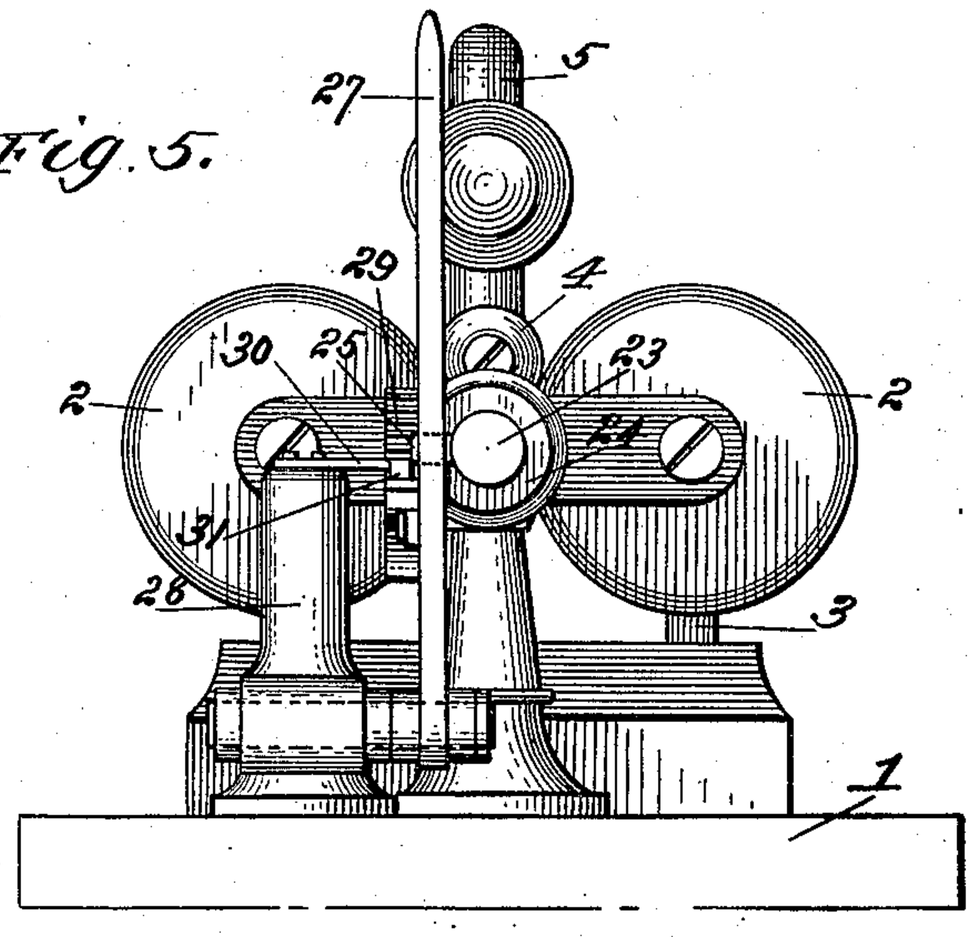


Fig. 6.

