

Feb. 18, 1941.

H. D. COLMAN

2,232,166

STORING TRANSMITTER

Filed April 11, 1938

18 Sheets-Sheet 1

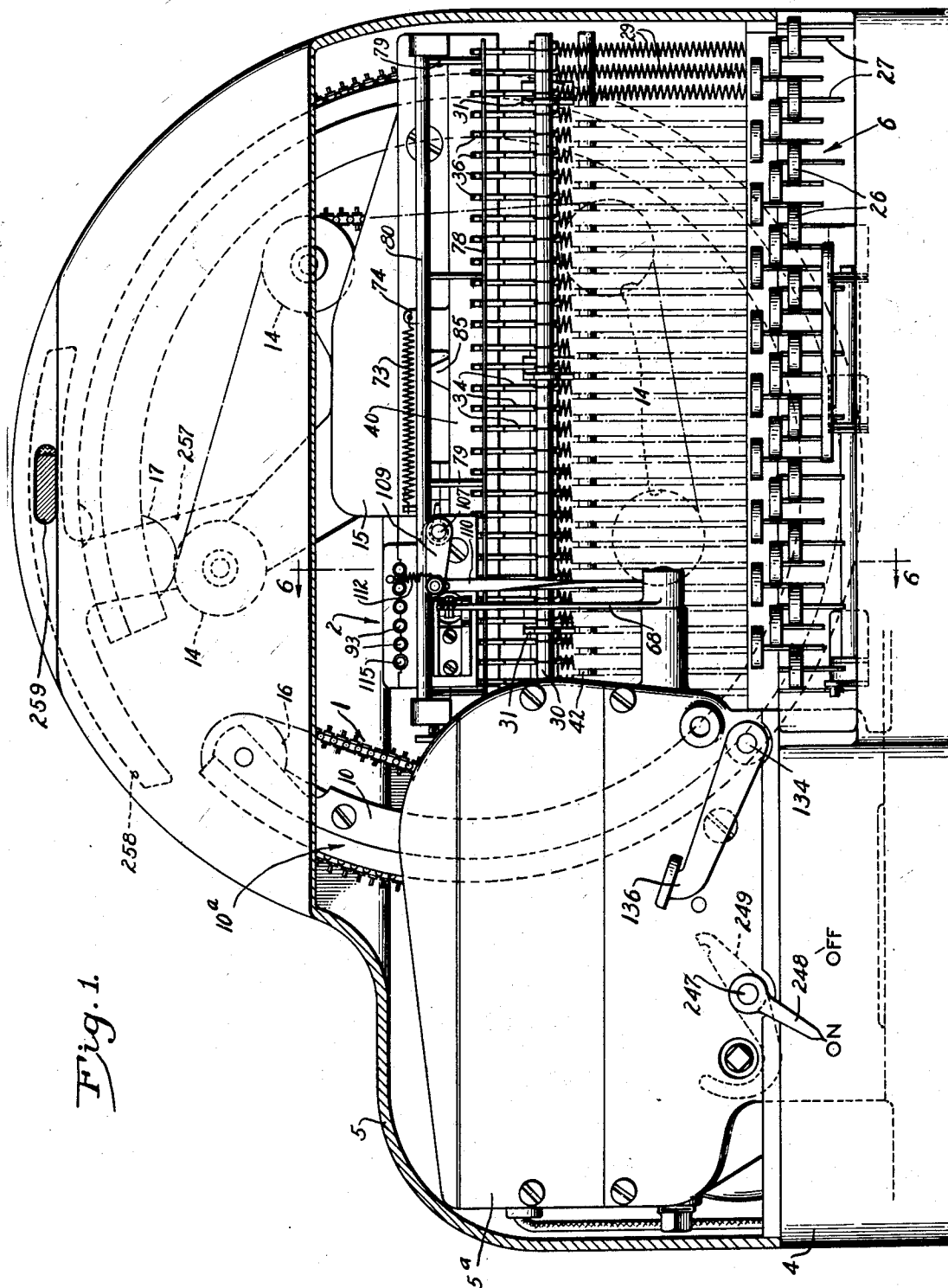


Fig. 1.

INVENTOR

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Feb. 18, 1941.

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STORING TRANSMITTER

Filed April 11, 1938

18 Sheets-Sheet 2

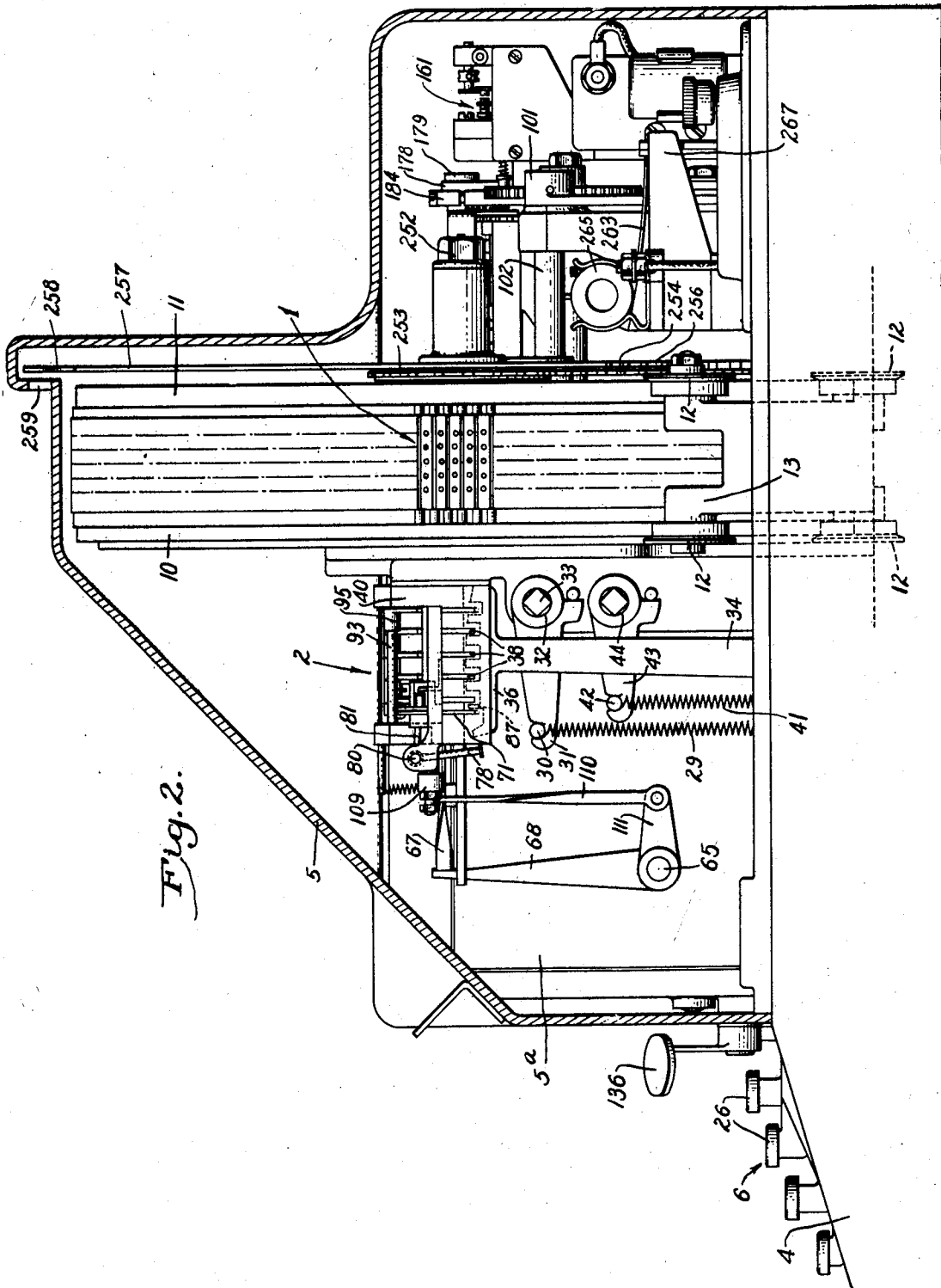


Fig. 2.

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Feb. 18, 1941.

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2,232,166

STORING TRANSMITTER

Filed April 11, 1938

18 Sheets-Sheet 3

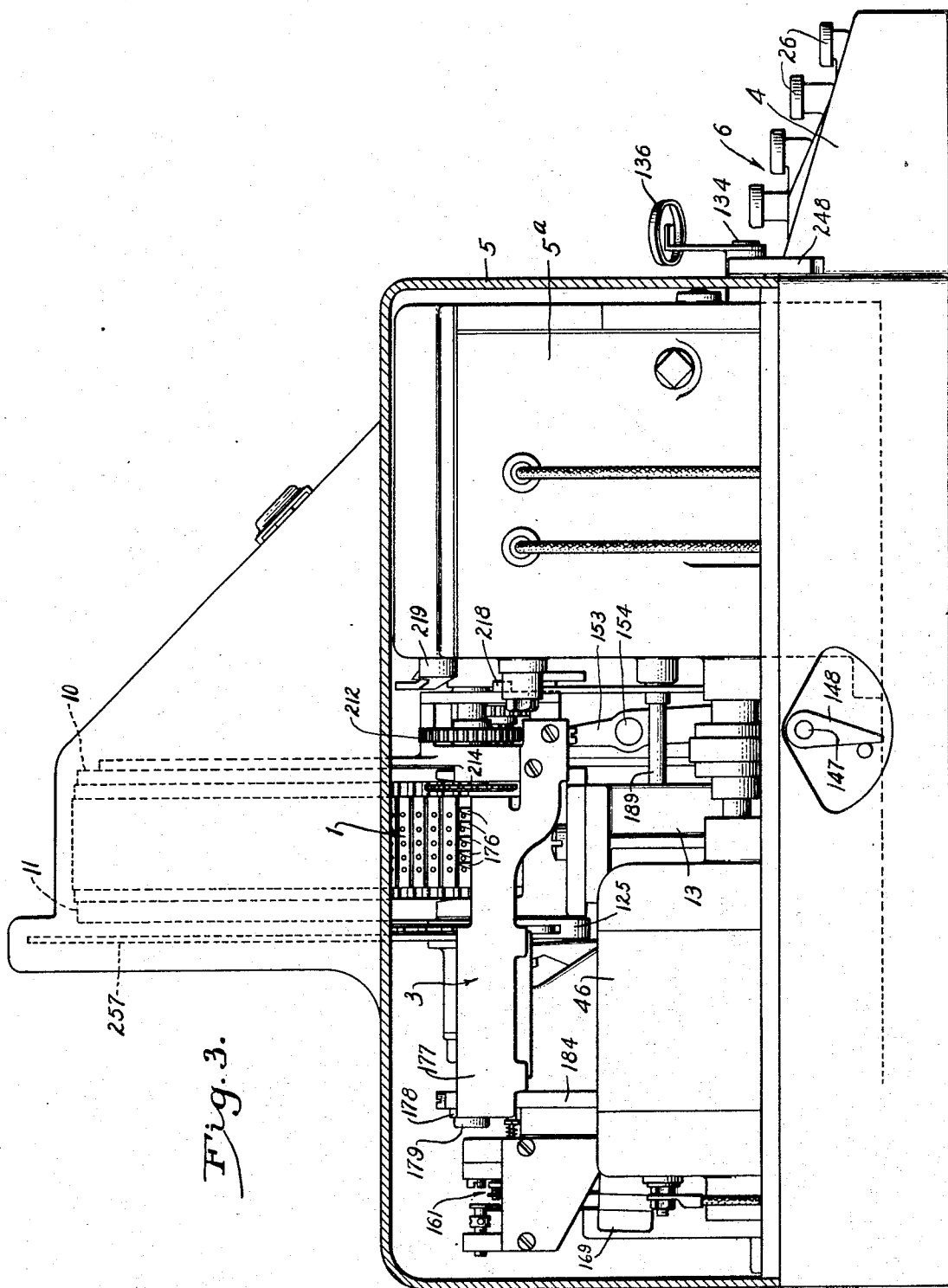


Fig. 3.

