No. 810,912. PATENTED JAN. 30, 1906.

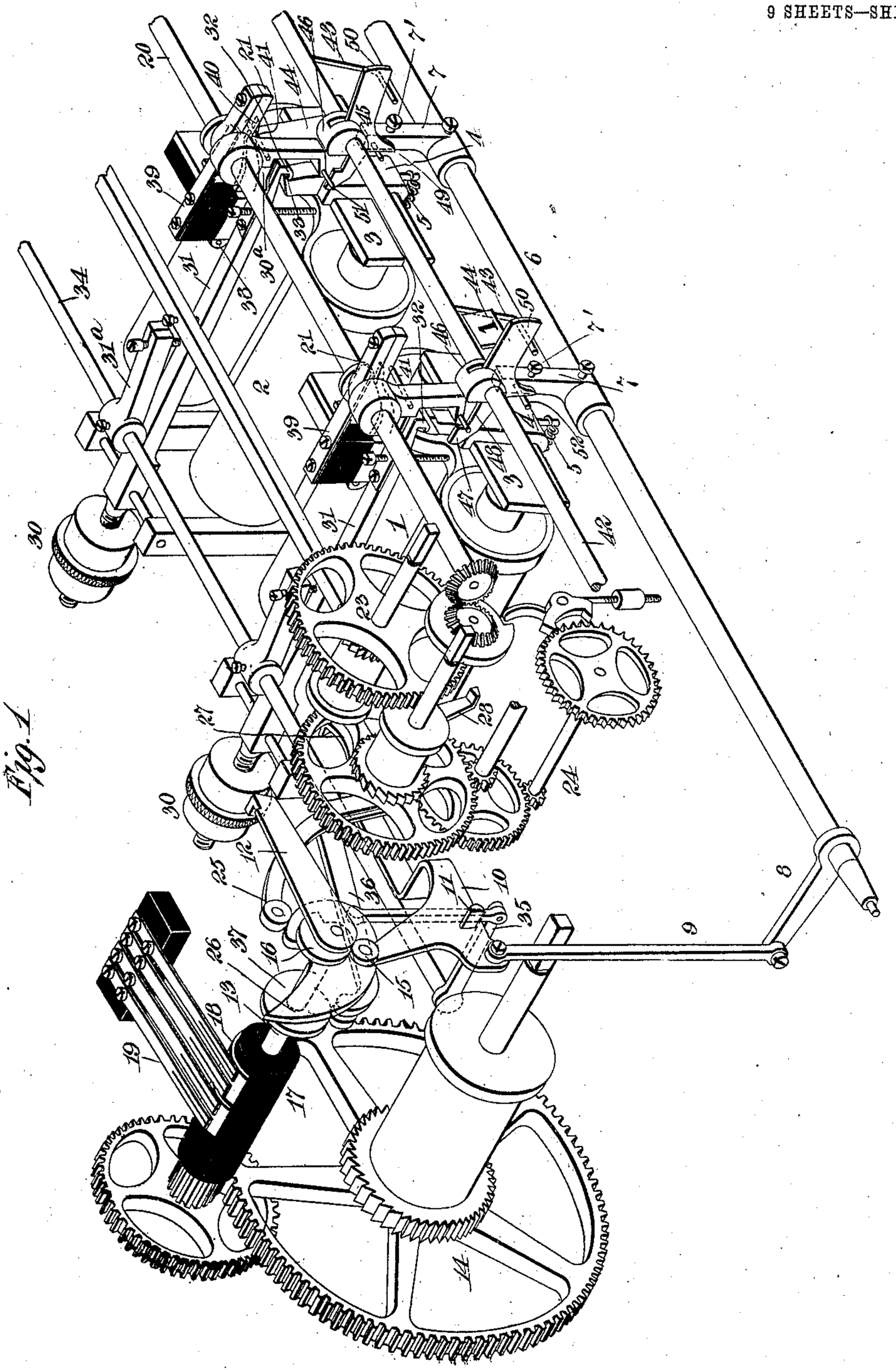
F. W. COLE.

AUTOMATIC NON-INTERFERING REPEATER FOR FIRE ALARM CIRCUITS.

APPLICATION FILED JAN. 31, 1905.

9 SHEETS—SHEET 1.

Fig. 1.



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9 SHEETS—SHEET 2.

Fig. 2

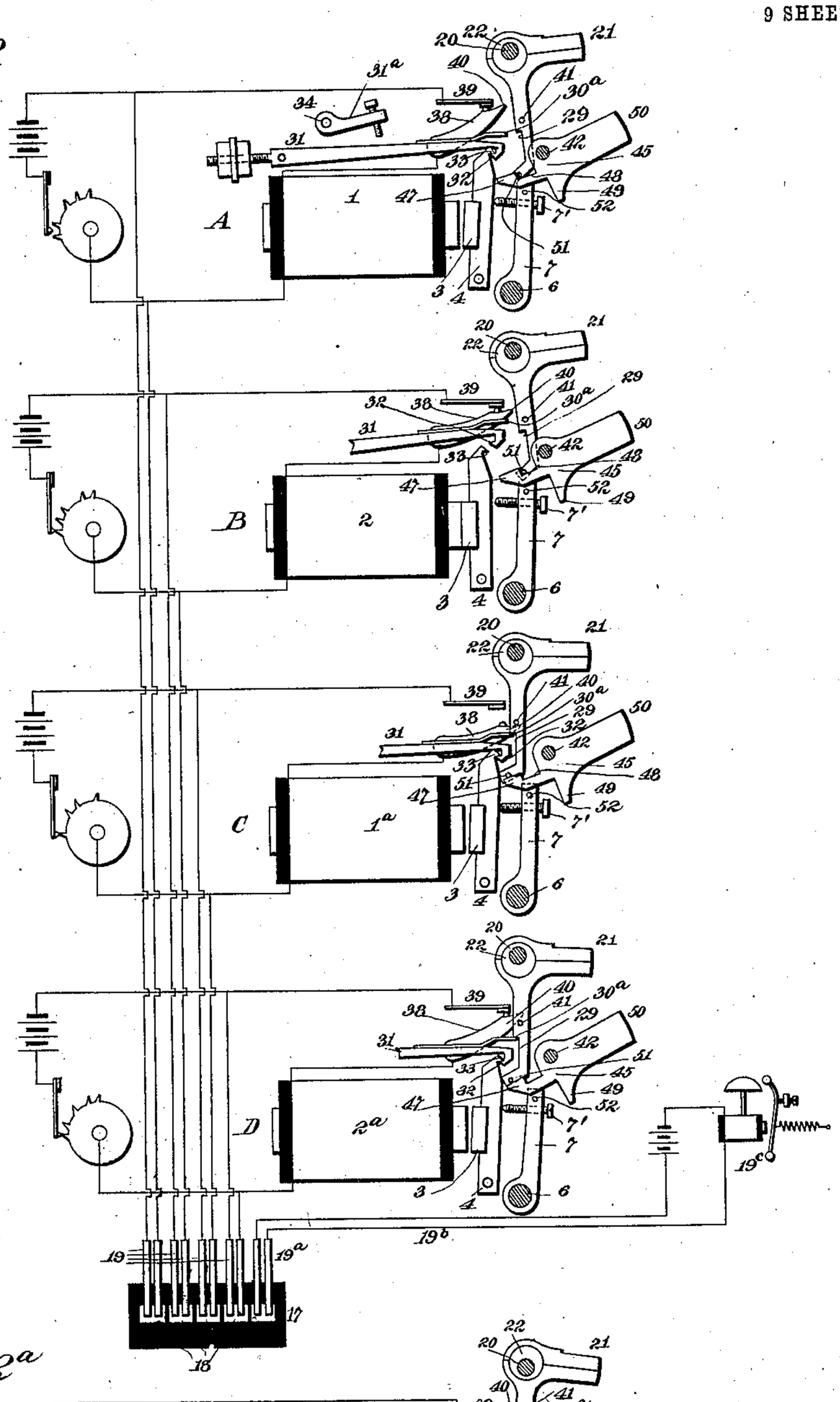
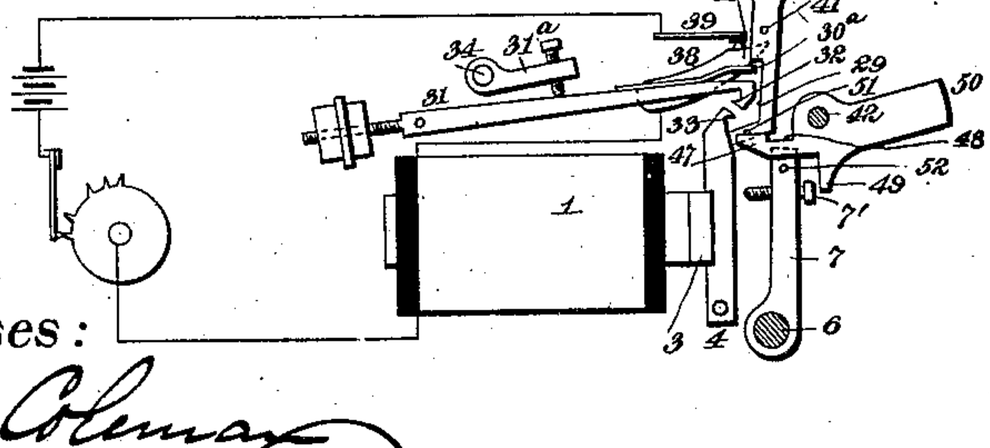


Fig. 2a



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9 SHEETS—SHEET 3.