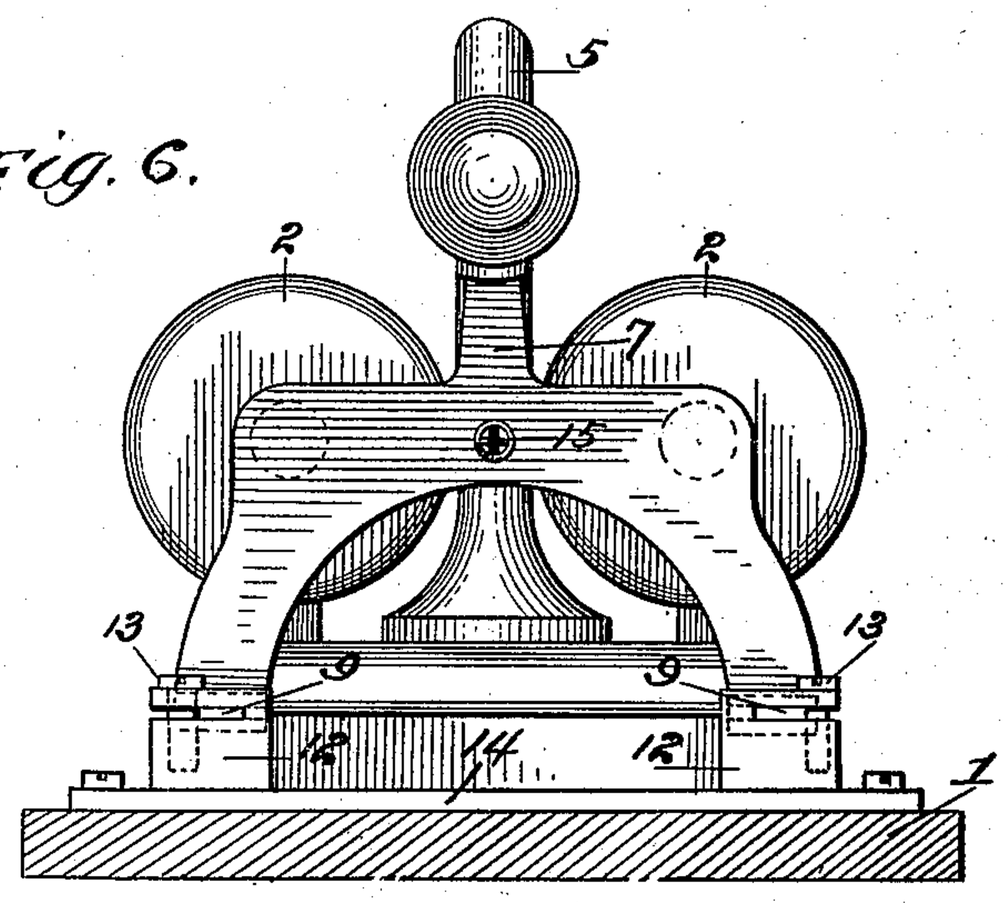


Fig. 7.

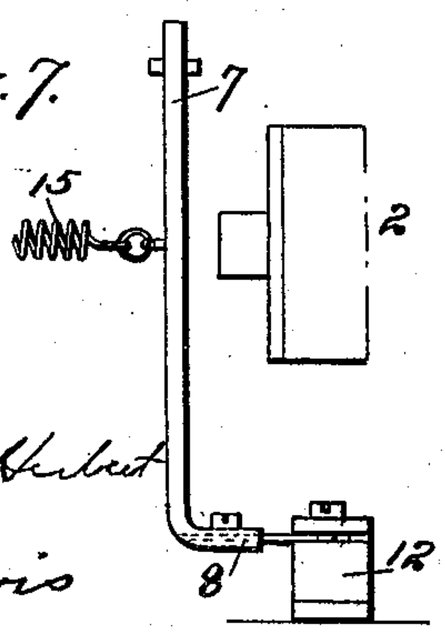
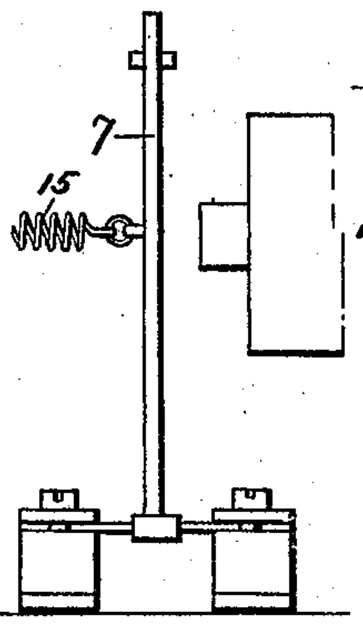


Fig. 8.



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JOHN F. SKIRROW, OF EAST ORANGE, NEW JERSEY.

CIRCUIT MAKING AND BREAKING DEVICE.

SPECIFICATION forming part of Letters Patent No. 688,554, dated December 10, 1901.

Application filed February 4, 1901. Serial No. 45,927. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. SKIRROW, a citizen of the United States, residing at East Orange, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Circuit Making and Breaking Devices, of which the following is a specification, reference being had therein to the accompanying drawings, in which—

Figure 1 is a side elevation showing the invention applied to a relay; Fig. 2, a plan view thereof; Fig. 3, a detail horizontal sectional view on line 3 3 of Fig. 1; Fig. 4, a detail showing the position of the armature when it is attracted by the magnet; Fig. 5, a rear elevation of the relay; Fig. 6, a transverse sectional view on the line 6 6 of Fig. 2, and Figs. 7 and 8 detail views showing modified forms of the means for supporting the armature.