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2,232,166

STORING TRANSMITTER

Filed April 11, 1938

18 Sheets-Sheet 4

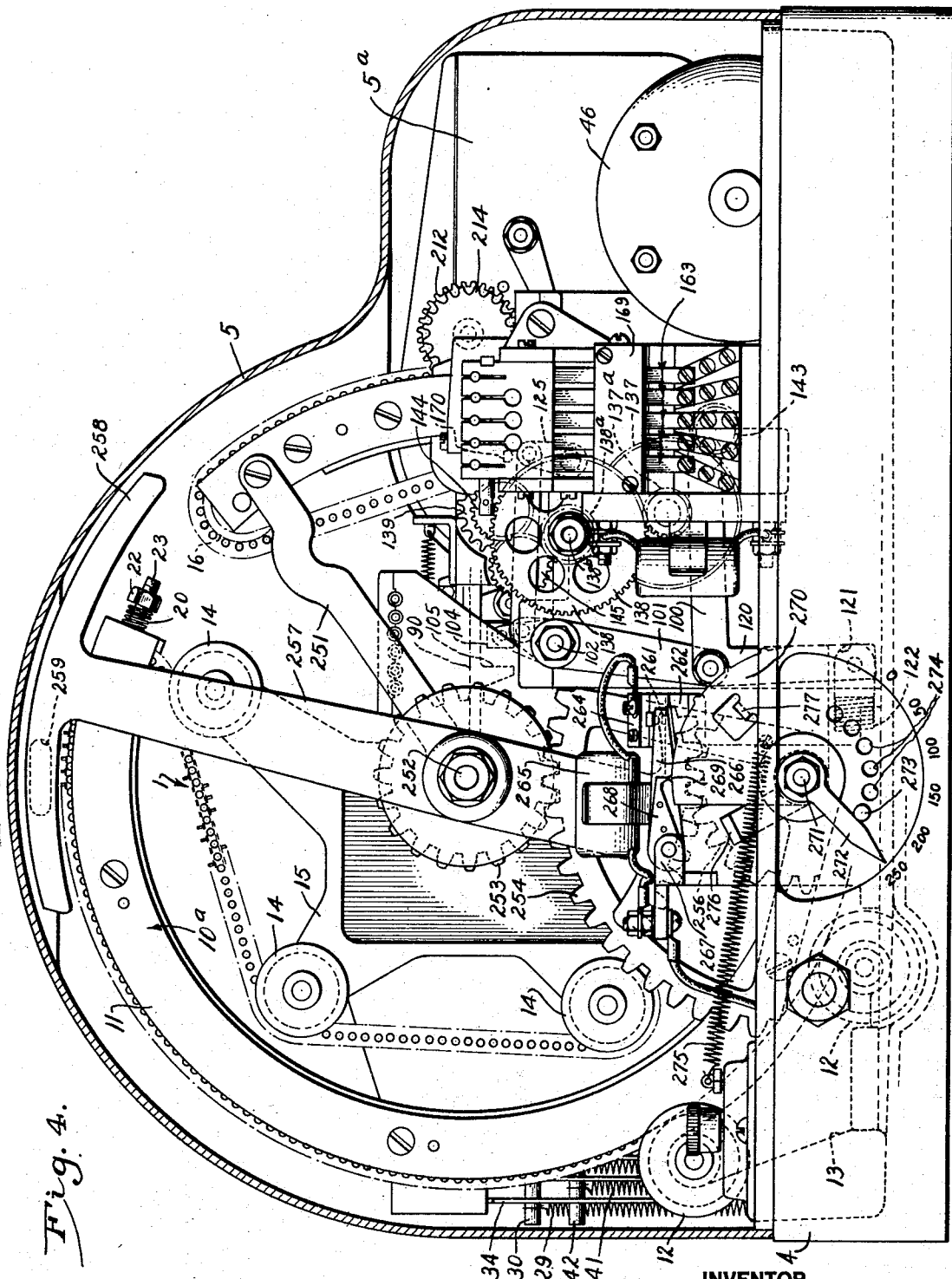


Fig. 4.

INVENTOR

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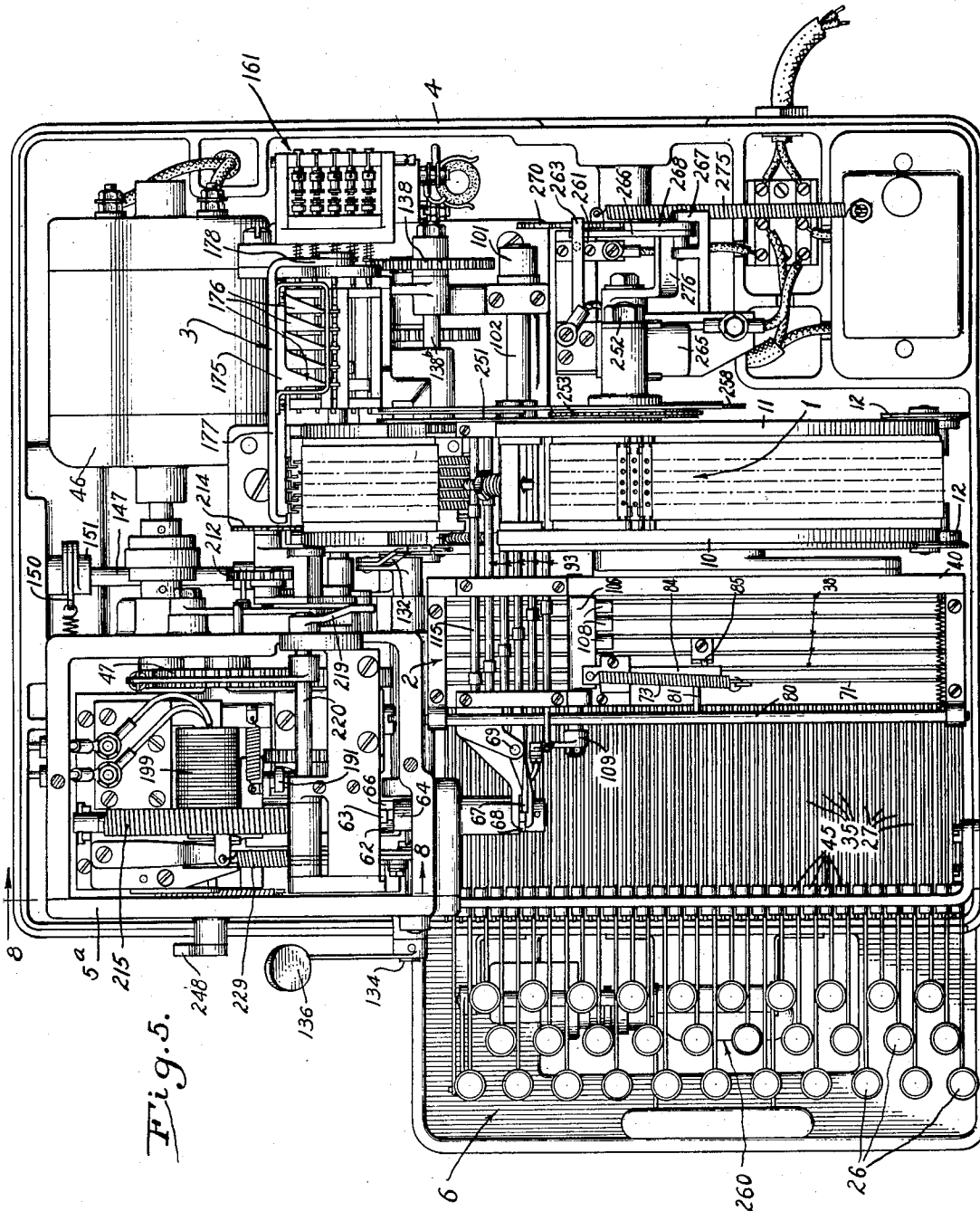
H. D. COLMAN

2,232,166

STORING TRANSMITTER

Filed April 11, 1938

18 Sheets-Sheet 5

**INVENTOR**

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STORING TRANSMITTER

Filed April 11, 1938

18 Sheets-Sheet 6

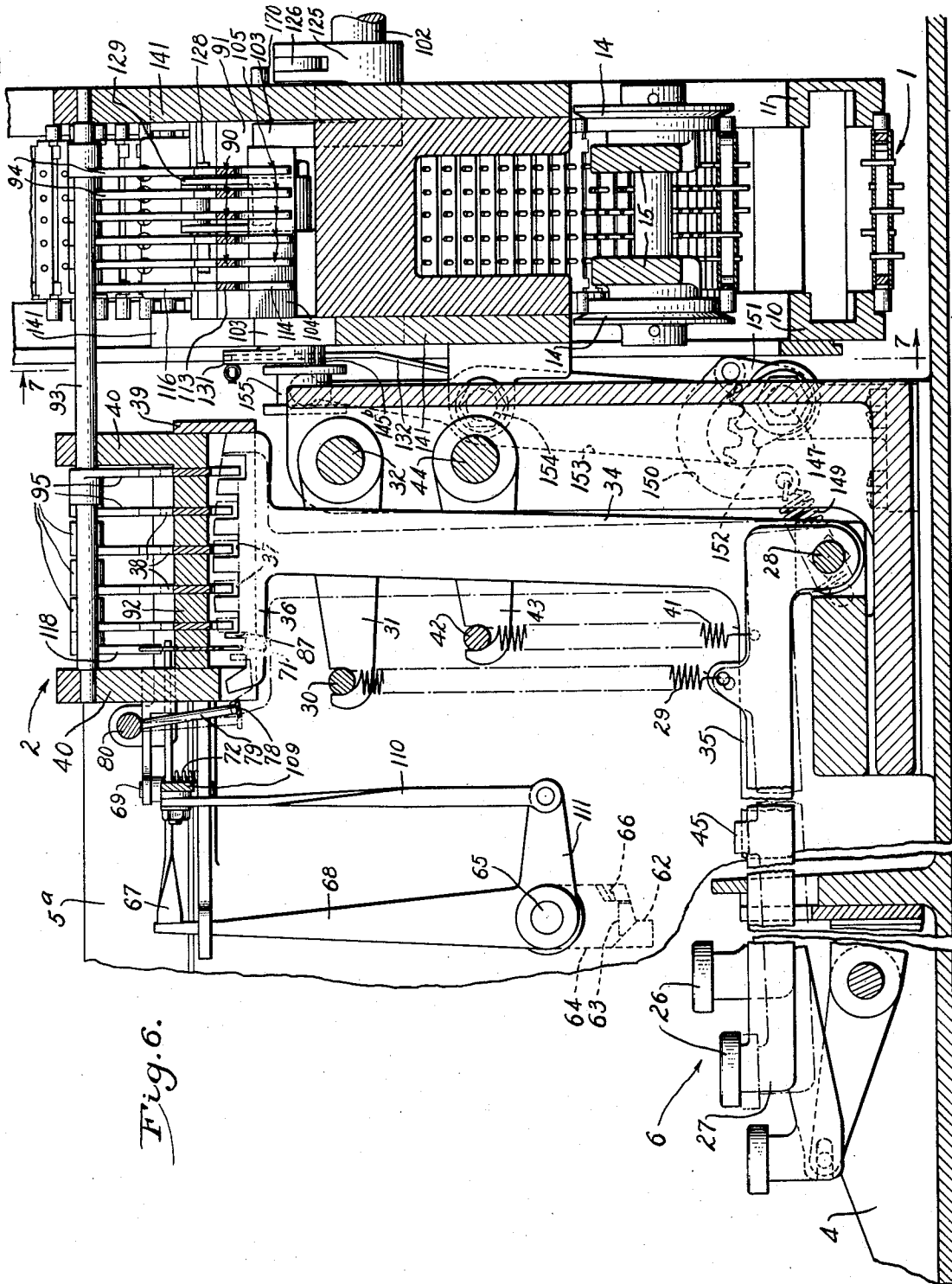


Fig. 6.