Fig. 5

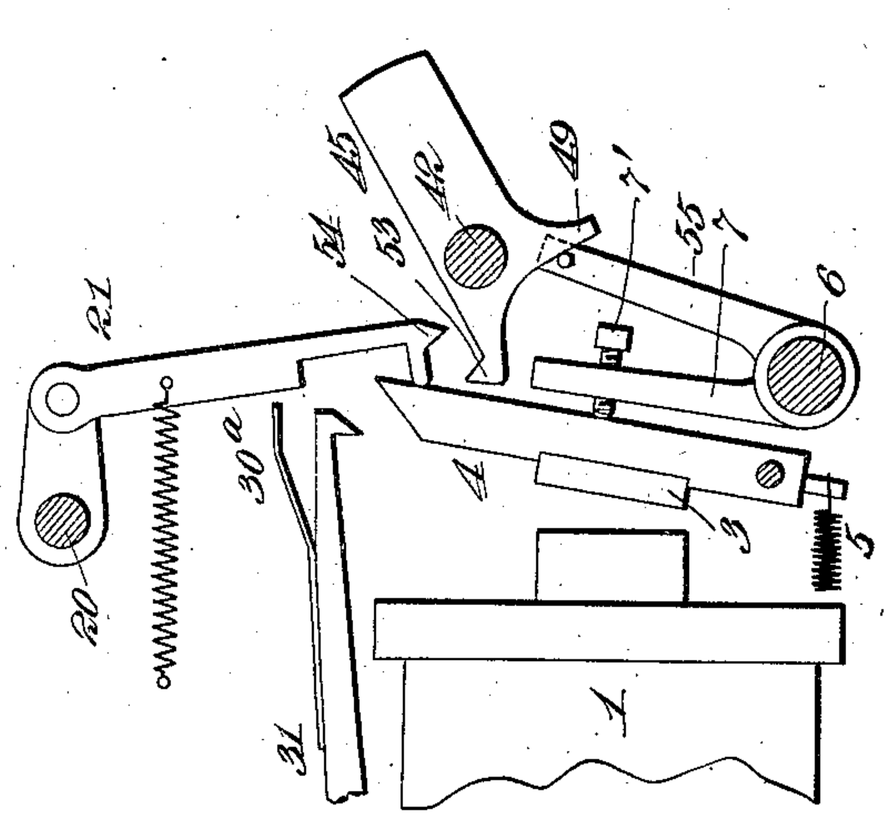


Fig. 4

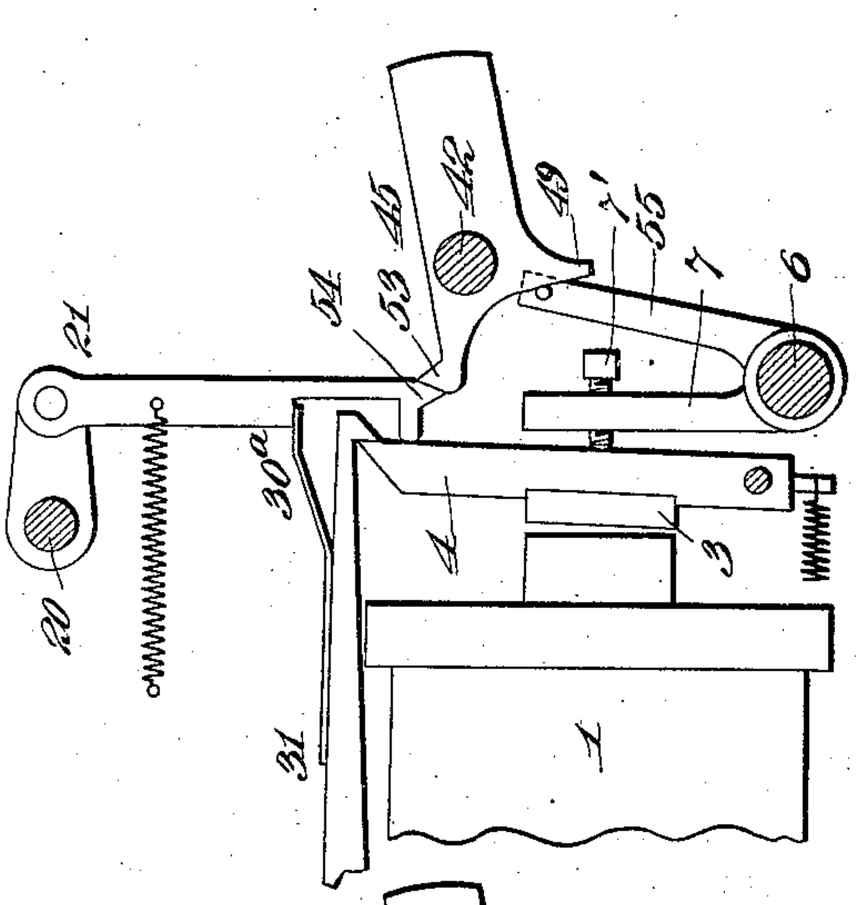
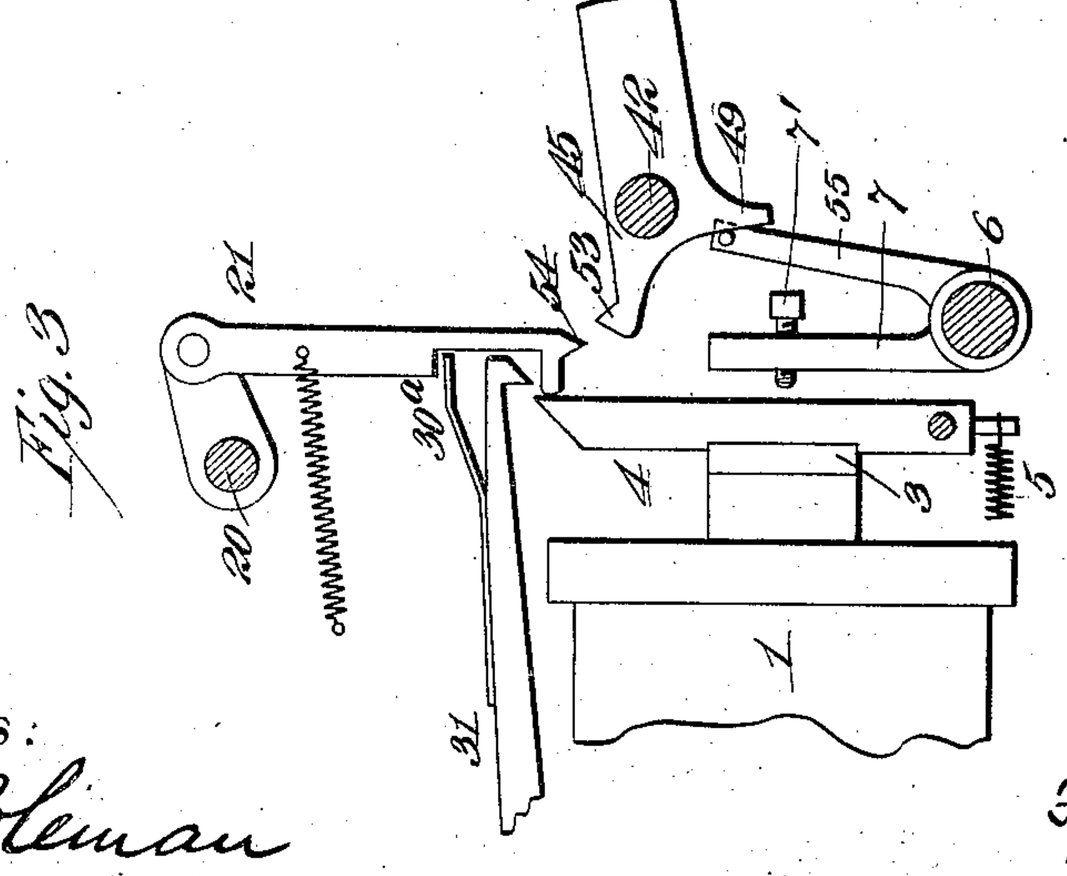


Fig. 3



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9 SHEETS—SHEET 4.

Fig. 8

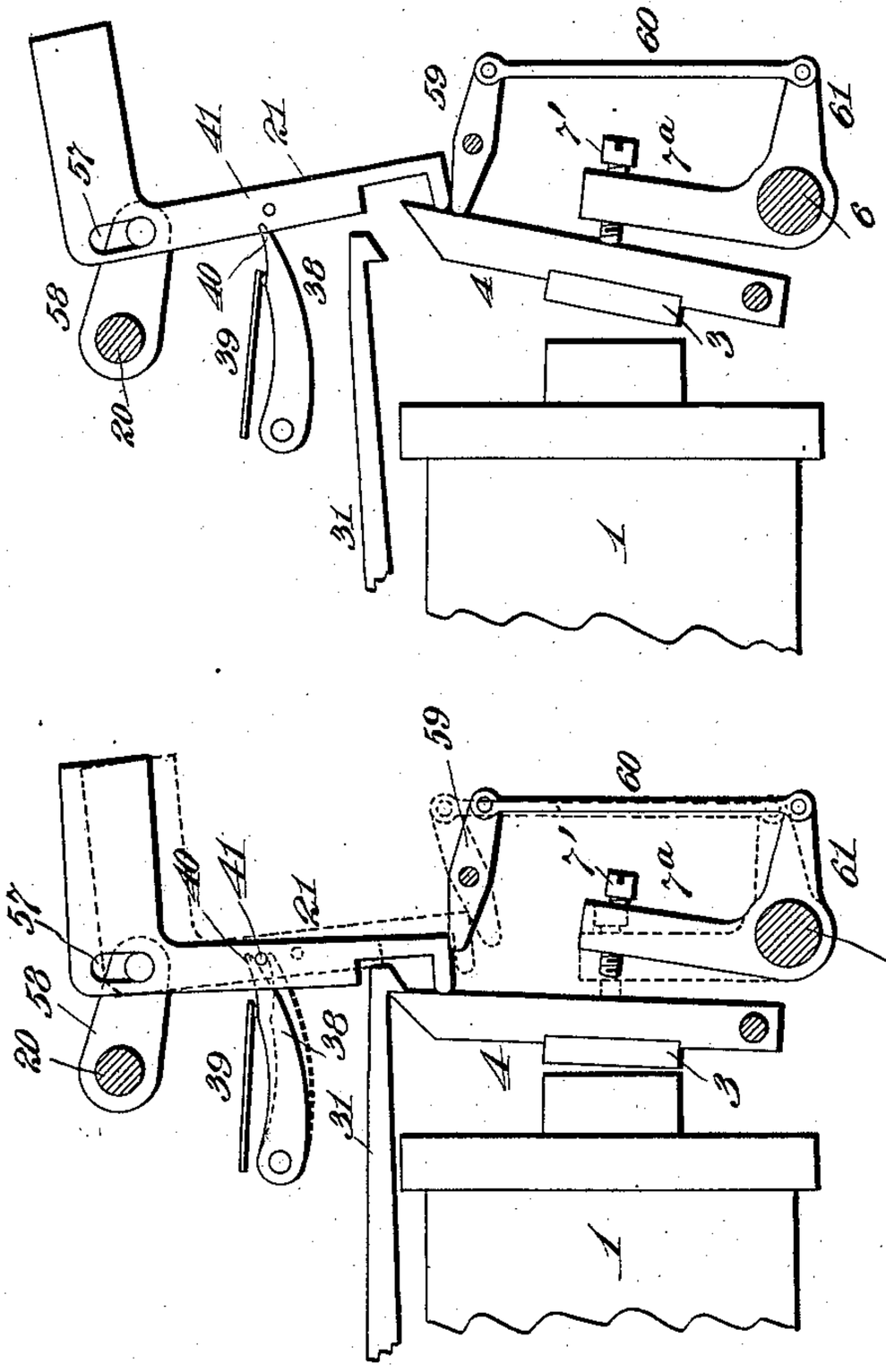
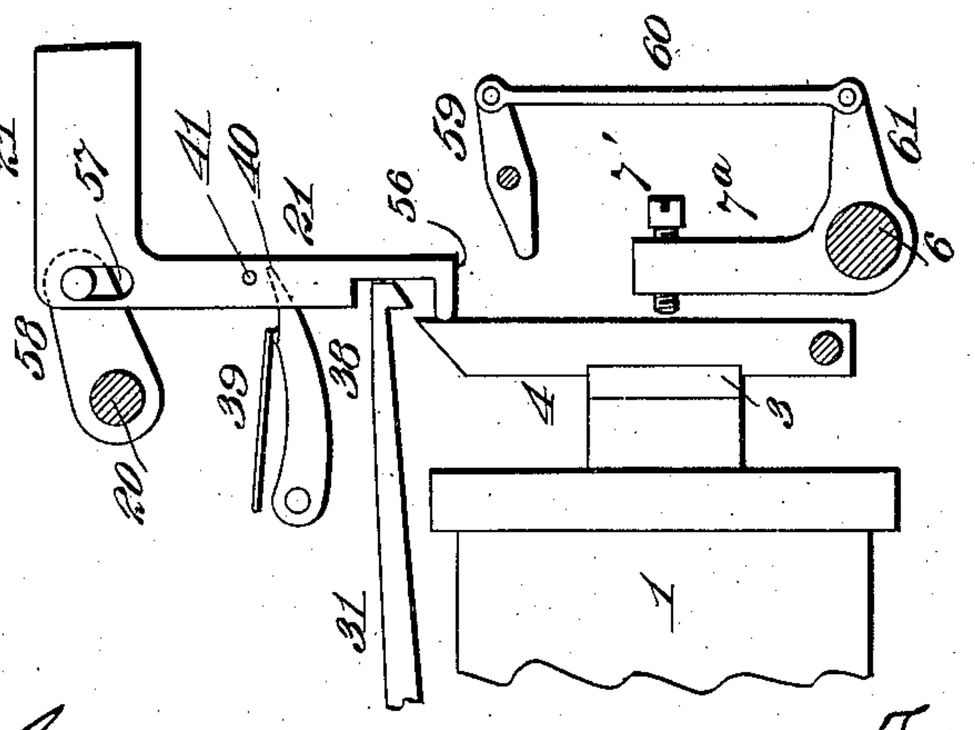