This invention relates to new and useful improvements in circuit making and breaking devices, and is particularly designed for use in telegraph relays and transmitters and other electric signaling devices; and it has for its object to increase the efficiency of such devices by providing improved means for supporting the armature and by providing means for the quick adjustment of the tension on the armature and for the rapid adjustment of the magnet toward or from the armature.

In relays and transmitters and other delicate electric signaling instruments wherein an armature forms one terminal of a circuit and is mounted on trunnions to enable it to readily swing toward a magnet it is necessary to provide an extra contact or electrical connection between the base of the trunnion-support and the armature to permit the current to flow to the armature without passing through the trunnions. This extra contact is a source of great trouble, as it must be extremely light or it will to too great an extent retard the movement of the armature, and being very delicate it is frequently broken or detached at one of its ends, which results in all the current going through the trunnions. It is well known that in sending signals through telegraph instruments all the contacts must be perfect in order to secure clear-cut well-defined signals. As the armature vibrates at a high rate of speed while the current is passing through it, it will be readily understood that there cannot be a perfect contact in the trunnions without clamping them so tightly as to prevent rapid operation, and consequently when the current flows through them there is a "rattling" or "shivering" of the instrument, which results in ragged and uneven signals and frequently puts the instrument out of use. Any defect in this extra contact which increases its resistance will send a part of the current through the trunnions and will result in this uneven signaling. Another great defect in these trunnion-mounted armatures is the binding of the armature-bearings. When the device is used as a transmitter and a heavy current is employed and for any cause these bearings are stiff and the armature does not quickly respond to the influence of the magnet and the upper end of the armature moves slowly between the contact-points, the current will arc across between the points, heating the trunnions and burning out and practically destroying the instrument. To prevent this arcing, the armature must move quickly and make and break contacts sharply. Dirt and dust will accumulate in the trunnions sufficiently to stiffen up the action of the armature and cause the current to arc. Another frequent cause of the binding of the trunnions is the shrinking and warping of the wood base on which the trunnions are mounted. When this wood base shrinks or warps, the trunnions are thrown out of position, and being very delicate mountings they are by this means thrown out of line sufficiently to cause them to work hard. Another frequent cause of poor and uneven signals is the wabbling of the armature caused by the bearings wearing sufficiently to badly fit their supports.

In this invention the trunnions are dispensed with, and consequently the extra connection around the trunnions is not necessary, and the armature is so mounted that its movement is not affected by the warping of its base or by any ordinary accumulation of dust.

Referring to the various parts by numerals, 1 designates the base of the relay, on which is slidably mounted in any suitable manner the magnet 2. As shown in the drawings, the casings of the poles of the magnet rest on