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18 Sheets-Sheet 7

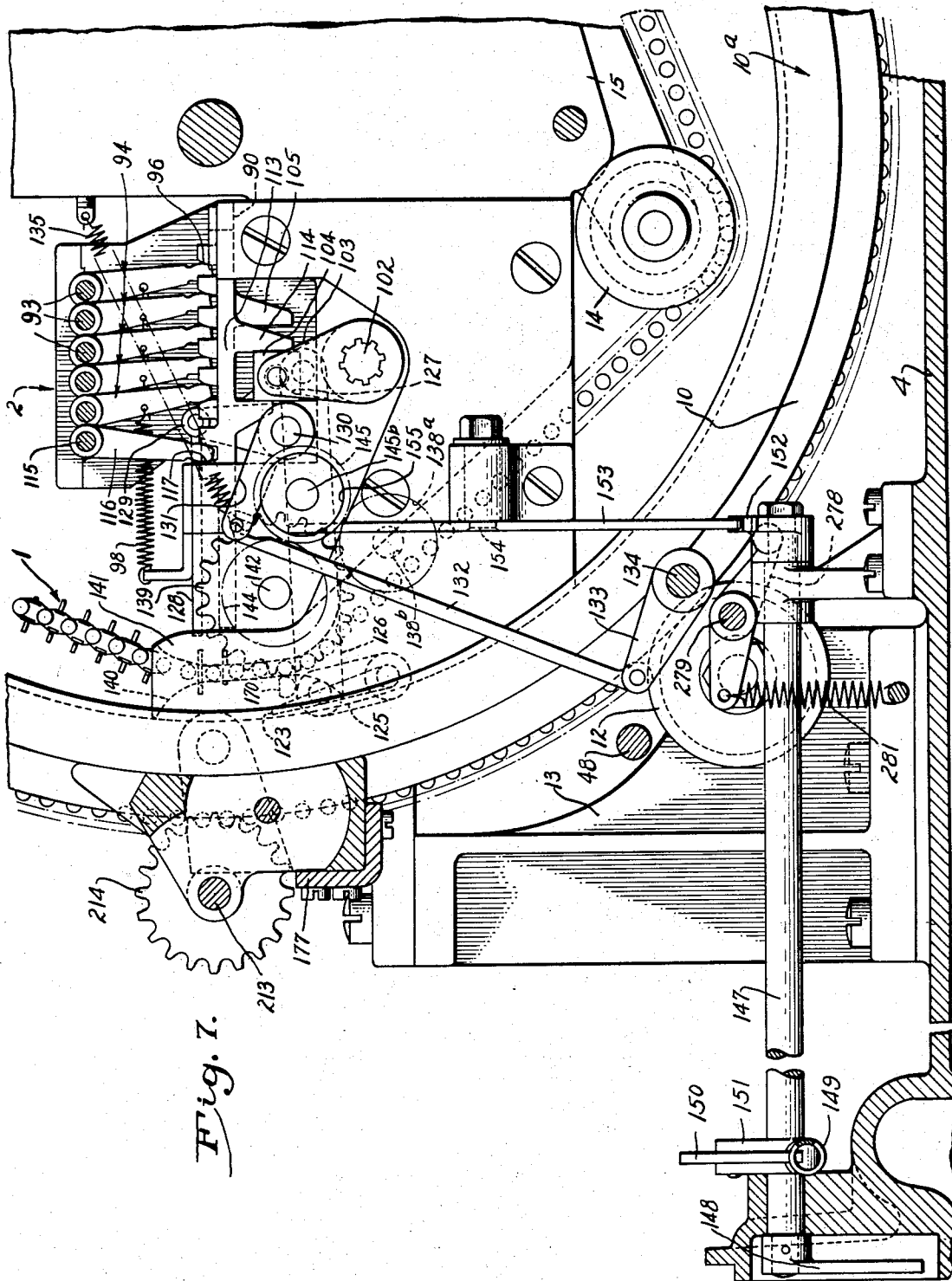


Fig. 7.

INVENTOR

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Filed April 11, 1938

18 Sheets-Sheet 8

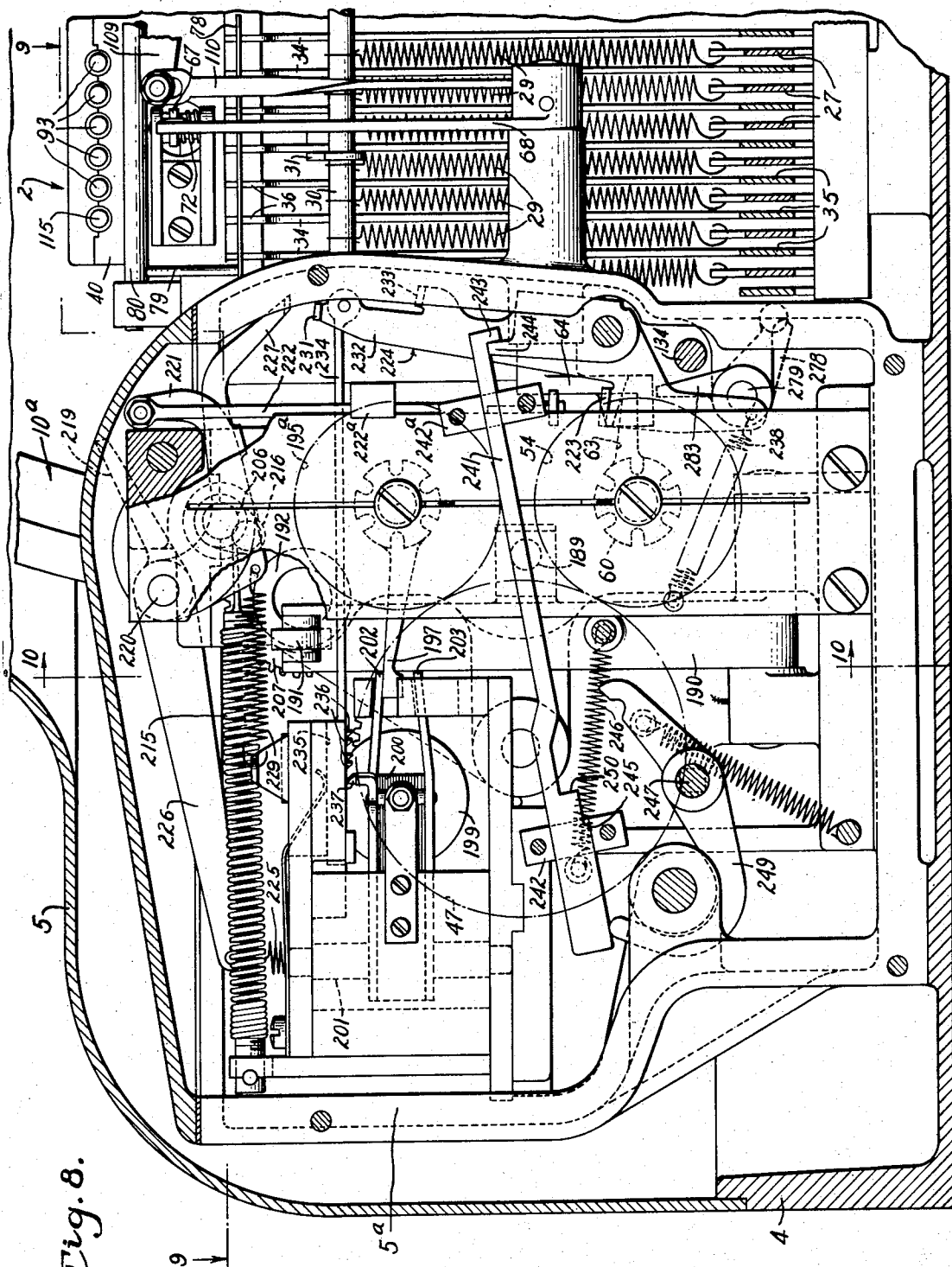


Fig. 8.

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H. D. COLMAN

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STORING TRANSMITTER

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18 Sheets-Sheet 9

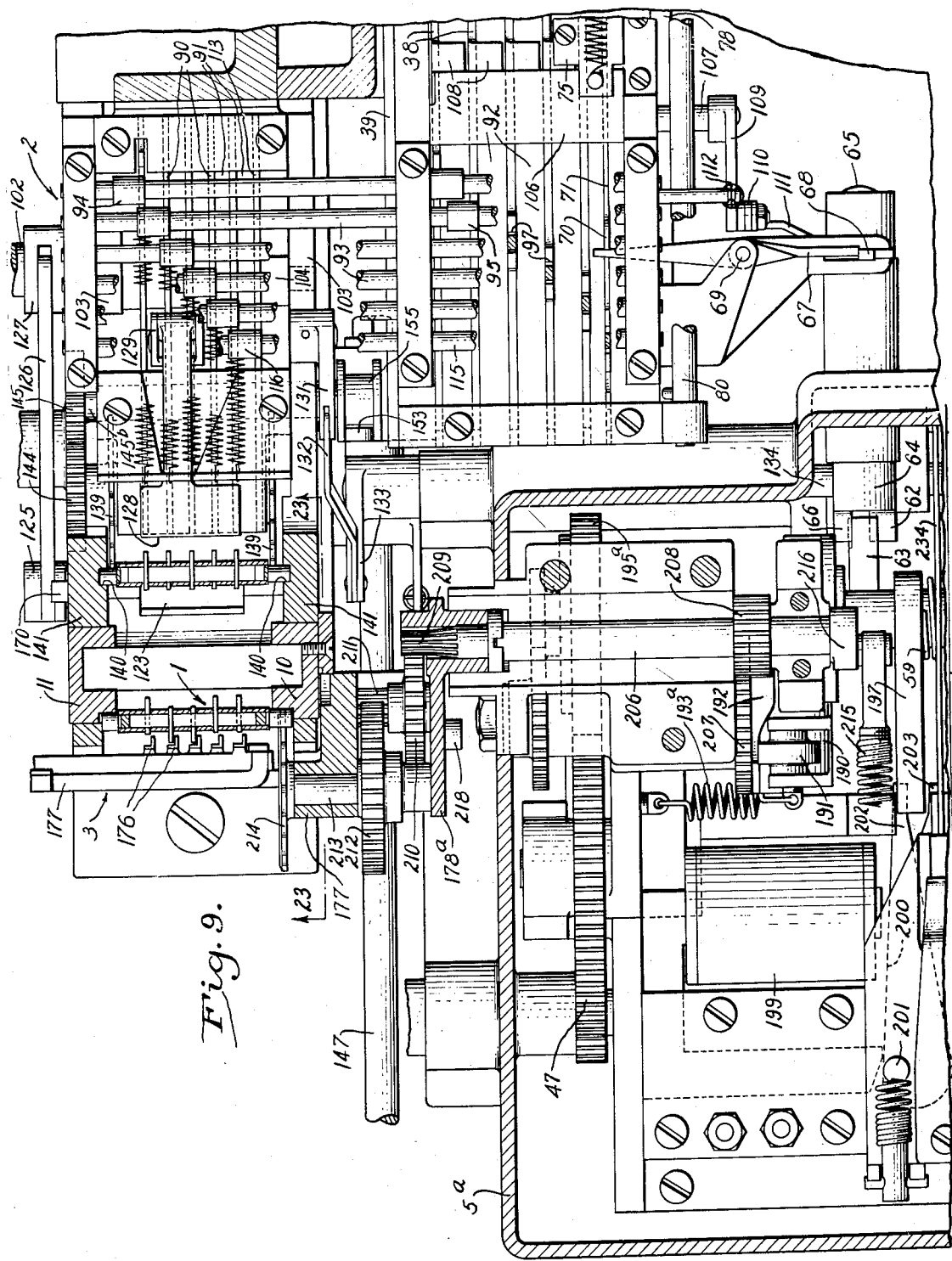


Fig. 9.