Fig. 7

Fig. 6



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9 SHEETS—SHEET 5.

Fig. 11

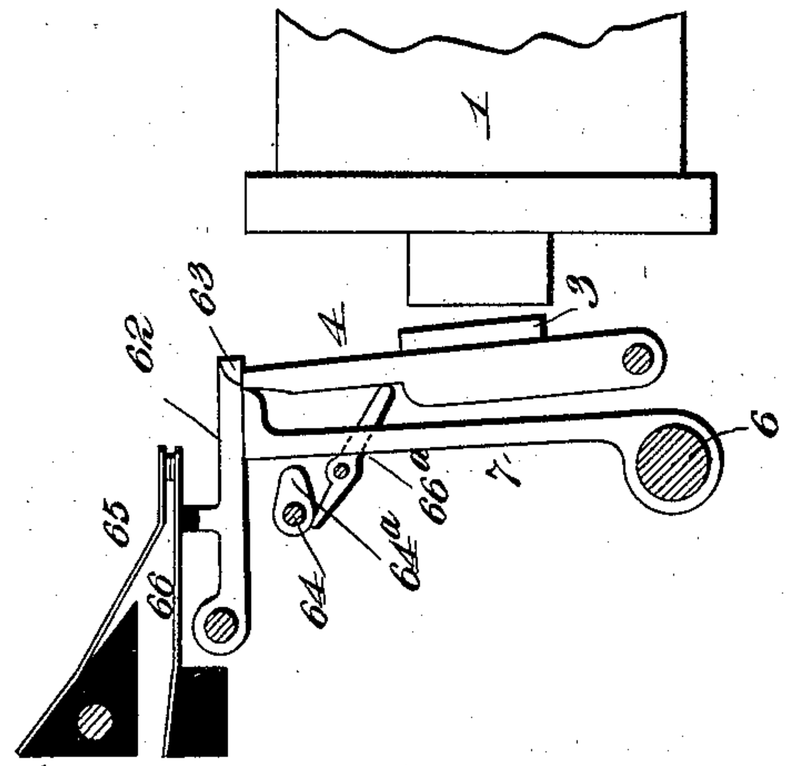
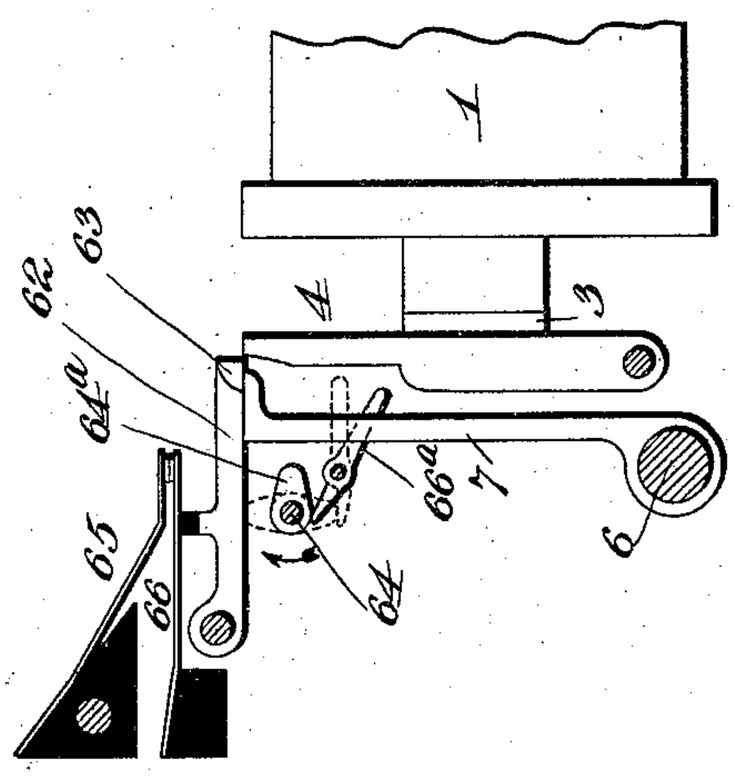


Fig. 10

Fig. 9



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9 SHEETS—SHEET 6.

Fig. 4.

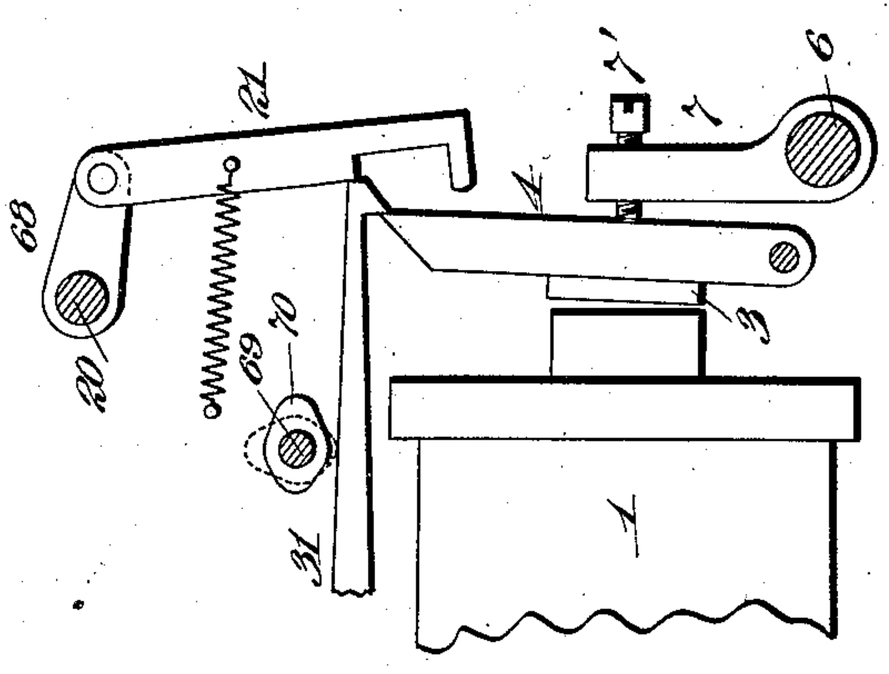


Fig. 4a.

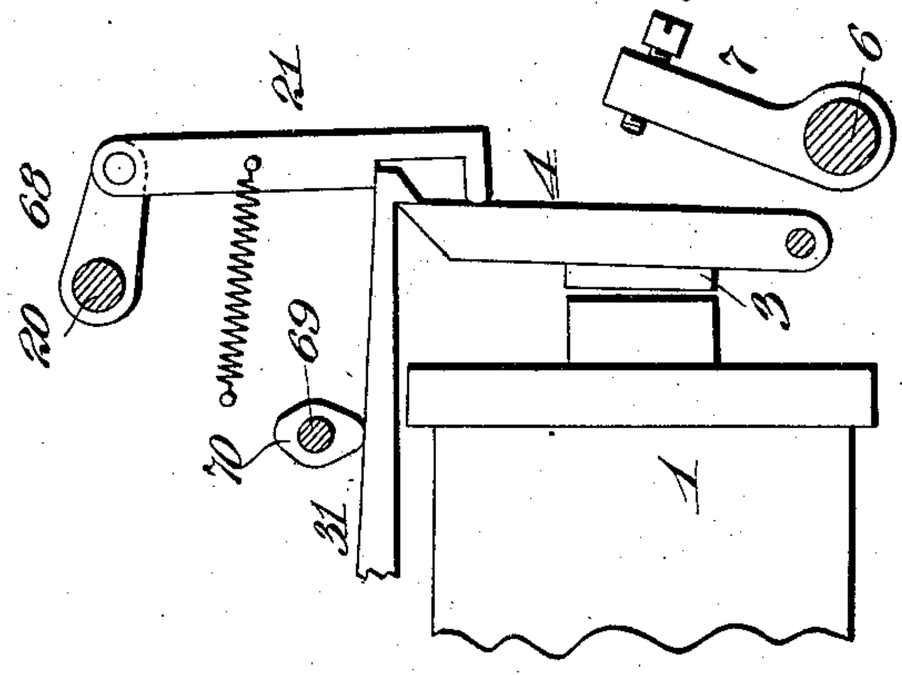
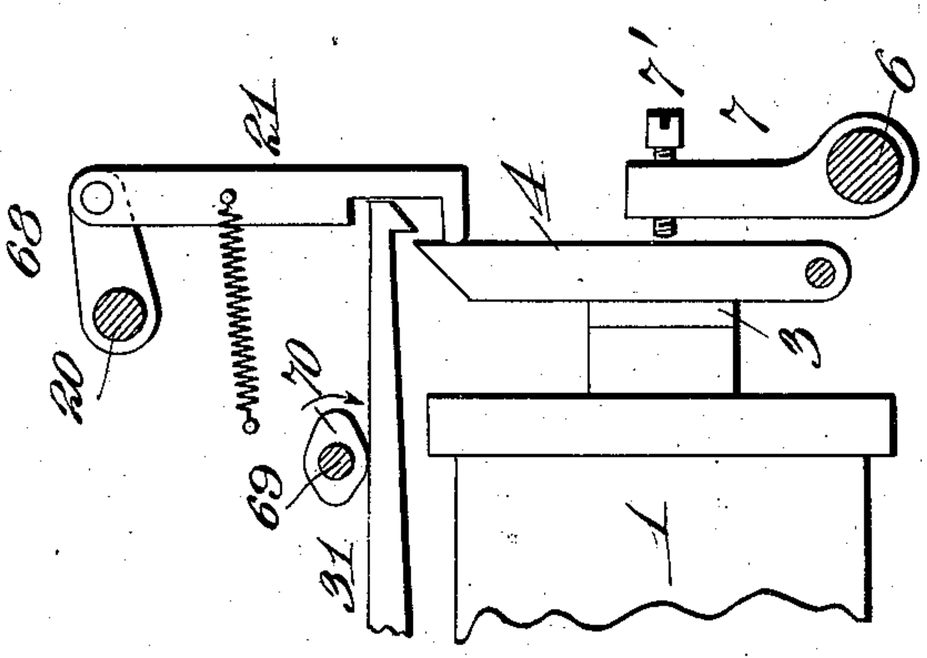