the bars 3 at their forward ends and are held down on said bars by the vertically-adjustable block 4, which is mounted on a post 5 and secured thereto in its various positions by a screw which bears at its inner end against the post. This post is mounted on the base between the poles of the magnet and at the forward ends thereof. The upper end of this post is curved over forward and carries the usual adjustable stops 6, between which the upper end of the armature 7 vibrates. The armature is formed at its lower outer ends with forward-projecting horizontal feet 8, which are slotted horizontally at their inner edges to form the clamping-jaws, as shown clearly in Fig. 3. Fitting in these slots between the jaws are thin spring-metal armature-supporting strips 9, which are held in said slots by screws 10, which pass down through the clamping-jaws on the inner sides of the strips 9. As these strips bear at their outer edges against the end walls of the slots and at their inner edges against the screws, it will be seen that it is impossible for them to be displaced laterally by accident. The screws 10 draw the two jaws together and cause them to grip the strips 9 and hold said strips rigidly against endwise movement. These strips project forward from the feet 8, perpendicular to the armature and parallel with the line of movement of the armature, and their rear ends are securely clamped in slots formed in posts 12, mounted on the base just forward of the feet 8. These posts are slotted horizontally at their outer edges to form the clamping-jaws, which are clamped down on the strips by means of the vertical screws 13, threaded through the jaws at the outer edges of the strips, thereby preventing the lateral displacement of the strips from the slots. The forward ends of the feet 8 are a very short distance from the rear face of the posts 12, so that the spaces between them through which the strips extend unsupported are quite small. This flexible spring-strip may be formed of any suitable material and may be securely clamped to the armature and the posts 12 by any suitable means. It is desirable, however, that the clamping means be such that the strips may be readily removed and new ones secured in place whenever the old ones become worn or broken. Instead of the feet 8 extending forward, as shown in Fig. 1, they may extend rearward, as shown in Fig. 7, and the strips extend rearward therefrom to posts 12, or, if desired, the strips may be extended on both the forward and rearward sides of the armature, as shown in Fig. 8, and a set of posts 12 provided for each end of the strips, in both of which forms the strips are perpendicular to the armature and parallel with the line of movement of it. It will be noted that the longitudinal edges of the strip are parallel with the axial line of the magnet-cores. When the current is sent through the magnet, the armature will be drawn rearward until the contact carried at the upper end thereof strikes against one of the contacts 6, carried by the yoke. This movement of the armature is permitted by the slight downward bending of the strips 9, as shown in Fig. 4. When the current is broken, the strips 9 return to their normal horizontal positions. The pull of the magnet on the armature is brought longitudinally on the supporting-strips, and when the strips are arranged as shown in Fig. 1 this pull tends to draw out said strips and, the armature being free at its upper end, bends said strips downward slightly until the stop or contact at the upper end of the armature strikes a contact-point on the yoke. When the strips are arranged as shown in Fig. 7, the pull of the magnet tends to buckle them. It will be noted that the pull on the armature exerted by the tension-spring is also brought longitudinally on the edges of the strips 9 and tends to compress or buckle them transversely when the strips are arranged as shown in Fig. 1. As the spaces between the feet 8 and the posts 12 through which the strips extend unsupported are very narrow, it will be seen that the strips will not buckle except under a severe strain, a much greater strain being required than could possibly be exerted by the tension device or the magnet of a telegraph-relay. When the strips are arranged as shown in Fig. 7, the strain of the tension tends to stretch the strips and keep them flat. By means of these armature-supporting strips, which are firmly clamped to the armature and to the posts 12, good metallic contacts are formed between the armature and the posts 12, through which the local circuit will readily flow without causing any sparking or heating of the armature-supports, the current flowing from the posts through the strips to the armature or in the reverse direction as easily and with practically as little resistance as in flowing through a solid bar. By forming the armature with the feet 8 and clamping the strips in horizontal slots formed therein a broad contact is secured between the strips and the armature and all extra contacts between the armature and its supports avoided. The spring-metal supporting-strips may be formed of phosphor-bronze, steel, or brass or other suitable material.

As shown in the drawings, the posts are connected by a base-plate 14, which is screwed to the base 1 and to which the electrical connection is made. It is obvious, however, that these posts may be independent and the current be sent through either one or both of them, as desired.

It will be noted that as the armature is drawn toward the magnet the supporting-springs will be bent slightly, either downward or upward, depending on whether they are arranged to extend forward or rearward from the armature, and that when the armature is released these springs return to their normal position, thereby causing the armature to

have a slight movement perpendicular to the axis of the magnet or across the magnetic field. The result of this bodily movement of the armature is to cause the contacts to rub or wipe against each other. The advantage of this wiping action of the contacts is that it keeps them clean and bright and prevents the accumulation of carbon thereon, thereby insuring clear signals. Another advantage of mounting the armature on these supporting-strips is that these springs take up the jar of the contacts and prevent any rebound of the upper end of the armature and avoids the necessity of mounting one of the contacts directly on a spring.