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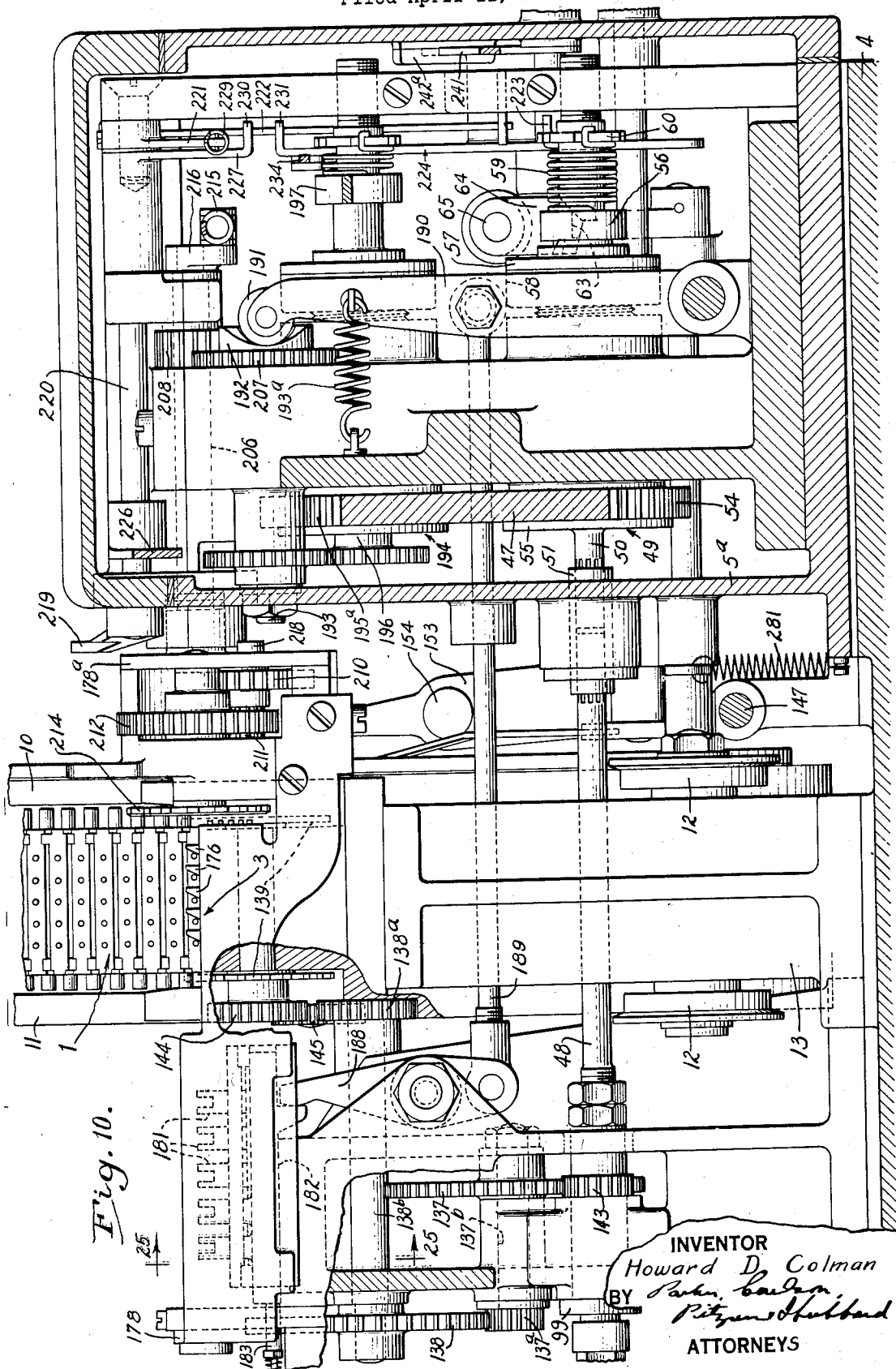
H. D. COLMAN

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Feb. 18, 1941.

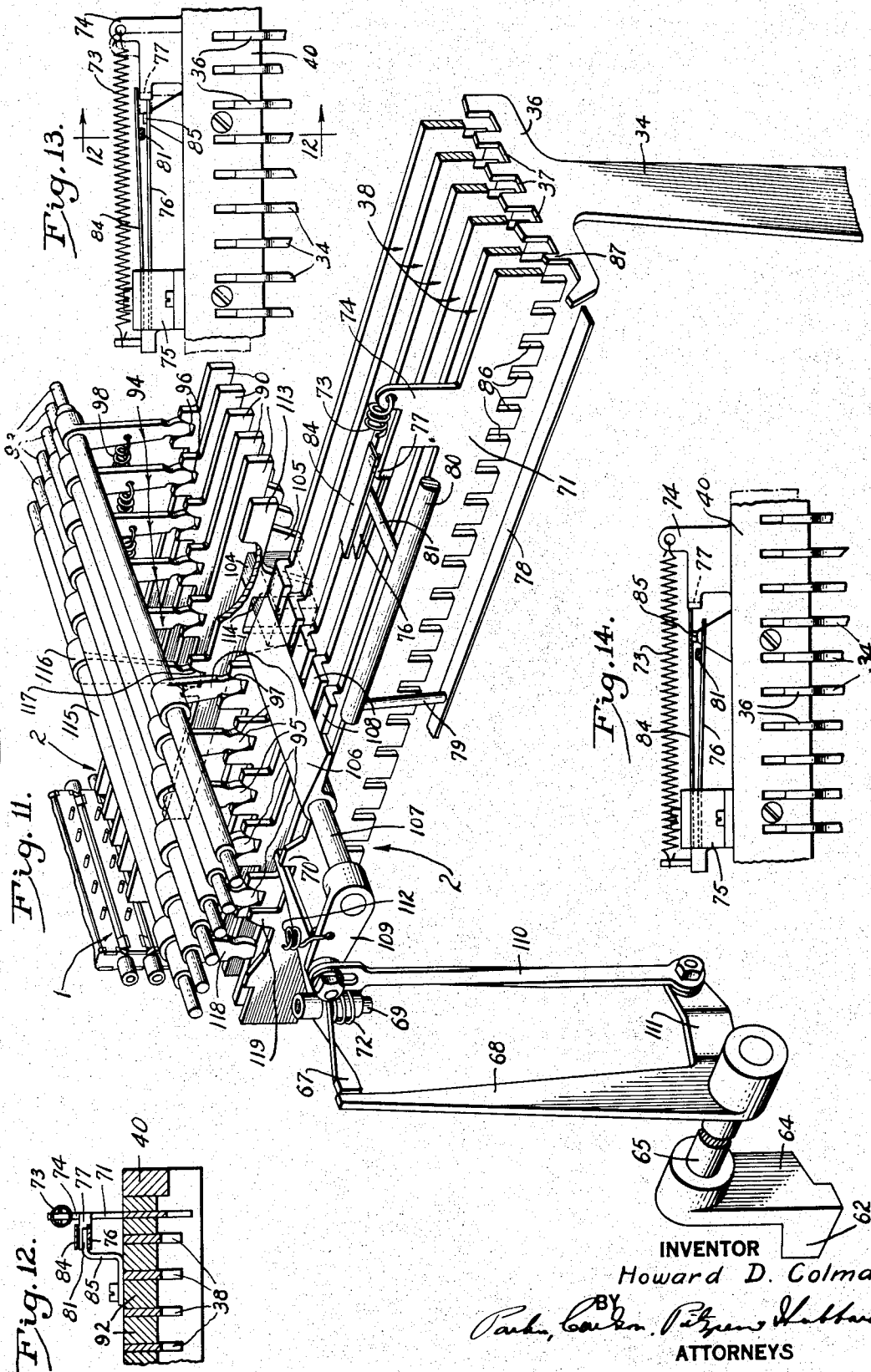
H. D. COLMAN

2,232,166

STORING TRANSMITTER

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18 Sheets-Sheet 11



INVENTOR

Howard D. Colman

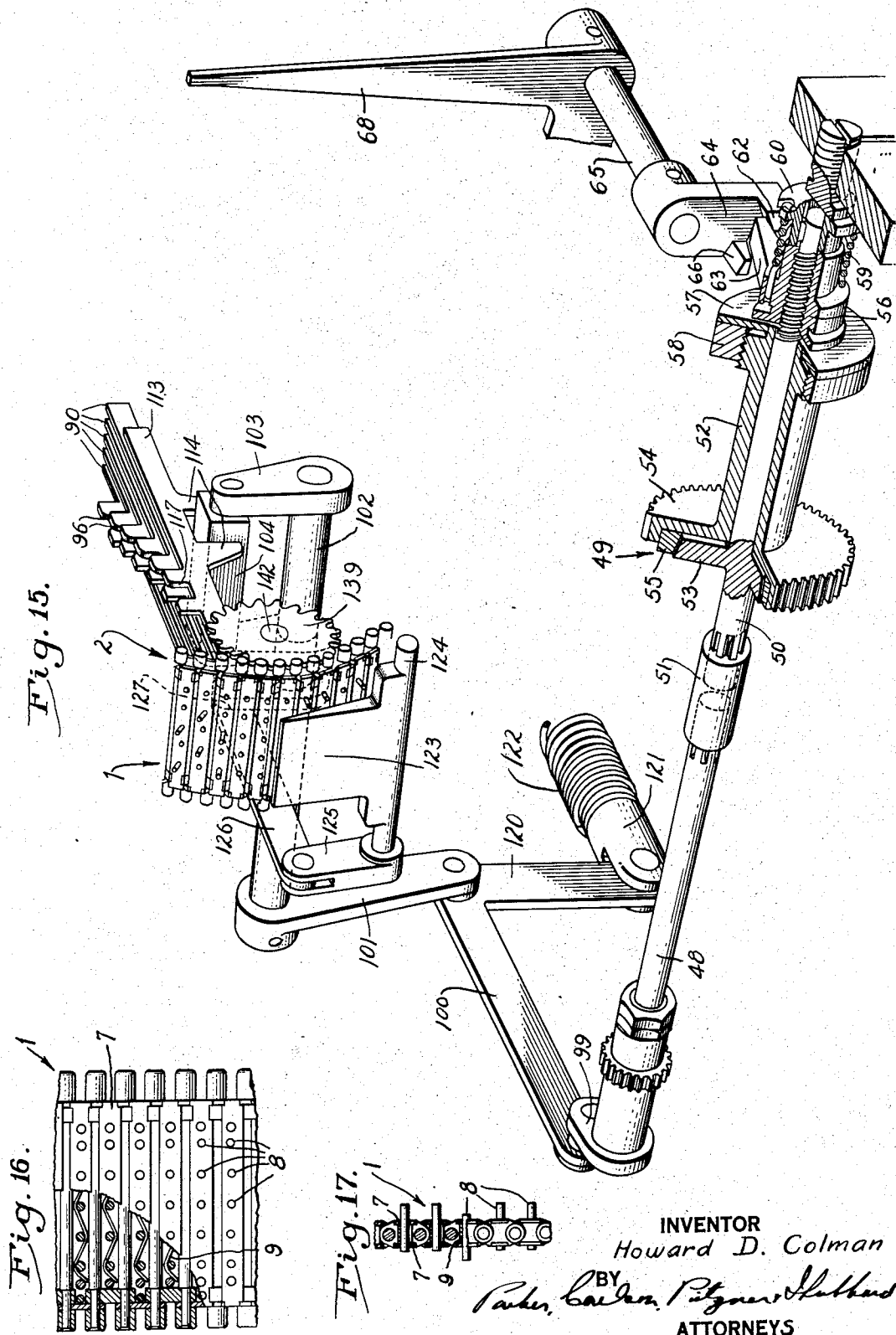
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ATTORNEYS

Feb. 18, 1941.