Fig. 4b.



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9 SHEETS—SHEET 7.

Fig. 14

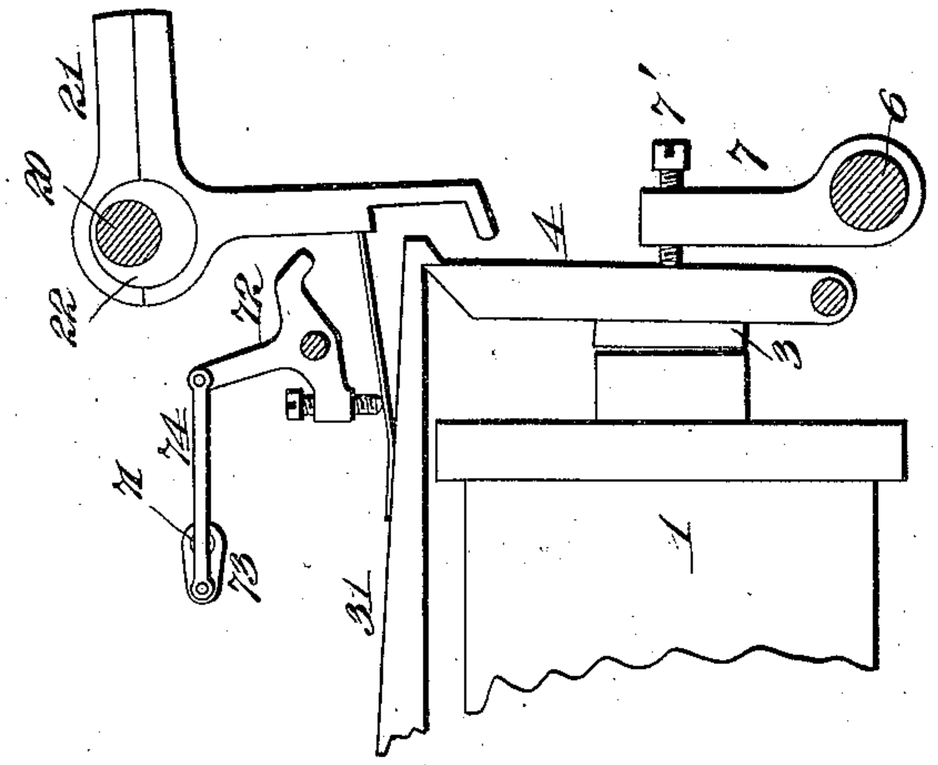


Fig. 16

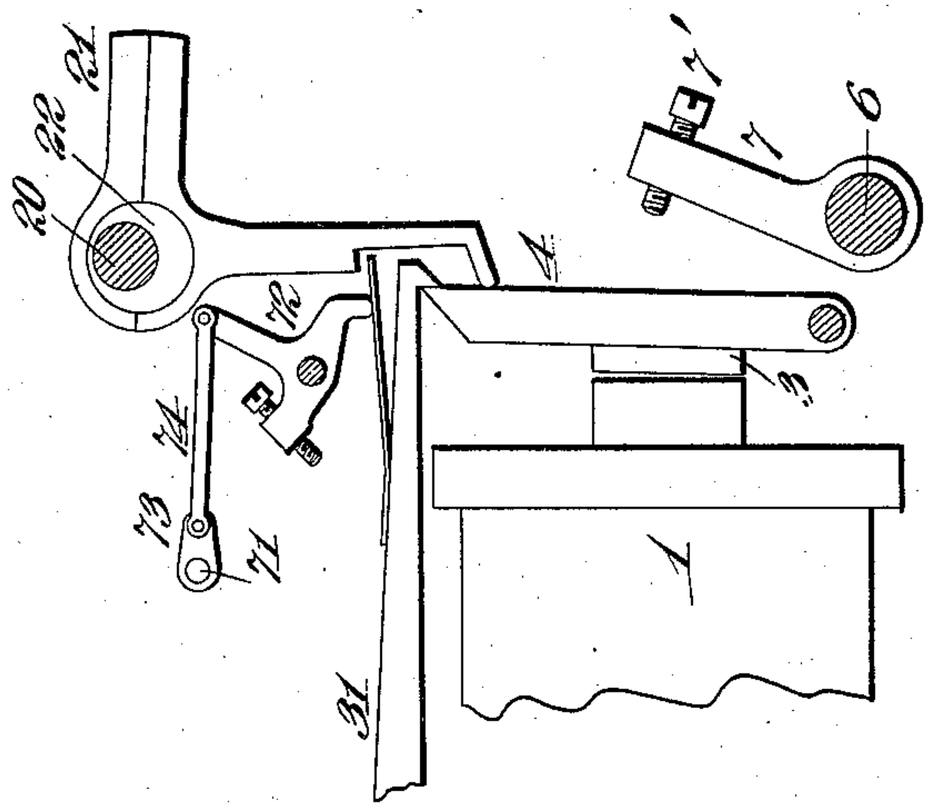
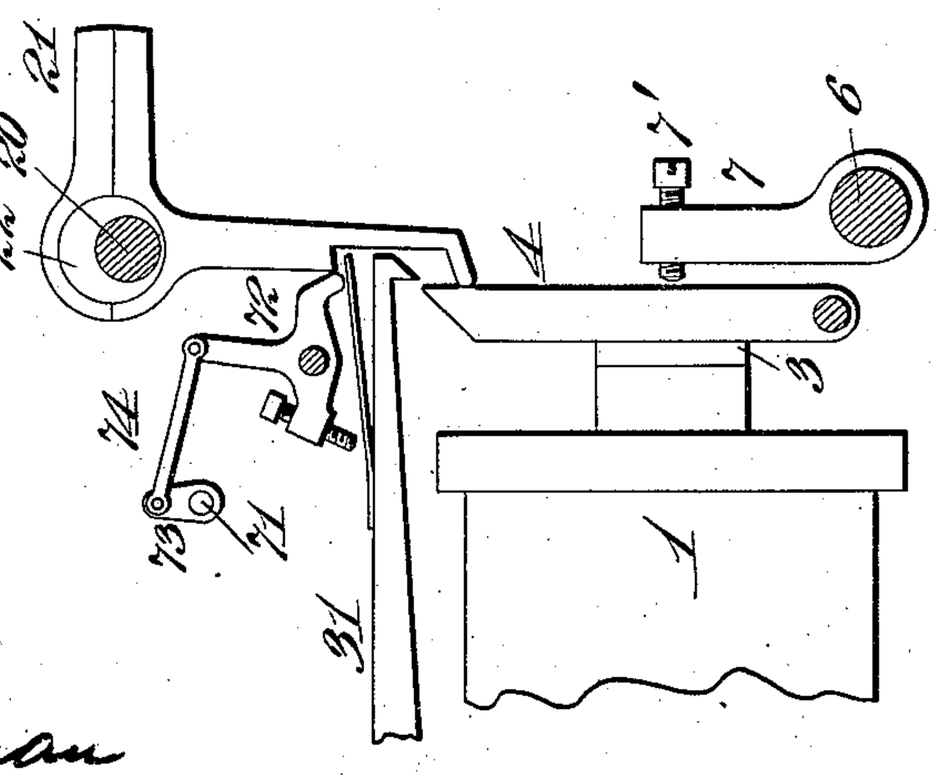