Secured to the center of the forward side of the armature is an elastic device 15, preferably a light coil-spring, to the forward end of which is fastened one end of a thread 16, the other end of said thread being passed under the inner end of a horizontal transverse shaft 17 and then secured thereto. This shaft is journaled in a post 18, and on its outer end is mounted a small pinion 19, and meshing with this pinion is a segmental rack 20, which is pivoted on the post 18 directly below the transverse shaft. Secured to the pivot of this segmental rack is an upward-extending shift-lever 21, and secured to the post 18 is a rearward-extending spring-detent 22, which engages the teeth of the segmental rack and holds said rack in any of its set positions against accidental displacement. It will thus be seen that by swinging the lever forward the shaft 18 will be rotated in the proper direction to wind the thread thereon, and thereby extend the coil-spring and increase the tension on the armature, and that by swinging the lever rearward the shaft is rotated in the proper direction to unwind the thread from the shaft, and thereby release the spring and decrease the tension on the armature. It will be noted that the thread is wound on the shaft in such a manner that the forward movement of the lever extends the spring forward, the movement of the lever and of the spring being in the same direction, and that the rearward movement of the lever releases the spring and permits it to contract or move rearward, the movement of the lever and the spring in this latter case being also in the same direction. It is obvious that this method of increasing or decreasing the tension on the armature is very advantageous, as the movement of the adjusting-lever is always in the direction in which it is desired to move the tension-spring, so that the operator instinctively knows in which direction to move the lever. It is also obvious that by the mechanism shown the tension may be very quickly increased or diminished. The spaces between the teeth of the segmental rack are numbered to form a scale-bar, so that the space in which the spring-detent rests when the instrument is adjusted for the normal working condition of the circuit in which it is placed may be noted and the instrument readily returned to this normal tension after the tension has been increased or diminished for any purpose.

Extending rearward from the middle of the cross-bar of the magnet is a horizontal rod 23, which passes through the standard 24 and carries near its rear end a lateral-extending pin 25. On this pin is mounted an antifriction-roller which works in a slot 26, formed in a vertical shift-lever 27, which is pivoted at its lower end in the standard 28 and carries a segmental rack 29 near the lower end of the slot 26. On top of the standard 28 is secured an inward-extending spring-arm 30, which is provided at its inner end with a downward-extending detent 31, which engages between the teeth of the rack 29 and yieldingly holds the lever 27 in its adjusted positions. It will thus be readily seen that the magnet may be quickly moved toward or from the armature by swinging the lever 27 on its pivot, and the detent 30 will serve to maintain the magnet in its various positions. The spaces between the teeth of the rack 29 are numbered to form a scale-bar, so that the space engaged by the detent when the magnet is in its normal working position may be noted and the magnet readily returned to its normal position after it has been moved toward or from the magnet for any purpose.

Instead of employing the racks and the spring-detent for holding the shift-levers in their adjusted positions any suitable devices may be employed for that purpose.

While I have shown and described the invention as applied to a telegraph-relay, it is obvious that it may be applied to other electric signaling and telegraph instruments which contain electrically-operated means for making and breaking circuits or work on substantially the same principles, and I do not wish to limit myself to one application of the invention.

Having thus described my invention, what I claim is—

1. In an electric signaling instrument, the combination, of an electromagnet, an armature therefor, a supporting-strip connected at its inner end to the armature and extending perpendicularly therefrom and substantially parallel with the line of movement of the armature, a variable tension connected to the armature, and means for supporting the outer end of the supporting-strip.

2. In an electric signaling instrument, the combination, of an electromagnet, an armature therefor, a supporting-strip connected at one of its ends to the armature and extending therefrom substantially parallel with the line of movement of the armature two edges of said strip being parallel with the axial lines of the magnet-cores.

3. In an electric signaling instrument the combination of an electromagnet, an armature therefor, a spring supporting-strip connected at one of its ends to the armature and extending therefrom substantially parallel with the line of movement of the armature,

whereby as the armature is drawn toward the magnet the supporting-strip will permit it to have a slight bodily movement across the field of the magnet, substantially as described.

4. In an electric signaling instrument, the combination of an electromagnet, an armature therefor, a tension device connected to the armature, and a spring-strip connected to the armature and extending perpendicularly therefrom and substantially parallel with the line of movement of the armature, a support, and means for securing the strip thereto, whereby the strain of the tension and of the magnet will be brought edgewise on the spring supporting-strip, substantially as described.

5. In an electric signaling instrument, the combination of an electromagnet, an armature therefor, a tension device connected to the armature and extending forward therefrom, and a horizontal spring supporting-strip connected to one edge of the armature and extending perpendicularly therefrom substantially parallel with the line of movement of the armature, a support, means for securing the strip thereto, whereby the strain on the armature will be brought edgewise on the supporting-strip substantially as described.

6. In an electric signaling instrument, the combination of an electromagnet, an armature therefor, a tension device connected thereto, a spring supporting-strip removably clamped to the armature and extending perpendicularly therefrom and substantially parallel with the line of strain of the magnet and of the tension device, the longitudinal edges of the strip being parallel with the axial line of the magnet, a support, and means for removably clamping the supporting-strip thereto, substantially as described.