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STORING TRANSMITTER
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Feb. 18, 1941.

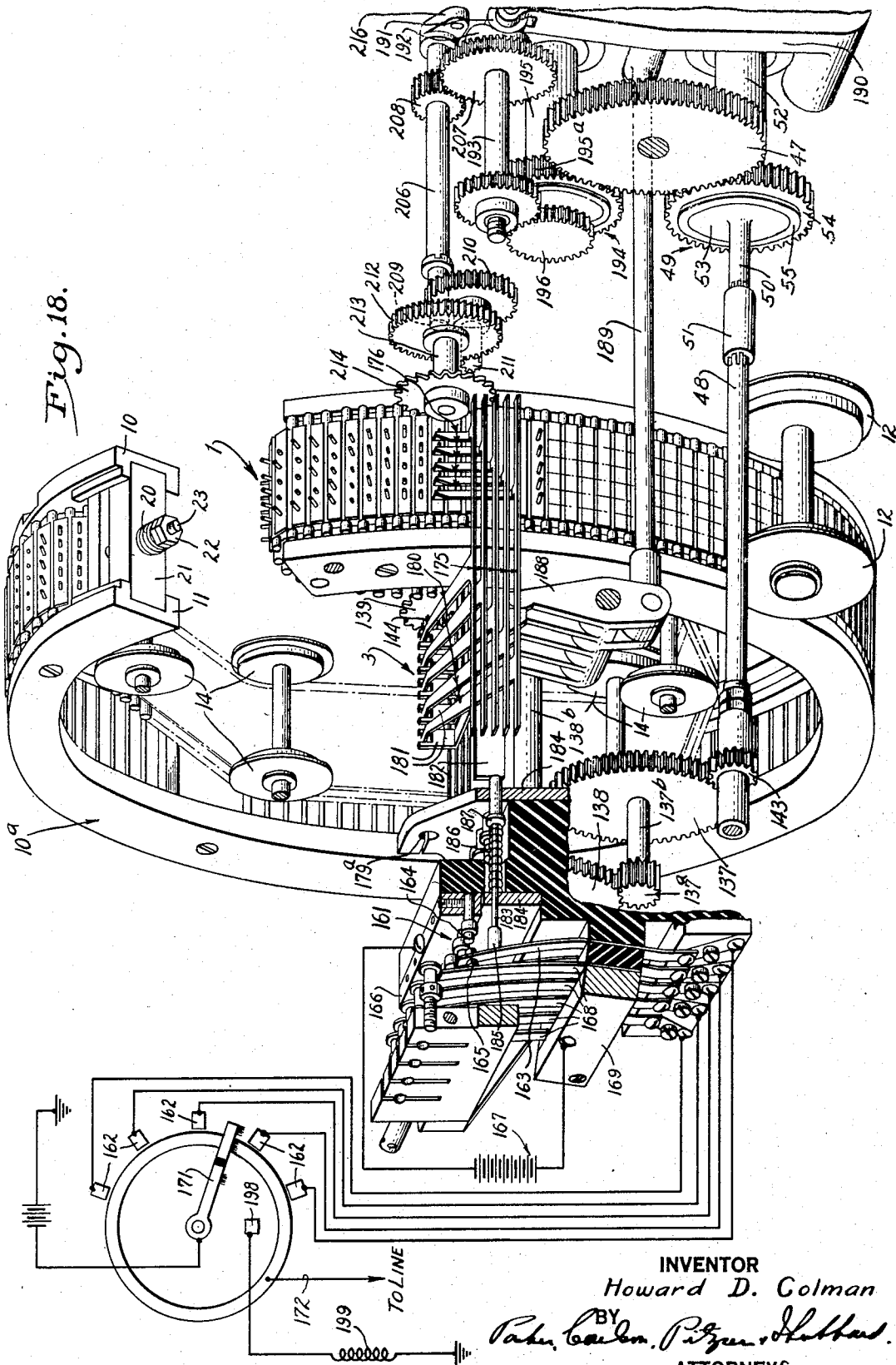
H. D. COLMAN

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Filed April 11, 1938

18 Sheets-Sheet 13

**INVENTOR**

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STORING TRANSMITTER

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18 Sheets-Sheet 14

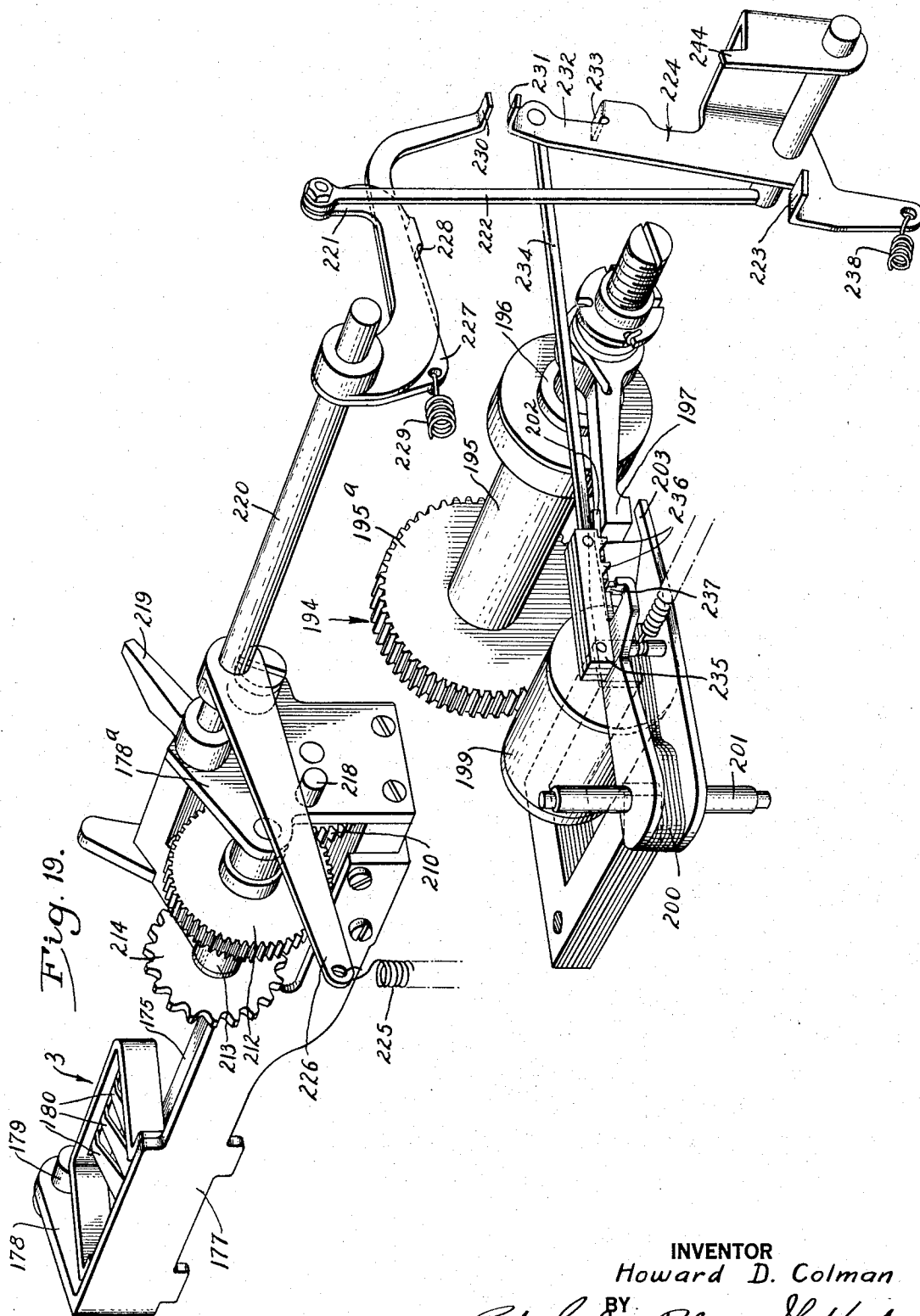


Fig. 19.

INVENTOR

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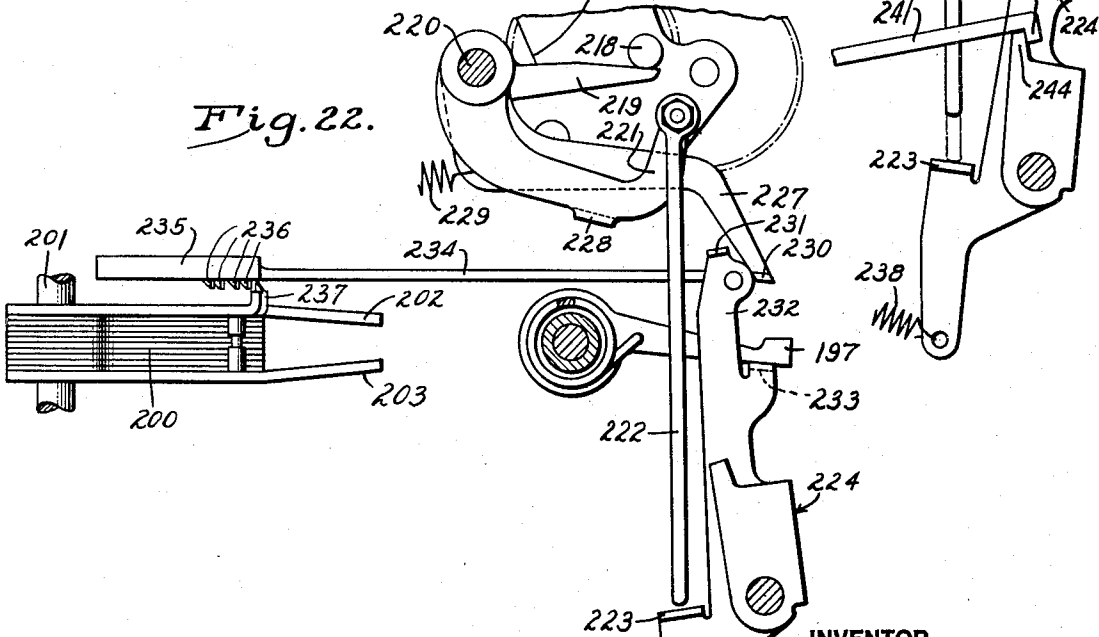
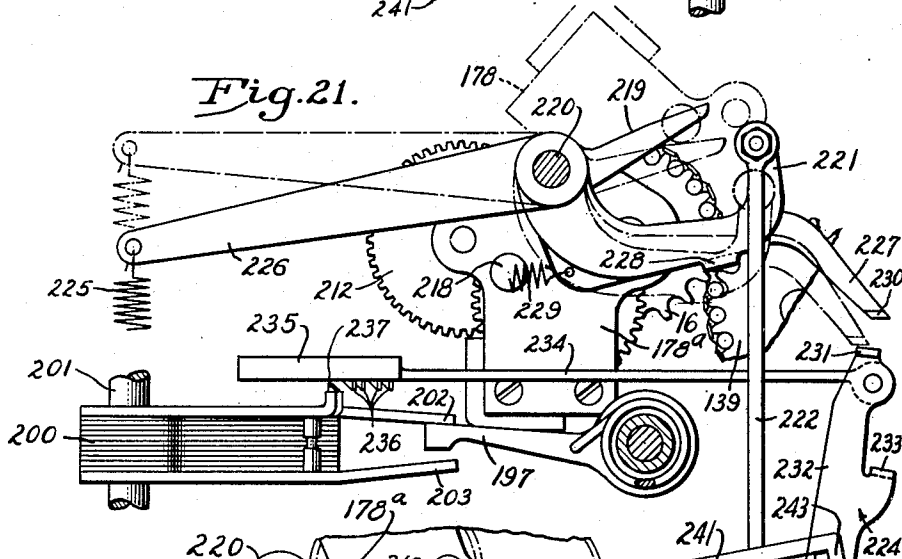
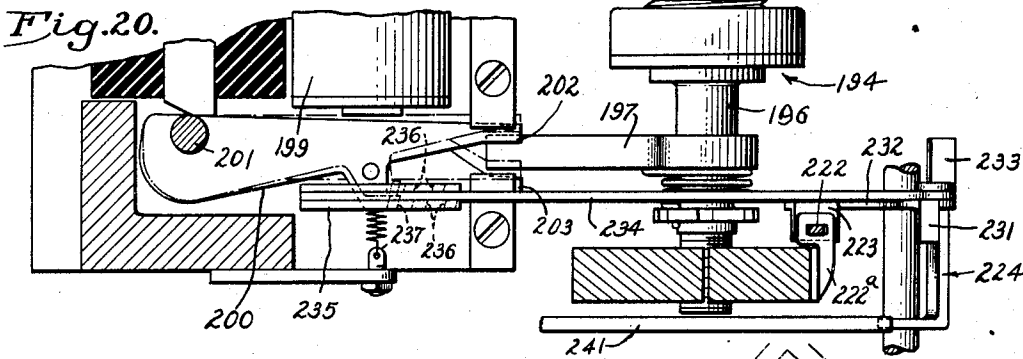
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18 Sheets-Sheet 15