Fig. 15



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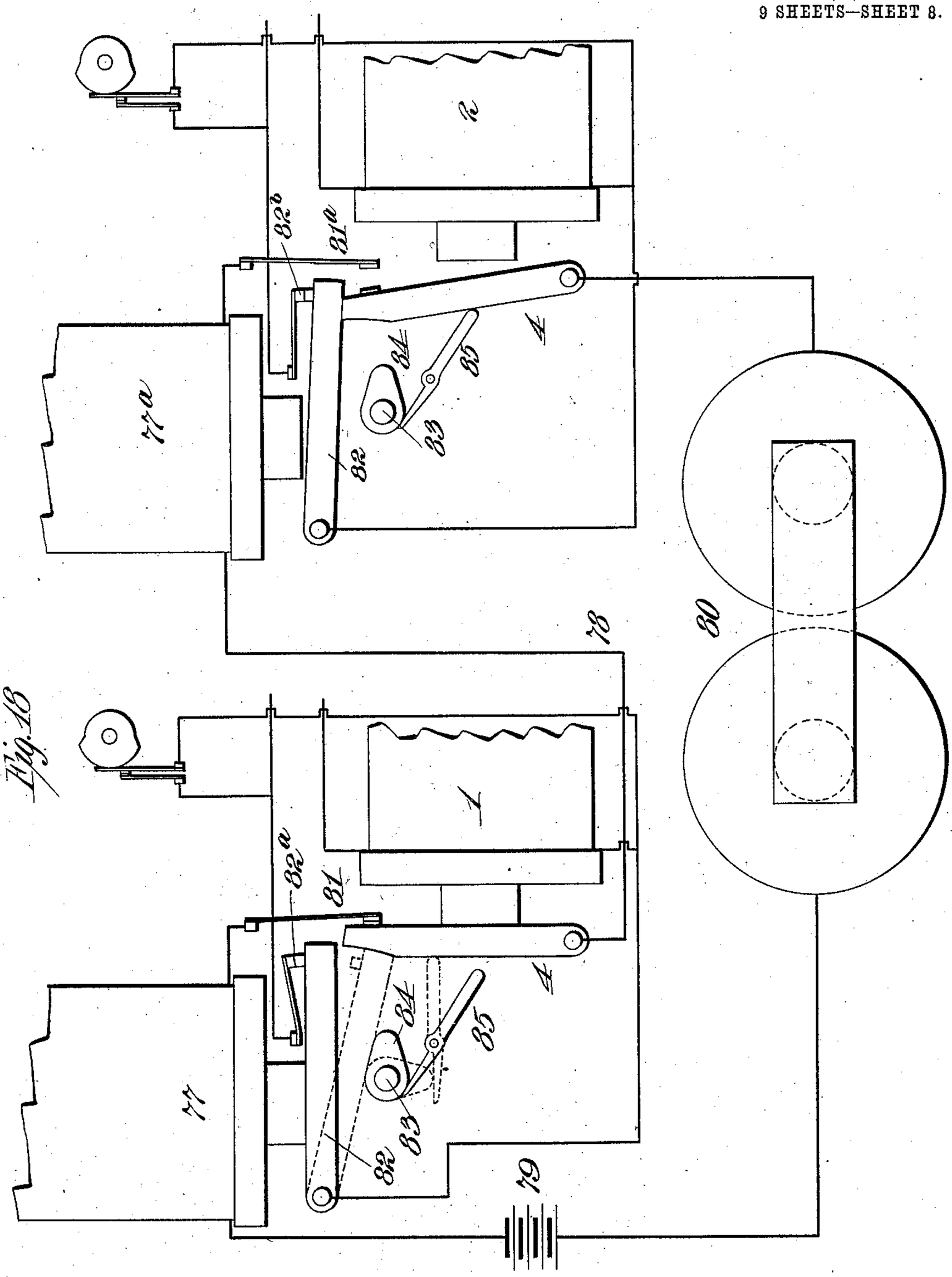
9 SHEETS—SHEET 8.



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APPLICATION FILED JAN. 31, 1905.

9 SHEETS—SHEET 9.

Fig. 21

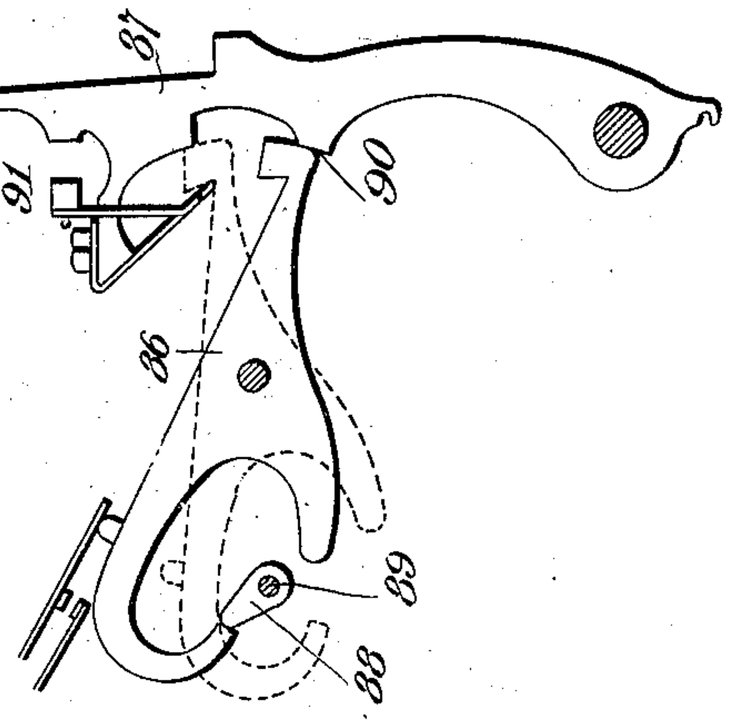


Fig. 20

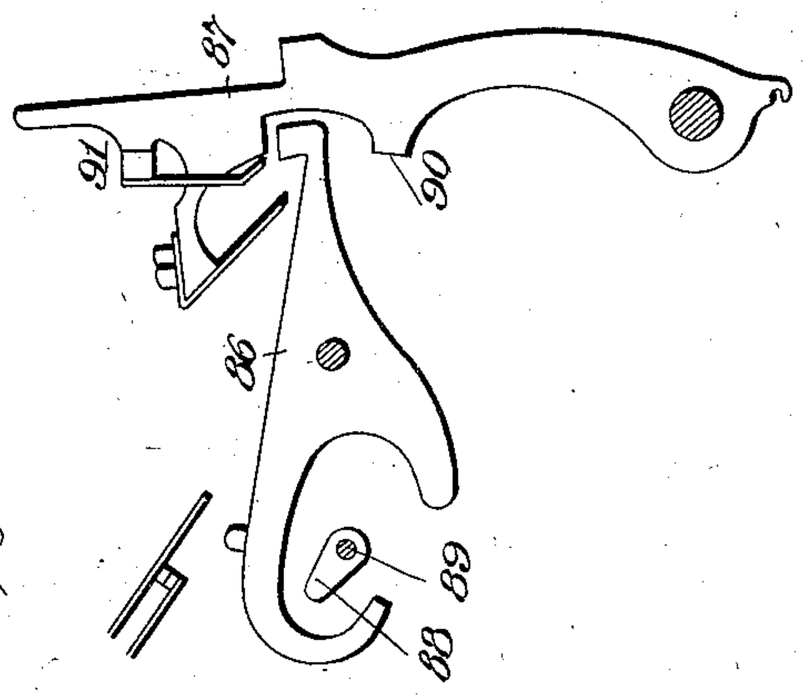


Fig. 22

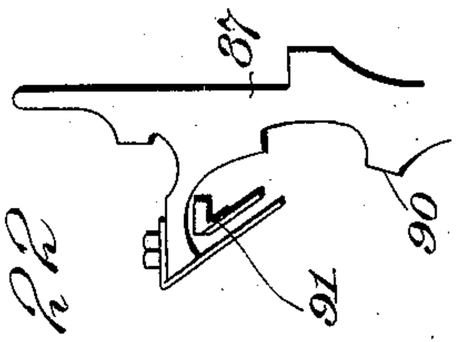
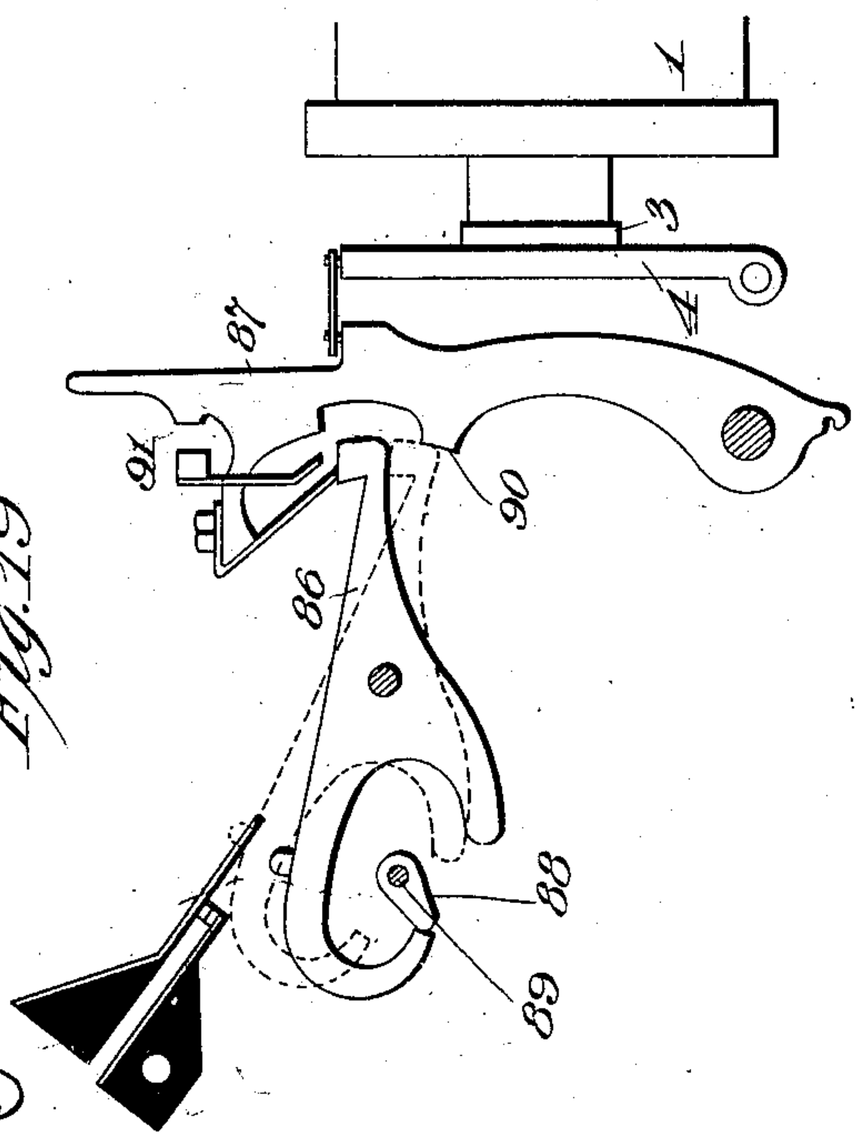


Fig. 19



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UNITED STATES PATENT OFFICE.

FREDERICK W. COLE, OF NEWTON, MASSACHUSETTS.

AUTOMATIC NON-INTERFERING REPEATER FOR FIRE-ALARM CIRCUITS.

No. 810,912. Specification of Letters Patent. Patented Jan. 30, 1906.

Application filed January 31, 1905. Serial No. 243,594.

To all whom it may concern:

Be it known that I, FREDERICK W. COLE, a citizen of the United States, residing at Newton, county of Middlesex, State of Massachusetts, have invented certain new and useful Improvements in Automatic Non-Interfering Repeaters for Fire-Alarm Circuits, of which the following is a specification.

The present invention relates to automatic repeaters for fire-alarm circuits wherein a plurality of street-circuits each comprising boxes and signals and a street-magnet are employed and which repeat the signal received from one circuit over all of the other circuits and actuate the signal devices in such circuits and may also actuate additional signal devices on separate circuits.