7. In an electric signaling instrument, the combination of an electromagnet, an armature therefor, a tension device connected to said armature and extending forward therefrom, a foot formed on one edge of the armature, a spring supporting-strip clamped to said foot perpendicular to the armature and extending substantially parallel with the line of movement of the armature, and means for supporting said strip, whereby the strain of the tension and of the magnet will be brought edgewise on the supporting-strip, substantially as described.

8. In an electric signaling instrument, the combination of an electromagnet, an armature therefor formed at its lower edge with forward-extending horizontal feet, horizontal flexible supporting-strips secured to these feet and extending longitudinally of the instrument, and means connected to the strips for supporting them.

9. In an electric signaling instrument, the combination of an electromagnet, an armature therefor, a tension device connected thereto and extending forward therefrom, horizontal feet formed on the lower edge of the armature, said feet being horizontally slotted at their inner edges, a supporting-strip clamped in said slots and extending therefrom in a line substantially parallel with the line of strain of the magnet, and posts formed with horizontal slots in their outer edges to receive the supporting-strips, and means for clamping the supporting-strips therein.

10. In an electric signaling instrument, the combination of an electromagnet, an armature therefor, a tension device connected thereto and extending forward therefrom, horizontal feet formed on the lower edge of the armature, said feet being horizontally slotted at their inner edges, supporting-strips fitting in said slots and extending substantially parallel with the line of strain of the magnet, a clamping-screw in each foot at the inner edge thereof and preventing lateral movement of the supporting-strip, posts formed with horizontal slots in their outer edges to receive the supporting-strips, and clamp-screws in the outer edges of the posts and bearing against the outer edges of the supporting-strips to prevent lateral movement thereof.

11. The combination of an electromagnet, an armature therefor, means for supporting said armature, an elastic device connected to the armature, a pivoted shift-lever, means connected to said shift-lever and to the elastic device, whereby the tension on the armature may be varied by moving the shift-lever and means for yieldingly holding the shift-lever, whereby it may be quickly moved in either direction to vary the tension.

12. The combination of an electromagnet, an armature therefor, an elastic device connected to said armature, a pivoted shift-lever, a spring-detent for holding the shift-lever in position and permitting it to be moved in either direction, means connecting said shift-lever to the elastic device, a scale and an indicating-point, one of said parts being carried by the shift-lever, substantially as described and for the purpose set forth.

13. The combination of an electromagnet, armature therefor, means for supporting said armature, a tension device connected to said armature and extending forward therefrom and consisting of an elastic device connected to the armature, a rotatable shaft, means for supporting said shaft, a pinion on the outer end of said shaft, a pivoted lever, a segmental rack carried by said lever and engaging the pinion on the shaft, and a thread connected to the shaft and adapted to be wound thereon and connected to the elastic device carried by the armature.

14. The combination of an electromagnet, an armature therefor, means for supporting armature, a tension device connected to said armature and extending forward therefrom and consisting of an elastic device connected to the armature, a rotatable shaft, means for supporting said shaft, a pinion on the outer end of said shaft, a pivoted lever, a segmental rack carried by said lever and engaging the

pinion on the shaft, and a spring-detent secured to the shaft-support and adapted to engage the teeth of the rack to hold the rack in its adjusted positions, and a thread adapted to be wound on this shaft and connected to the elastic device carried by the armature.

15. The combination of a slidably-mounted electromagnet, an armature therefor, a pivoted shift-lever, means connecting the lever to the magnet whereby a movement of the lever will move the magnet in the same direction, and means for yieldingly holding the shift-lever in its adjusted positions.

16. The combination of a slidably-mounted electromagnet, a shift-lever pivoted at its lower end, means connecting the shift-lever to the magnet, a segmental rack carried by the shift-lever, and means engaging said segmental rack to hold the lever and the magnet in their adjusted positions.

17. The combination of a slidably-mounted electromagnet, a rearward-extending horizontal rod connected thereto and provided with a lateral pin near its rear end, a guide for said rod, a pivoted shift-lever formed with a slot adapted to receive said pin, a segmental rack carried by said shift-lever, and a device engaging said rack to hold the shift-lever in its adjusted positions.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 1st day of February, 1901.

JOHN F. SKIRROW.

Witnesses:
WM. R. DAVIS.
JOHN G. PEARSE.