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2,232,166

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Fig. 23.

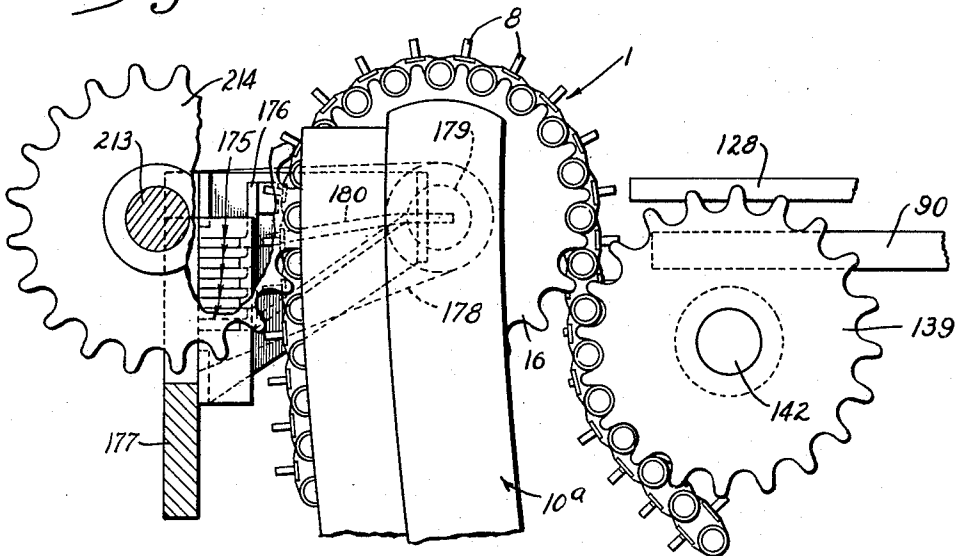
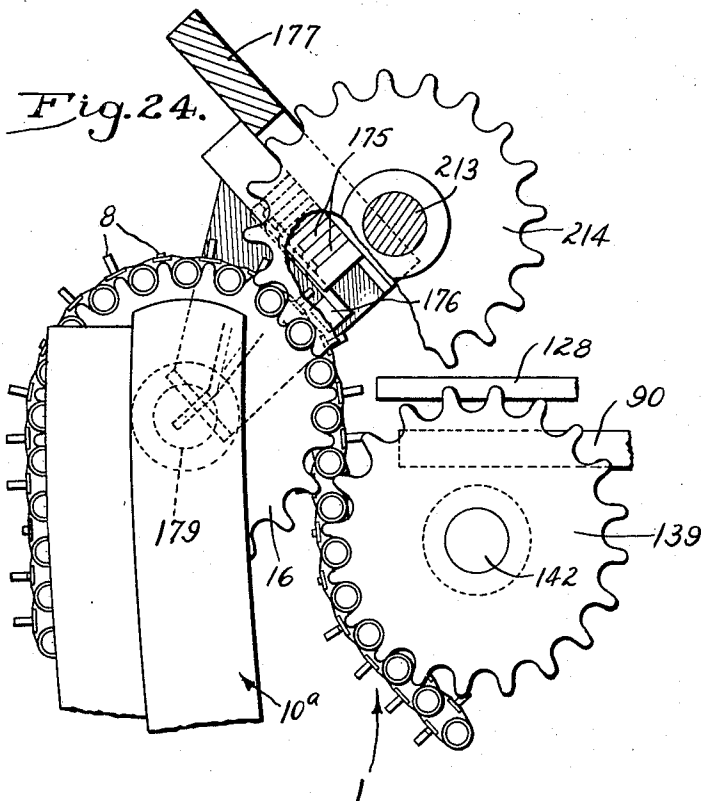


Fig. 24.



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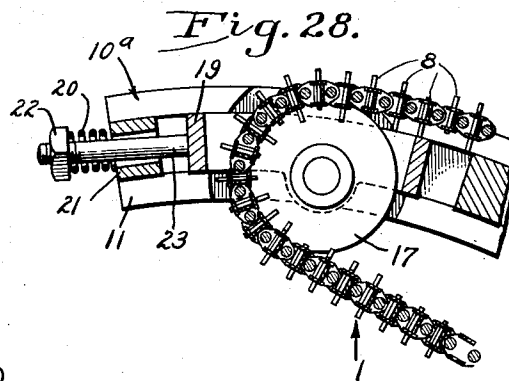
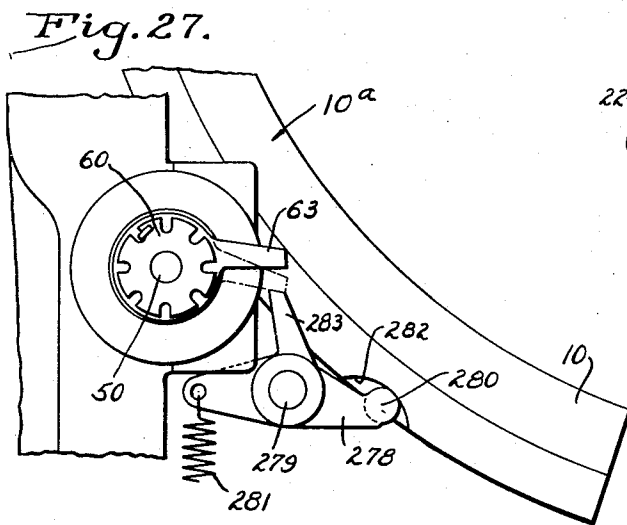
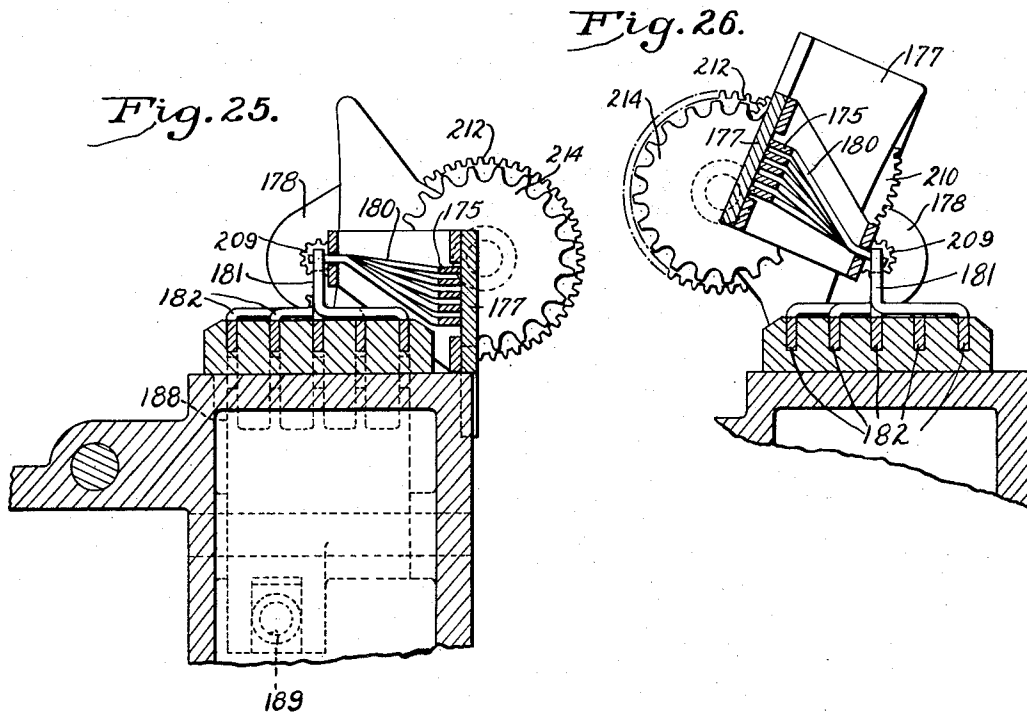
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Filed April 11, 1938