The object I have in view is the production of a device which may receive a signal from a street-circuit and repeat the signal to other street-circuits without danger of interruption from other signals sent over any of the circuits over which the signal is being repeated even though two or more signals be started at the same instant of time and without the signal in control being interrupted or mutilated. In other words, my object is the production of a repeater which will have all of the attributes of the most-highly organized street-signal boxes and which will not only absolutely prevent interference, but which will not mutilate the signal received.

Another object is to produce a device which will cut out the street-circuit over which a signal is being sent when such signal is locked out, so that the locked-out signal will be sent over its own street-circuit and actuate the signal devices therein, the signal in control repeating its signal to all of the other street-circuits except the one cut out.

I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of the necessary parts of a device embodying my invention. Fig. 2 is a diagrammatic view showing the several circuits. Fig. 2ª is a diagrammatic view showing the parts at rest and waiting the reception of a signal. Figs. 3, 4, and 5 are views of a modification showing, respectively, the parts in the normal position, the parts while locked out, and the parts while in control. Figs. 6, 7, and 8 are views of another modification similar to the three preceding figures. Figs. 9, 10, and 11 present still another modification. Figs. 12, 13, and 14 are similar views of another modification. Figs. 15, 16, and 17 are similar views of another modification. Fig. 18 is a view showing a modification in which additional magnets are employed as substitutes for mechanical devices. Figs. 19 to 22 represent the moving elements of a modification based upon the structure disclosed in my Patent No. 616,222, but with my present improvements applied.

In all of the several views like parts are designated by the same reference characters.

The structure illustrated in Figs. 1 and 2 is based upon that disclosed in the patent to Francis A. Skelton, No. 569,250, dated December 28, 1897, but with my present improvements added.

In Fig. 1, 1 and 2 represent the street-magnets, each of which forms a portion of a street-circuit embracing a number of call-boxes and signaling devices, the circuits being normally closed. It is to be understood that as many street-magnets are employed as there are street-circuits. The number added, however, will not change the principle of the device. The armatures 3 3 are carried on levers 4, pivoted to the frame (not shown) and retracted by springs 5 when the magnets are deënergized and they are not otherwise prevented. These armatures and levers constitute moving devices. Each moving device has two positions, a normal or attracted position and an abnormal or retracted position, the first when the magnet is energized or the member locked out, as will be explained, and the second when the magnet is deënergized and its armature is free to be retracted. 6 is the resetting-shaft, carrying a series of levers 7, provided with adjusting-screws 7′, as shown, for engaging with the levers 4 and resetting all of the moving devices which may be in the retracted position should their street-circuits be broken or for any other reason. To the resetting-shaft 6 is secured an arm 8, which, through a link 9, is connected to a lever 10, which is provided with a pin 11, which in turn will engage with an offset in the free extremity of an arm 12, carried upon the shaft 13. The shaft 13 may be rotated by clockwork of the customary type, (indicated generally by the character 14,) which constitutes a repeating-train and which comprises a train of gears and a drum and cord and weight, the latter two not being illustrated. The end of the lever 12 engaging

with the pin 11 will serve as a lock to prevent the shaft 13 from rotating. Should the lever 10 be elevated a sufficient distance to cause the pin 11 to clear the offset end of the lever 12, the shaft 13 will be revolved by the repeating-train. The lever 10 is provided with an upward-extending portion which is provided with a small friction-roller 15, which is adapted to engage with a cam 16, carried by the shaft 13. The configuration of the cam is such that when the lever 12 is in engagement with the pin 11 the lever 10 may be elevated a sufficient distance to disengage the pin from the lever before the roller is stopped by engagement with the cam 16. Upon the shaft 13 and cam 16 revolving the roller 15, engaging with the latter, will be forced downward, so that the arm 12, completing its rotary movement, will engage with the pin 11 and will be there held until again released. The shaft 13 is provided with a cylinder 17, of insulating material, carrying plates 18, of metal, which engage with the brushes 19 and complete the street-circuits momentarily during the revolution of the shaft 13, thus repeating the signal. The cylinder may be provided with additional contact-plates 18^a, which will engage with additional brushes 19^a, forming a portion of additional signal-circuits 19^b, including signal devices 19^c, if such are desired. The locking-shaft 20 carries a plurality of angle-levers 21, supported upon eccentrics 22 above and in front of each moving member. These angle-levers constitute means for controlling the lock-out levers, as will be described, and each has three positions—viz., first, an elevated position before a signal is received and after a sufficient interval of time has elapsed after the receipt of a signal; second, a lowered retracted position, and, third, a lowered attracted position, the two last positions being assumed during the receipt of a signal. The locking-shaft is adapted to be given a half-revolution by means of a locking-train (shown generally at 23) and provided with the usual cord and weight. (Not shown.) The movements of the locking-train are controlled by a timing-train. (Shown generally at 24.) This timing-train has connected to it by a friction-coupling a timing-lever 25, provided at its free extremity with a roller which engages with a cam 26, secured to and revolved by the shaft 13. This timing-lever is provided with a releasing-sector 27, having a notch by which the relatively short and long extremities of the double lever 28 may be engaged and permit the locking-shaft 20 to alternately make about a half-revolution. Each of the angle-levers 21 is provided with a recess 29, which is caused to engage when permitted by means of a counterweight 30 with a spring 30^a, carried by the free extremity of the locking-lever 31. This extremity of the locking-lever is formed with a hook 32, which engages with a similar hook 33 made upon the moving member. The locking-levers constitute means for locking the moving members in the normal or attracted position. The locking-levers 31 are counterbalanced and are depressed at the proper moment upon each operation of the repeating mechanism by means of levers 31^a, carried upon the second resetting-shaft 34. This second resetting-shaft is oscillated by means of an arm 35, connected to a lever 36, which is provided with a roller adapted to engage with a cam 37, carried upon the shaft 13. Above each street-magnet is a cut-out lever 38, which is normally elevated by a spring (not shown) to engage with the fixed contact 39, thus constituting a switch or cut-out. The contact and lever are connected so as to form a portion of the street-circuit. The free end of the lever is provided with a cam-shaped extension 40, which may be engaged by a pin 41, carried by the angle-lever 21. 42 is a shaft mounted above and parallel to the resetting-shaft 6 and carrying fingers 43, which are adapted to reset the indices 44 when such are released.

So much of the device described is quite similar to that disclosed in the Skelton patent above referred to.

The mechanism so far described will prevent interference by signals received after the apparatus has received and is repeating a signal. It will not, however, prevent interference by signals received simultaneously. Such signals will all be received and repeated with unintelligible results. The additional mechanism by means of which the desirable and new results are secured is as follows: Mounted adjacent to each moving device is a lever 45, which is preferably pivoted to the shaft 42, a block 46 surrounding the shaft and provided with a notch which will prevent endwise movement of the lever 45 and will also limit, if desired, the extent of its oscillatory movement, the extent of movement being determined by the length of the slot. Each lever is provided with an extended portion 47, having a flat upper surface and a notch 48. It is also provided with a depending portion 49 and a lateral extension 50, the latter constituting a counterweight portion. Each angle-lever is provided at its lower extremity with a pin 51, which may bear upon the extension 47 or rest within the notch 48, as depends upon the position of the parts. Each lever 7 of the resetting device is provided with a pin 52, which may engage with the downward projection 49. The lever 45, together with the pins and notches, constitutes a means for holding the angle-lever in the retracted position.

The operation of the device is as follows: The street-magnets 1, 2, 1^a, and 2^a being each in a normally closed street-circuit their arma-

tures 3 3 will be attracted, as shown in Fig. 2ª. As soon as a signal (which is composed of alternate makes and breaks of the circuit) is sent it will be received by the magnet in the circuit, which magnet will be deënergized and its armature retracted by means of its spring 5. This retracting motion will oscillate the shaft 6 through the lever 7, raise the link 9 and lever 10, causing the pin 11 to slip by the end of the lever 12 and permitting the shaft 13 to make a revolution by means of its train of gears. This will rotate the cylinder 17 and pass the plates 18 under the brushes 19, thus completing and then breaking all of the street-circuits except the one over which the signal is being received, which circuit will not be interfered with, as the cut-out in that circuit will not be opened, the operation of which will be described subsequently. As the shaft 13 rotates the roller 15, engaging with the cam 16, will lower the lever 10, oscillate the resetting-shaft, and return the armature to position in front of its magnet. The pin 11 will engage with the lever 12 and prevent further rotation of the shaft 13 until the magnet is again deënergized, when the same operation will occur. Upon the shaft 13 revolving the cam 26 engaging with the lever 25 will move it, so that the arm 28, engaging with the notch in the releasing-sector 27, will permit the locking-train 23 to impart approximately a half-revolution to the locking-shaft 20. This will depress the angle-lever 21 by means of the cam 22. This movement, it will be understood, takes place immediately upon the rotation of the shaft 13 and before it has rotated to any considerable extent. The retraction of the lever 7 will, by means of the pin 52 engaging with the depending portion 49 of each of the levers 45, oscillate them upon their axis. The angle-lever 21 will be moved backward by its engagement with the lever 4 as the latter is retracted and permit the pin 51 to drop in the notch 48. This lever 45 will only be moved so as to have its notch 48 out of the path of engagement of the pin 51 when the lever 7 is in its farthest retracted position, and the lever 7 in returning to normal will allow the notch 48 to come far enough upward to engage the pin 51 before the lever 21 has swung forward far enough to get it out of the range of said notch. Therefore the said lever 21 will always be held from swinging entirely forward when actuated by or following an operating moving device. The parts will then be in the position shown at A in Fig. 2. At the same time the moving devices of all of the other street-magnets will be in the restored position. Their levers 45 will be oscillated in a manner similar to that of the magnet over which the signal is being sent; but as their angle-levers 21 will not be oscillated, but simply depressed by the action of their eccentrics 22, their pins 51 will continue to rest upon the extensions 47 of the levers 45. In this position the notch 29 will engage with the spring on the locking-lever 31, depressing it to cause its hook 32 to engage with the hook 33 on the armature-lever 44, and thus lock out the moving member. At the same time the pin 41 will engage with the lever 38 and separate it from contact with the part 39, at this point breaking the street-circuit. The parts coöperating with such locked-out moving member will be in the position shown at C in Fig. 2 and will leave the device over which the signal was originally received in control, with its street-circuit at 38 and 39 closed. The parts will work in this manner during the time the signal is being received and repeated as many times as provided for by the street-box. After the signal is completed a time will elapse until the timing-train moves the lever 25 against the base of the cam 26, permitting the arm 28 to pass through the notch in the releasing-sector and rotating the locking-shaft 20 the balance of its revolution. This will, through the agency of the eccentrics 22, elevate all of the angle-levers 21 to the position shown at A in Fig. 2, thus unlocking all of the previously-locked-out moving devices. The apparatus will be then in position to receive and repeat another signal. Should two signals be received at about the same instant of time on different circuits, they will actuate their own street-magnets, all other street-magnets having their moving devices locked out as previously described, and the signal will be repeated over the circuit of such locked-out magnets. The two magnets in control will actuate their moving devices together so long as they move in unison. As soon, however, as the moving device of one magnet is retracted, while the other is in restored or attracted position, the one to first become retracted will lock out the moving device of the other magnet. The reason for this is as follows: The two moving devices which move in unison will have their angle-levers 21 held away from their lock-out levers 31 by engagement of their pins 51 with the notch 48. They will be moved, as previously described, into these notches 48 by the retraction of their armature-levers 4, which, as previously described, will engage with the lower extremities of the angle-levers 21. As soon, however, as one of these armature-levers 4 ceases to be retracted it will fail to move out its angle-lever. The lever 45 will, however, be oscillated by the lever 7 in retracting, thereby releasing the pin 51 from the notch 48, and thus allowing the angle-lever 21 to swing forward until the shoulder in its notch 29 passes over the spring 30ª on the lever 31, which is depressed at this time by lever 31ª, which acts at each operation of the repeater to thereby lock said lever in such position thereafter so that its moving device will be locked

out and will not respond to the impulses of its magnet thereafter. To make the operation more clear, the simultaneous receipt of two signals, as shown in Fig. 2, may be described. At B the moving member of the box is shown as arranged for sending the signal "3-2," the box D to send the signal "2-1-2." Should both boxes be sprung simultaneously or nearly simultaneously, the corresponding street-magnets will be deënergized, the mechanism actuated, and the inactive or energized magnets locked out, as at C, breaking their circuits and allowing the first impulse of the two signals, which are identical, to be repeated over such locked-out circuits. The second impulse of the two signals will be sent under exactly similar conditions. When the box at B is sending its third impulse, the box at D will be at the position to produce the pause or rest between the "2" and the "1" of its signals. Consequently that circuit will be broken. Its armature, however, will be returned to the inactive position (shown at A) by means of its lever 7, and its lock-out lever 31 will be depressed at the proper moment by means of its lever 31ª engaging with the moving devices and preventing its retraction when the lever 7 is again retracted. The third impulse of the signal at B will be now sent, energizing and deënergizing its magnet, allowing its moving device to become retracted, and actuating the starting-train and repeating the impulse as before. The movement of the shaft 6 at this impulse will retract the lever 7 of the magnet D and engage the pin 52 with the lever 45 adjacent to such magnet. This will release the pin 51 from the notch 48 and allow the angle-lever 21 to swing inward, engaging its notch with the lock-lever 31, which is depressed, as above described. The moving device at D will now be completely locked out, for when the circuit is again completed to send the "1" of its signal the moving device cannot respond, because it is engaged by the lock-out lever 31, which cannot rise owing to the pressure of the angle-lever 21. The magnet will remain locked out until after the completion of the revolution of the shaft 20, which can occur only after a suitable interval has elapsed after the last impulse of the signal at B has been received. It is to be noted that the angle-lever at D is swung in after it has been lowered by the rotation of the shaft 20, so that its pin 41 will pass below the cut-out lever 38 and not above it, as at C. Consequently the street-circuit at D will not be cut out and the signal from B will not be repeated over it. The signal at D will be continued to be received, but will not be repeated over any other circuits, as its street-magnet will be locked out. It will be understood, therefore, that when a signal is locked out should a plurality of signals be received at the same time such signal will not be mutilated, but will be continued to be sent over its own circuit, while the magnet in control will repeat its own signal over the circuits which are primarily locked out and will of course actuate the signal apparatuses in its own circuit.

My invention may be modified in many ways. In Fig. 3 the lever 45 is provided with a finger 53, which may engage against a corresponding finger 54, carried by the angle-lever 21 and lock out the moving member 4 by engagement therewith, as shown in Fig. 4. The lever 45 is disengaged from engagement with the angle-lever by means of a pin carried by the arm 55, secured to the resetting-shaft 6. In lieu of eccentrics on the shaft 20 lever-arms are employed, as shown, and springs take the place of the counterbalances to engage the angle-levers with the lock-out levers 31.

In Figs. 6, 7, and 8 is shown still another modification. In this view the angle-lever 21 is mounted in a slot 57 on a pin carried by an arm 58, secured to the shaft 20, so that the angle-lever may be elevated under some conditions without affecting the position of the arm 58. The lock-out device comprises the lever 21 and a short pivoted lever 59, connected by a link 60 to a lever 61, secured to the shaft 6, and which may be a portion of the lever 7ª. As shown in Fig. 7, the lever 59 being oscillated by the retraction of any armature will engage with the bottom end 56 and lift the angle-lever 21, so that it can swing into position to lock the lever 31, thus locking out the moving member 4 of any circuits which operated simultaneous and have ceased to so operate. In Fig. 8 a circuit is shown in control. The angle-lever 21 is swung back by the moving device 4 in retracting and cannot swing forward to locking position of Fig. 7 when said moving device is restored, as the lever 7 in restoring also turns the short lever 59 into normal position, which thereby allows the lever 21 to drop the length of its slot 57, and thus bring its locking-shoulder below the end of the lever 31 as it swings toward said lever. Fig. 6 shows the parts in their normal position. Should two or more magnets receive a signal simultaneously, then the moving devices will continue to move so long as they move in unison. As soon as they cease to so move, then the first one to reach the retracted position will lock out all the others in the attracted position by the engagement of the lever 59 with the bottom portion 56 of the angle-lever of such magnet, thereby lifting the same from dotted-line position in Fig. 7, so as to enable it to swing to the full-line position there shown.

In Figs. 9, 10, and 11 a somewhat-different structure is shown. In this view in lieu of the angle-lever a horizontal lever 62 is provided, having an angular offset 63 at its free extremity. This lever 62 is so pivoted in re-

lation to the armature-lever 4 and the releasing-lever 7 that it may rest upon the latter and permit the former to swing under the offset. A restoring-shaft 64 is provided with a cam 64ª, which is adapted to engage with a lever 62 and elevate the latter after the signal has been repeated. The shaft 64 is actuated by mechanism similar to the locking-shaft 20, so that it will make a slight partial revolution immediately upon the receipt of a signal and will complete its revolution after a definite time has elapsed after the signal has been received. In operation an armature-lever 4 being retracted, as shown in Fig. 11, by the demagnetizing of its magnet will engage with its lever 7 and oscillate the shaft 6, retracting all of the other levers 7 and allowing their levers 62 to drop to the position shown in Fig. 10. The offset of the levers 62 will then engage with the levers 4 and serve as a means for locking them out. Should two moving devices be actuated at the same time, they will be free to move so long as they move in unison. Should, however, one be attracted while the other is still retracted, the lever 7 being also retracted at such time will allow the lever 62 to drop, thus locking out the lever 4 first attracted. Instead of the cut-out device already described that shown in these figures may be employed. The part 65 is fixed, while 66 may drop down to the position shown in Fig. 10 and be supported by the lever 62, breaking contact when the device is cut out. A dog 66ª, adapted to be engaged by the cam 64ª, serves as a means for returning any moving member of which its street-circuit should be accidentally broken and also restores the levers 62 to normal position after the completion of a signal.

The modification shown in Figs. 12, 13, and 14 employs a lever 68 in lieu of an eccentric on the lock-out shaft 20 and a cam-shaft 69, which is geared to and rotated once at each impulse of the repeating mechanism. This cam-shaft carries a double gibbous cam 70, which will engage with the lock-out lever 31 and depress it, so that its hooked extremity can engage with the lever 4 to hold it in normal or restored position. The lever 21 can hold this lever 31 in its locking position to lock out all the moving members not in control. It will be noted that the double gibbous cam 70 has one end longer than the other and its shaft is revolved simultaneously with the restoration of the lever 7, as it is geared to the revolving shaft that restores said lever. Fig. 12 shows the normal position of the parts. Fig. 13 shows an operating-lever locked out, with the lever 7 retracted and the cam 70 at its first quarter-turn when it depresses lever 31 to its greatest extent and low enough to allow the lever 21 to swing forward and lock it, which lever 31 will do for every operating-lever that has started in unison and has ceased to so operate. Fig. 14 shows the operating-lever in control. It has been restored by the lever 7, and just as it is so restored the short end of the cam 70 will have depressed the lever 31 enough to catch and hold said lever, but not far enough to allow the lever 21 to swing forward to its locking position. The lever 31 will thereafter be held in this locking position by the friction of the operating-lever pressing against it; but when this pressure is taken off by the attraction of the magnet then said lever, being counterbalanced in the usual way, will be free to and will swing upward, allowing free passage-way for the operating-lever to be again retracted on the next break in its circuit.

In the modification illustrated in Figs. 15, 16, and 17 instead of the shaft and cam a shaft 71 is employed and is rotated at each impulse in the same way. This shaft actuates a bell-crank lever 72 by means of a crank 73 and link 74. The two extremities of the bell-crank alternately engage with the lock-out lever and spring on the end of it in a similar manner to the double cam 70. In Fig. 18 the same idea is carried out with lock-out magnets instead of mechanical devices. This device is somewhat similar to that disclosed in the patent to W. H. Kirnan, No. 749,387, dated January 12, 1904. In these views 77 and 77ª are the non-interference magnets connected in a local circuit 78, which includes a battery 79 and a magnet 80 for actuating the starting mechanism. This circuit also includes cut-outs 81 81ª, actuated by the moving members 4 4. Adjacent each moving device 4 is an armature 82, attracted by the lock-out magnets 77 and 77ª, and when dropped passes within the range of movement of the moving device 4, as shown in broken lines at magnet 77, preventing retraction of the latter. A restoring-shaft 83, actuated by the timing-train and carrying a cam 84, moves the armature 82 within the attractive scope of its magnet. A dog 85 may be moved by the cam 84 to return the moving device 4 against its street-magnet should for any reason that circuit remain broken. In operation when the street-magnet is deënergized the moving device 4 is retracted, as shown, at the magnet 77ª, breaking the local circuit 78 at the cut-out 81ª and actuating the starting device by means of the magnet 80. This will deënergize the cut-out magnet 77ª and allow its armature 82 to drop out of the magnetic field and assume the position shown in broken lines at 77 and lock all the moving devices and break the line-circuit at 82ª. It will, however, not drop beyond the field of magnetic attraction of the active non-interference magnet 77ª of the street-magnet, but will be supported upon its moving member, keeping the line-circuit closed at 82ᵇ. On the magnet being again energized its moving device 4 will be attracted, the circuit 78 com-

pleted, and the armature 82 attracted, as the local circuit 78 will be closed at 81ª before 82 is released. Should a street-magnet remain energized, its moving device 4 will not be retracted. This will permit its corresponding non-interference armature 82 to drop to the dotted-line position shown, thus locking out the street-magnet. Should two magnets start in unison, the one which is first in the retracted position thereafter will break the local circuit 78 and allow the non-interference armature 82 of the other to drop, as shown in broken lines, thus locking out that moving device. The non-interference armatures are returned by means of the restoring-cam 84.