18 Sheets-Sheet 17



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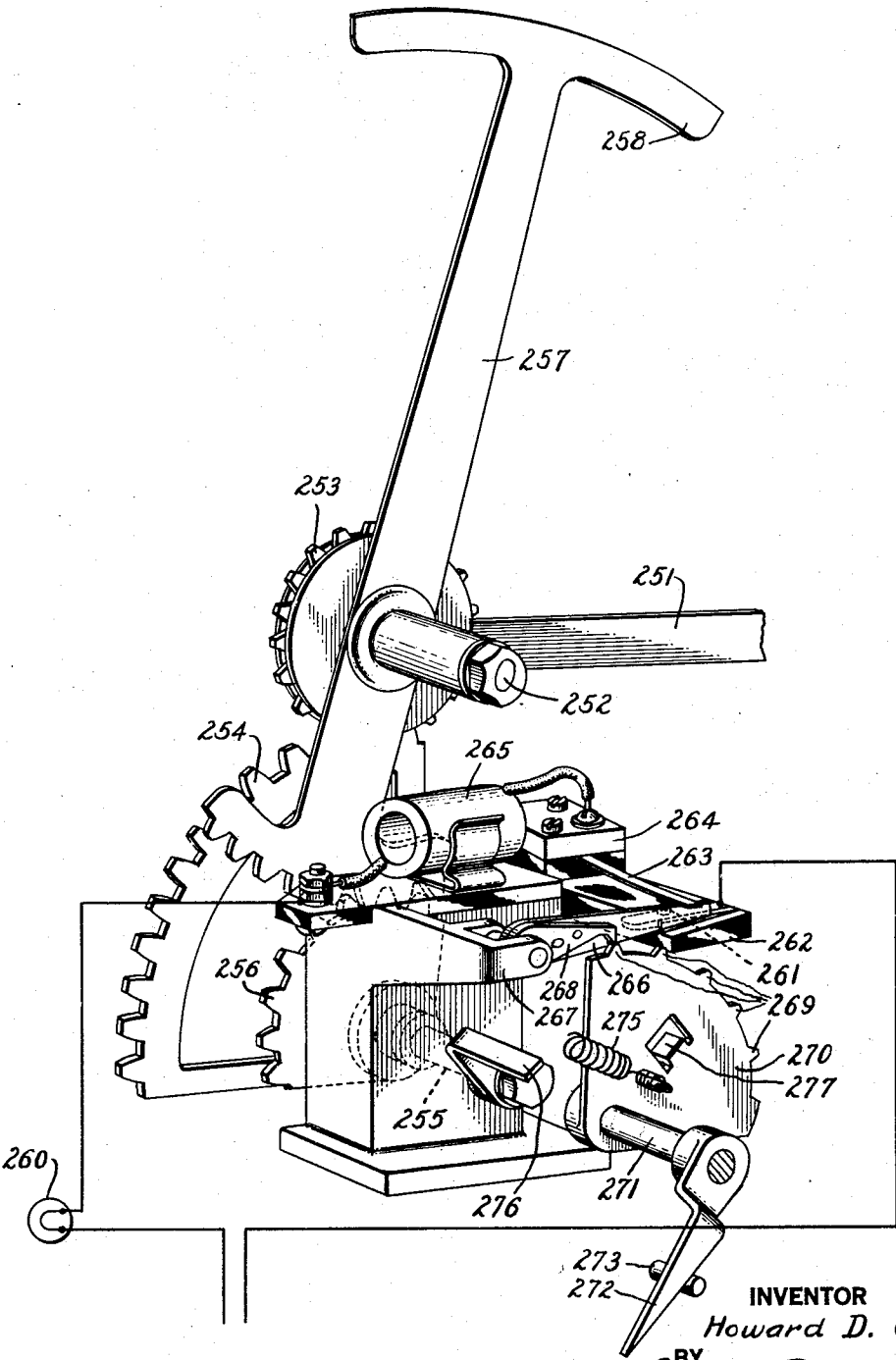
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Fig. 29.



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UNITED STATES PATENT OFFICE

2,232,166

STORING TRANSMITTER

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Application April 11, 1938, Serial No. 201,293

46 Claims. (Cl. 178—17.5)

The invention relates to improvements in storing transmitters of the general type shown in the patent to Howard D. Colman, No. 1,962,136, granted June 12, 1934, in which signals set up intermittently by the manual control of a keyboard are temporarily stored in varying numbers on a storage medium and transmitted therefrom at a uniform rate.

One object of the invention is to provide an improved storing transmitter of the above general character embodying novel features of construction which render its operation more efficient and reliable and which materially increase the speed and accuracy with which signals may be recorded by the operator for subsequent automatic transmission.

Another object is to provide an improved signal recording mechanism of general utility embodying novel means for preventing the recording of more than one signal upon the storage medium in the event that a key of the controlling mechanism is held depressed for an abnormal length of time.

The invention also aims to provide novel means for locking the keys of the keyboard control mechanism against operation until the signal designated by a previously operated key has been properly recorded on a signal storing medium.

Another object is to provide improved means for automatically locking the signal recording mechanism against further operation when the storage medium becomes completely filled with signals awaiting transmission.

Another object is to provide improved means for indicating the amount of message matter in storage in storing transmitters of the above type.

Another object is to provide novel means for temporarily freeing the signal storing medium from the control of the signal recording mechanism to permit continuous operation of the transmitter for testing purposes or the like.

Still another object is to provide, in a storing transmitter having transmitting mechanism arranged to operate in conjunction with a rotary distributor, a novel control means for insuring operation of the transmitting mechanism and distributor in proper timed relation.

A further object is to provide improved means by which the operation of the transmitting mechanism may be interrupted and restarted manually.

Other objects and advantages of the invention will become apparent from the following detailed

description taken in connection with the accompanying drawings, in which:

Figure 1 is a front elevational view of a storing transmitter embodying the features of the invention, a portion of the outside cover being broken away to show the general arrangement of the parts.

Figs. 2 and 3 are right and left hand elevational views, respectively.

Fig. 4 is a rear elevational view.

Fig. 5 is a plan view.

Fig. 6 is a sectional view taken along the line 6—6 of Fig. 1.

Fig. 7 is a sectional view taken along the line 7—7 of Fig. 6.

Fig. 8 is a sectional view taken along the line 8—8 of Fig. 5.

Figs. 9 and 10 are sectional views taken, respectively, along the lines 9—9 and 10—10 of Fig. 8.

Fig. 11 is a fragmentary perspective view of the signal recording mechanism.

Fig. 12 is a sectional view taken along the line 12—12 of Fig. 13.

Figs. 13 and 14 are detail views of parts of the signal recording mechanism.

Fig. 15 is a fragmentary perspective view of the signal recording mechanism.

Figs. 16 and 17 are detail front and side views of the recording medium or pin chain.

Fig. 18 is a perspective view and wiring diagram of the transmitting mechanism.

Fig. 19 is a fragmentary perspective view of the transmission controlling mechanism.

Figs. 20, 21 and 22 are detail views of the mechanism shown in Fig. 19.

Fig. 23 is a sectional view taken along the line 23—23 of Fig. 9 showing the relation between the pin pushers and the reader car.

Fig. 24 is a sectional view taken along the same line as Fig. 23 showing the reader car in an advanced position.

Fig. 25 is a sectional view taken along the line 25—25 of Fig. 10.

Fig. 26 is a sectional view taken along the same line as Fig. 25 showing the reader car in a different position.

Fig. 27 is a detail view of the keyboard locking mechanism.

Fig. 28 is a detail view of one end of the chain car showing the chain tensioning mechanism.

Fig. 29 is a perspective view of the storage indicator mechanism.

By way of illustration, the invention has been shown embodied in a device for storing and

transmitting telegraphic signals, but it is to be understood that many of the features may be used to advantage in other devices in which signals set up by means of a keyboard are temporarily stored in mechanical form prior to effecting a selective or controlling operation. It is also to be understood that the invention is susceptible of various modifications and alternative constructions, and that the illustrative embodiment shown in the drawings and described in detail in the specification, is not intended to limit the invention to the specific form disclosed, it being my aim to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

General construction

The storing transmitter selected to illustrate the invention comprises generally a signal storing medium preferably in the form of a pin chain 1 (Figs. 1 to 7) for storing signals in mechanical form, a keyboard-controlled mechanism 2 for recording signals on the storage medium, and a transmitting mechanism 3 operative to translate the stored signals into electrical impulses and to transmit the same over a telegraph circuit. The storing medium, recording mechanism and transmitting mechanism, together with suitable driving, control and supervisory devices, are assembled in a compact unit mounted on a suitable base 4 and enclosed by a cover or casing structure 5 preferably of sheet metal. As herein shown, the base 4 is of hollow, generally rectangular construction and is arranged to provide an oil reservoir from which oil is distributed to the various moving parts of the machine to lubricate the same. The gears and clutches of the drive mechanism are enclosed in a suitable auxiliary housing 6 in which the parts operate submerged in oil thereby insuring proper lubrication and tending to maintain the friction surfaces of the clutches in condition for proper operation at all times.

Signal storing medium

In the preferred embodiment of the invention, the signals are selected by means of a manually operable keyboard 6 and are stored mechanically on the signal storing medium or pin chain 1 composed, in the present instance, of approximately two hundred and fifty links. Each link comprises a pair of elongated narrow bars 7 (Figs. 16 and 17) arranged side-by-side in closely spaced relation and pivotally connected at opposite ends to the bars of adjacent links. Spaced longitudinally of each link and therefore transversely of the chain is a row of five axially movable pins 8 adapted to be shifted selectively to represent various preconcerted signal combinations. The pins 8 are arranged to be frictionally held by pressure of a spring 9 in either of two positions which may be conveniently designated as the pushed and non-pushed positions.

The chain is preferably arranged in the form of an endless loop having elongated opposed runs connected at opposite ends to form arcuate bights. This loop is supported for movement with and also relative to a circular car 10 forming almost a complete circle and comprising two segmental plates 10 and 11 (Fig. 18) rigidly held in parallel spaced relation and supported for rotation about a horizontal axis by paired rollers 12. The latter are carried on brackets 13 (Figs. 2 and 4) at opposite sides of the base 4, and

the spacing of the roller pairs 12 is such that the car extends substantially below the upper side edges of the base 4 so that a portion of the chain carried thereby is submerged in the oil stored in the base. Thus the chain in its movements serves to carry the oil to the upper part of the machine for distribution to the bearings of the various moving elements.

As will be seen by reference to Figs. 6 and 18, the outer run of the elongated chain loop extends around and its opposite side edges are guided by the flanged outer edges of the plates 10 and 11. The inner run of the loop is guided by four pairs of rollers 14 (Fig. 18) rotatably supported on the radially projecting arms of a spider 15 as best shown in Figs. 1 and 4. Rollers 16 and 17 (Figs. 23, 24 and 28) journaled at opposite ends of the car support the chain loop and define the closed ends or bights thereof. The rollers 16 are in the form of sprockets with teeth of the same pitch as the pitch of the chain so that the movements of the chain and car are accurately coordinated as will appear presently.

As shown in Fig. 28, the rollers 17 are journaled in a block 19 slidably supported between the plates 10 and 11 and yieldably urged toward the end of the car by a compression spring 20 interposed between a spacing member 21 rigid with the plates and a nut 22 threaded onto the end of a rod 23 anchored to the block 19. The spring 20 thus maintains the chain under proper tension at all times, the tension being adjusted by turning the nut 22.

The chain car and rollers 14 thus maintain the chain loop in the form of a letter C with the closed ends of the loop disposed closely adjacent each other and adapted to travel around a circular path with the bodily movable car. With the chain loop thus mounted, substantially the entire length of the chain may be utilized for signal storage by associating the pin setting elements of the signal recording mechanism and the pin feeling elements of the transmitting mechanism with opposite runs of the loop and locating these elements externally of the loop.

The movements of the pin chain relative to the recording and transmitting mechanisms are governed by the operation of these mechanisms substantially in the manner set forth in said prior Patent No. 1,962,136. With the recording mechanism in operation and the transmitting mechanism idle, the chain remains stationary at the transmitting point and is advanced relative to the recording point. In this operation, the chain supporting car and the closed ends of the chain loop move in a clockwise direction as viewed in Figs. 23 and 24. When the recording mechanism is idle and the transmitting mechanism is in operation the chain is held stationary at the signal recording point and advanced past the transmitting point. Under these conditions, the chain car is moved in the reverse direction and through one half the distance of such chain advance. On the other hand, when both the transmitting and recording mechanisms are operating at exactly the same speed, the chain is advanced past the recording and transmitting points at the same rate and the chain car remains stationary.

Keyboard mechanism

The keyboard mechanism 6 by which the signals are set up for recording on the storage medium comprises a group of manually operable keys 26. The keys when operated initiate the

operation of power driven means for advancing the storage chain and, through suitable permutation selector mechanism, control a series of pin-setting elements or pin pushers for pushing the chain pins out of nonpushed or blank position.