In Figs. 19, 20, 21, and 22 are shown my idea as applied to a device similar to that shown in my Patent No. 616,222, dated December 20, 1898. In this case the lock-out device 86 is normally held (see Fig. 19) by the moving device 87, which in retractive position allows said lock-out device to immediately drop, (see Fig. 20,) and all such devices that do not drop will be immediately picked up by a cam 88 on the revolving shaft 89 (see Fig. 21) and moved to engage with the abutment 90 and lock their respective armatures from operating. The lock-out device or devices which first move are thereafter alternately held in a second position (see Fig. 20) by the releasing-lever 91 and their respective moving devices 87. If two moving devices are operated simultaneously in the beginning, the first one thereafter to be in attracted position out of unison with the other will immediately get locked out by a further movement of its locking-out device, as shown in the dotted-line position in Fig. 21. After these locking devices have been locked out they cannot be again restored until after the end of the signal by cam-shaft 89 completing its revolution when released by time-train. In Fig. 22 the releasing-lever 91 is placed within the opening in the moving device instead of above, as shown in Figs. 19, 20, and 21.

I claim—

1. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device which controls means for repeating the signal, means for repeating the signal over the street-circuits, and a lock for each moving device, the lock being controlled by that moving device which is first in the retracted position after a plurality of the moving devices have been simultaneously operated and have ceased to move in unison, to lock out and render inoperative all of the other moving devices, whereby the signal of the circuit in control will be continued to be sent without mutilation.

2. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device which controls means for repeating the signal, a lock for each moving device, and means for mechanically controlling the lock, by that moving device which is first in the retracted position after a plurality of the moving devices have been simultaneously operated and have ceased to move in unison, to lock out and render inoperative all of the other moving devices, whereby the signal of the circuit in control will be continued to be sent without mutilation.

3. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device which controls means for repeating the signal, means for repeating the signal over the street-circuits, a lock for each moving device, and means for mechanically controlling the lock, by that moving device which is first in the retracted position after a plurality of the moving devices have been simultaneously operated and have ceased to move in unison, to lock out and render inoperative all of the other moving devices, whereby the signal of the circuit in control will be continued to be sent without mutilation.

4. In a non-interference repeater for fire-alarm circuits, the combination of a plurality of circuits, each including a street-magnet, and a repeating mechanism which comprises moving contact devices and a timing device, of moving devices actuated by the street-magnets, each of said moving devices being capable of movement from a normal to an abnormal position and vice versa and by such movement actuating the repeating mechanism, and the timing device, means for repeating over the street-circuits, a locking-out device for each moving device, means for bringing the locking-out devices into action by the movement of a moving device from the normal to the abnormal position, after a plurality of such moving devices have been simultaneously operated and have ceased to operate in unison, which moving devices will control all of the other locking-out devices and lock out all of such moving devices as are in the normal position and prevent the movement of these moving devices so long as the timing-train is operating.

5. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device which controls means for repeating the signal, a lock for each moving device, means for cutting out the street-circuit of a moving device which has been locked out at the inception of a signal, the lock being controlled by that moving device which is in a certain position after a plurality of the moving devices have been simultaneously operated and have ceased to move in unison, to lock out and render inoperative all of the other moving devices whereby the signal of

the circuit in control will be continued to be repeated without mutilation over the street-circuits which were locked out at the inception of a signal.

6. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device which controls means for repeating the signal, a lock for each moving device, means for cutting out the street-circuit of a moving device which has been locked out at the inception of a signal, the lock being controlled by that moving device which is in the retracted position after a plurality of moving devices have been simultaneously operated and have ceased to move in unison, to lock out and render inoperative all of the other moving devices whereby the signal of the circuit in control will be continued to be repeated without mutilation over the street-circuits which were locked out at the inception of a signal.

7. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device which controls means for repeating the signal, means for repeating the signal over the street-circuits, and a lock for each moving device, the lock being controlled by that moving device which first operates after a plurality of the moving devices have been simultaneously operated and have ceased to move in unison, to lock out and render inoperative all of the other moving devices except the one which thus gets control, whereby the signal of the circuit in control will be continued to be sent without mutilation.

8. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device which controls means for repeating the signal, a lock for each moving device, and means for mechanically controlling the lock by that moving device which first operates after a plurality of the moving devices have been simultaneously operated and have ceased to move in unison, to lock out and render inoperative all of the other moving devices except the one which thus gets control, whereby the signal of the circuit in control will be continued to be sent without mutilation.

9. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device which controls means for repeating the signal, and a mechanical lock for each moving device, the lock being controlled by that moving device which first operates after a plurality of the moving devices have been simultaneously operated and have ceased to move in unison, to lock out and render inoperative all of the other moving devices except the one which thus gets control, whereby the signal of the circuit in control will be continued to be sent without mutilation.

10. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device which controls means for repeating the signal over the street-circuits, locking devices therefor, the said moving devices being normally unlocked and means actuated by each impulse received for locking out all of the moving devices in the normal position when a moving device is in the abnormal position.

11. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device which controls means for repeating the signal, mechanically-controlled locking devices therefor, the said moving devices being normally unlocked and means actuated by each impulse received for locking out all of the moving devices in the normal position when a moving device is in the abnormal position.

12. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device which controls means for repeating the signal over the street-circuits, mechanically-controlled locking devices therefor, the said moving devices being normally unlocked and means actuated by each impulse received for locking out all of the moving devices in the normal position when a moving device is in abnormal position.

13. In a non-interference repeater for fire-alarm circuits, the combination with a timing device and repeating mechanism, of a series of street-circuits, each embracing a magnet, a moving device for each magnet controlling the repeating mechanism, means for repeating the signal over the street-circuits, means for locking out all circuits not receiving a signal, such circuits staying locked out until the end of a repeated signal, and independent locking-out devices one for each moving device, their freedom to act to lock out a moving device depending upon the position of the corresponding moving device at each impulse to the repeating mechanism, and means for restoring the locking devices controlled by the timing device.

14. In a non-interference repeater for fire-alarm circuits, the combination with a timing device, and repeating mechanism, of a series of street-circuits, each embracing a magnet, a moving device for each magnet controlling the repeating mechanism, means for repeating over the street-circuits, means for cutting out and locking out all circuits not receiving a signal, such circuits staying locked out and cut out until the end of a repeated signal, and independent locking-out devices one for each moving device, their freedom to act to lock out a moving device depending upon the po-

sition of the corresponding moving device at each impulse to the repeating mechanism, and means for restoring the locking-out and cutting-out devices controlled by a timing device.

15. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device, which controls means for repeating the signal, means for repeating the signal over the street-circuits, a locking-lever for each moving device, and means for controlling the locking-lever, such means being actuated by the first moving device to get into retracted position after a plurality of moving devices have been simultaneously actuated and cease to move in unison:

16. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device, which controls means for repeating the signal, a locking-lever for each moving device, and mechanical means for controlling the locking-lever, such means being actuated by the first moving device to get into retracted position after a plurality of moving devices have been simultaneously actuated and cease to move in unison.

17. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device which controls means for repeating the signal, means for repeating the signal over the street-circuits, a locking-lever for each moving device, and mechanical means for controlling the locking-lever, such means being actuated by the first moving device to get into retracted position after a plurality of moving devices have been simultaneously actuated and cease to move in unison.

18. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits, each embracing a magnet and a moving device which controls means for repeating the signal, means for repeating the signal over the street-circuits, each moving device having a normal and an abnormal position, a lock, means for locking the moving devices in the normal position, and means for controlling the locking means, such controlling means being controlled by a moving member which gets into the abnormal position, after a plurality of devices have moved in unison, and ceased to so move.

19. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits, each embracing a magnet and a moving device which controls means for repeating the signal, each moving device having a normal and an abnormal position, a mechanical lock, means for locking the moving devices in the normal position, and means for controlling the locking means, such controlling means being controlled by a moving member which gets into the abnormal position after a plurality of devices have moved in unison, and ceased to so move.

20. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits, each embracing a magnet and a moving device which controls means for repeating the signal, means for repeating the signal over the street-circuits, each moving device having a normal and an abnormal position, a mechanical lock, means for locking the moving devices in the normal position, and means for controlling the locking means, such controlling means being controlled by a moving member which gets into the abnormal position, after a plurality of devices have moved in unison, and ceased to so move.

21. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device which controls means for repeating the signal, a cut-out in each street-circuit, and a lock-out device for each moving device, means for actuating the cut-out and the locking devices for each street-circuit in normal condition at the inception of a signal, and means for actuating the lock-out devices of all but one of the other street-circuits which were in abnormal condition when a plurality of circuits received a signal simultaneously but whose moving devices cease to move in unison.

22. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device, means for repeating the signal over the street-circuits, a repeating-train, a timing-train and a resetting-train, means for locking the moving devices, means actuated by the resetting-train for engaging with the means for locking the moving devices, and means actuated by the moving devices for moving the means actuated by the resetting-train, for locking out the moving devices, such means being actuated by a moving device which is first in abnormal position after a plurality of signals have been simultaneously received, and the moving devices cease to move in unison.

23. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device, a repeating-train, a timing-train and a resetting-train, mechanical means for locking the moving devices, means actuated by the resetting-train for engaging with the means for locking the moving devices, and means actuated by the moving devices for moving the means actuated by the resetting-train, for locking out the moving devices, such means being actuated by a moving device which is first in abnormal position after a plurality of signals have been simultaneously received, and the moving devices cease to move in unison.

24. In a non-interference repeater for fire-alarm circuits, the combination of a series of street-circuits each embracing a magnet and a moving device, means for repeating the signal over the street-circuits, a repeating-train, a timing-train and a resetting-train, mechanical means for locking the moving devices, means actuated by the resetting-train for engaging with the means for locking the moving devices, and means actuated by the moving devices for moving the means actuated by the resetting-train, for locking out the moving devices, such means being actuated by a moving device which is first in abnormal position after a plurality of signals have been simultaneously received, and the moving devices cease to move in unison.

25. In a non-interference repeater for fire-alarm circuits, the combination with a street-magnet, a moving device actuated thereby, means for resetting the moving device, means for locking out the moving devices and means for controlling the lock-out means, of a lever having means for engaging with the resetting means, and having a recess for engaging with the lock-out controlling means, to prevent action of the latter upon the lock-out means by the position of the moving devices.

This specification signed and witnessed this 13th day of December, 1904.

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