As shown in Figs. 5 and 6, the keys 26 are carried on horizontally disposed key levers 27 pivoted on a shaft 28 extending transversely of the machine at the rear of the keyboard. In the preferred form of the mechanism, each key lever is provided with a coiled tension spring 29 tending to hold the key lever in a raised position. To provide for adjusting the tension of the key lever springs 29, the springs are anchored to a rod 30 adjustably supported for movement toward and from the key levers by forwardly projecting arms 31 fast on a shaft 32 which is frictionally held in suitable bearings carried by the frame of the machine. Any suitable means such as a wrench adapted to engage a squared section 33 on the shaft may be utilized for rotating the same to move the rod 30 toward or from the key levers.

Pivoted on the shaft 28 adjacent each key lever and individual thereto is an L-shaped control member having an upwardly extending arm 34 and a horizontal arm 35 lying parallel to and closely adjacent the key lever. The upper end of the arm 34 terminates in a transversely disposed elongated bar or flag 36 having an arcuate upper edge suitably notched as at 37 for cooperating with a series of horizontally disposed notched permutation bars 38.

As will be seen by reference to Fig. 6 of the drawings, the flags 36 and permutation bars 38 are so arranged that the bars lie within the notches 37 when the flags are positioned against a rear stop 39 carried at one side of the permutation bar supporting frame 40. In the particular embodiment herein disclosed, the flags are normally held against the stop by individual springs 41 connecting between the horizontal arm 35 of each flag member and a rod 42 adjustably supported by arms 43 on a shaft 44. The shaft 44 is frictionally supported on the frame in the same manner as the key lever adjusting shaft 32 and may be similarly rotated to adjust the tension of the control member springs.

The flags 36 are adapted to be moved forwardly to selectively block the permutation bars 38 upon the operation of the associated key 26. To this end, the key lever 27 is formed with a bent-over lug 45 extending over the horizontal arm 35 of the control member so that when the key lever is depressed, the control member will rock about its pivot shaft 28 and move the flag into controlling relation to the permutation bars.

Clutch release

In the preferred form of the machine, the movement of the flags 36 to operative position is utilized to initiate the operation of power driven means for advancing the pin chain past the signal recording mechanism as hereinbefore mentioned, and for positioning the permutation bars and associated apparatus as will appear presently. The power driven means comprises a start-stop shaft 48 (Figs. 10, 15 and 18) adapted to be driven cyclically through the medium of a friction clutch generally designated by the reference character 49, the arrangement being such that the shaft is rotated through a complete revolution for each key operation.

Referring more particularly to Fig. 15, the clutch 49 includes a driven member 50 connected to the shaft 48 by a suitable spline coupling 51

and adapted to be frictionally driven by a driving member 52. The driving member is in the form of a sleeve rotatably mounted on the frame of the machine and encircling member 50. It is arranged to be rotated continuously by an electric motor 46 (Figs. 3 and 5) through the medium of an idler gear 47 meshing with a gear 54 rigid with the member 52. The face of the gear 54 is recessed to receive a disk-shaped enlargement 53 formed on the member 50, the inner surface of the gear being lined with an annular band 55 of suitable material for frictionally engaging the periphery of the enlargement 53. As will be seen by reference to Fig. 15, the surfaces of the co-acting parts 53, 55, are inclined relative to the axis of the member 50 so that the clutch may be engaged and disengaged by shifting the member 50 longitudinally relative to the member 52.

Suitable clutch actuating mechanism is provided for shifting the driven member 50 into and out of engagement with the driving member 52. As shown in Fig. 15, the actuating mechanism comprises a sleeve 56 threaded onto the member 50 and bearing at one end against a plate 57 on the adjacent end of the driving member. The plate 57 is adjustably supported by an annulus 58 threaded onto the member 52 whereby the relative spacing of the parts may be readily adjusted as required. A coiled spring 59 anchored at one end to a sleeve 60 keyed to the member 50 and at the other end to the sleeve 56 tends to rotate the latter sleeve in a clockwise direction as viewed in Fig. 15. Since the sleeve bears against the plate 57, its rotation is effective to shift the driven member 50 to the right into clutch engaging position.

Disengagement of the clutch is effected by interposing a stop 62 in the path of a finger 63 fast on the sleeve 56. The motion of the sleeve is thus arrested but the driven parts continue to move under their own momentum and, in turning through a fraction of a revolution against the action of the spring 59, retract the driven member 50 so that the disk 53 is withdrawn from engagement with the friction element 55 and held separated while the clutch is disengaged.

The stop 62 comprises a lug formed on a crank arm 64 fast on a rock shaft 65 which is disposed transversely of the start-stop shaft 48 so that the stop may be moved into and out of the path of the clutch finger by rocking the shaft. In order to positively limit the movement of the shaft 48 to one revolution in each operating cycle, a lug 66 on the crank arm 64 is formed with its upper blocking surface disposed above and at one side of the stop 62. The stop and lug are spaced apart slightly less than the width of the clutch finger 63 as shown in Fig. 6, so that one or the other is always interposed in the path of the finger as the crank arm 64 is rocked between its limit positions. Thus, when the crank arm is in operated position, the stop 62 is shifted out of blocking position and the clutch finger 63 will, upon the completion of the rotating cycle of the start-stop shaft, engage the lug 66 and disengage the clutch. Pressure of the clutch finger upon the inclined surface of the lug serves to rock the crank arm back to normal position thereby returning the stop to blocking position. Substantially upon the stop reaching this position, the clutch finger slips over the edge of the lug 66 and moves into engagement with the stop which maintains the clutch disengaged until released in the usual manner at the start of the next operating cycle.

Movement of the stop 62 to release the clutch

finger 63 upon the operation of a key is effected by the spring 59 in the particular form of the mechanism herein disclosed. To this end, the stop and clutch finger are formed with inclined cooperating surfaces so disposed that the pressure exerted by the spring and clutch finger on the stop tends to rock the shaft 65 and thus move the stop out of blocking position. However, such movement of the shaft is normally prevented by a detent 67 (Fig. 11) positioned so as to engage the end of an upwardly projecting arm 68 fast on the shaft 65.

The detent 67 is arranged to be moved out of the path of the arm 68 in response to the operation of any one of the keys 26. As will be seen by reference to Fig. 11, the detent is in the form of an elongated, horizontally disposed flat bar pivoted intermediate its ends on a vertical pivot pin 69. One end of the detent is positioned for engagement with the free end of the clutch release arm 68, the other end lying in the path of an upstanding lug 70 formed on the upper edge of a control bar 71. A coiled spring 72 acts on the detent to maintain it in engagement with the lug 70.

In the preferred form shown, the control bar 71 is slidably supported for endwise movement in the permutation bar supporting frame 40. A coiled tension spring 73 secured between an upstanding arm 74 on the bar and a stationary bracket 75 (Figs. 13 and 14) tends to move the bar to the left as viewed in Fig. 11. Such movement is normally prevented by a detent 76, preferably in the form of an elongated flat spring supported at one end on the bracket 75 and having its other end disposed in the path of an inbent lug 77 projecting forwardly from the arm 74.

Means is provided for moving the detent 76 out of blocking position in response to the operation of any key 26 of the keyboard. In its preferred form, this means comprises a light ball 78 (Figs. 6 and 11) extending transversely across and in front of the group of flags 36. The ball is supported by depending arms 79 on a rock shaft 80 having a horizontally projecting arm 81 extending over the detent 76. When a flag is moved to operative position upon the actuation of its associated key, it engages the ball 78 thereby rocking the shaft 80 and withdrawing the detent from engagement with the lug 77. The control bar is thus free to move under the influence of its spring 73 and, in this movement, actuates the detent 67 to release the start-stop clutch.

Means to prevent repetition of signals

Means is provided to prevent repeated recording of signals on the storing medium in the event that a key is held either fully or partially depressed for a prolonged interval. This means as shown comprises an auxiliary detent 84 (Figs. 11 to 14) in the form of an elongated flat spring supported on the bracket 75 above the detent 76 and extending parallel thereto for engagement with the lug 77. The detent 84 is engaged by the arm 81 and normally held in a raised position out of the path of the lug. However, when the shaft 80 is rocked to release the detent 76, the arm withdraws its support from the auxiliary detent which moves down and, due to its length being greater than that of the detent 76, it rests on the upper edge of the lug.

At the end of the signal recording cycle, the control bar is retracted sufficiently to permit the auxiliary detent 84 to move into the path of the

lug 77 as shown in Fig. 14, assuming that the key which initiated the previous operation is held either fully or partially depressed. The auxiliary detent thus holds the control bar in retracted position and maintains the detent 67 in blocking relation to the clutch release arm 68 so that further rotation of the start-stop shaft is prevented. Upon release of the key, the arm 81 withdraws the detent 84 and permits the detent 76 to return to blocking position as shown in Fig. 13. A suitable stop 85 is interposed between the detents 76 and 84 as shown in Fig. 12 to limit the movement of the same.

Means to prevent false signal recordation

Means is provided for preventing false signal recordation either by "clipping," as when a key is struck with a glancing blow as frequently happens in high speed operation, or by operation of a second key before the signal set up by a previously operated key is properly recorded. To this end, the control bar 71 is arranged so that after its release to initiate an operating cycle it is effective to hold an actuated control member or flag in advanced position independently of the actuating key until the signal designated thereby is properly recorded and to prevent forward movement of a second flag. For this purpose, the control bar is formed with a plurality of notches 86 (Fig. 11) arranged to align with the flags 36 when the bar is in normal rest position. An upstanding lug 87 on each flag is adapted to pass through the corresponding notch 86 when the flag is moved forwardly to operative position upon the depression of the associated key.

When the control bar is released, the notches 86 are moved out of the path of the lugs 87 so that the flag which initiated the release of the bar is held in its advanced position until the control bar is retracted following the recordation of the signal. This arrangement insures that the flag will be held in operated position for the interval required to record the signal even though the key is released immediately after being depressed or when the key is struck a relatively light, quick blow. As long as the control bar is held in advanced position, the unnotched portion is disposed in the path of the lugs 87 of the unoperated flags which are thus prevented from moving forwardly to operative position in the event that their associated keys are depressed. Thus recordation of a false signal on the control medium by premature depression of a second key is effectively prevented.

Signal recording mechanism

Signals are recorded on the storage chain by a set of pin pushers, one for each pin in a row, arranged for actuation by the permutation selector mechanism controlled through the medium of the manually operable keyboard. In the embodiment of the invention herein disclosed, provision is made for utilizing a five-unit code signal, hence five pushers are provided for co-operating with the five pins carried by each link of the chain 1. As shown in Figs. 6, 7, 11 and 15, the pushers comprise elongated bars 90 slidably supported by spaced horizontally disposed combs 91 for endwise movement toward and from the inner run of the chain.

Each pusher 90 is operatively connected with one of the five permutation bars 38 which are supported in parallel relation for endwise movement by spaced combs 92 carried on the station- 75

ary frame 40 at one side of the pusher assembly. As herein shown, the operative connection between a pusher and its associated permutation bar is provided by a rock shaft 93 extending transversely of the same and having rigidly attached levers 94 and 95 engaging in notches 96 and 97 formed in the pusher and bar respectively. The lever 95 is preferably somewhat shorter than the lever 94 so that the pusher may be moved through a stroke of sufficient length to properly set a pin while the permutation bar is moved through a relatively shorter stroke. Coiled tension springs 98 acting on the levers 94 tend to rock the shafts 93 in a clockwise direction as viewed in Fig. 11 and thus shift the pushers in a direction to push the chain pins out of non-pushed or blank position as shown in Fig. 17.

Power actuated means is provided for retracting the pushers and permutation bars against the action of their associated springs and for controlling the release thereof to record a signal combination on the chain. The retracting means comprises a crank arm 99 (Fig. 15) fast on the start-stop shaft 48 and connected by a link 100 with a crank arm 101 fast on a rock shaft 102. The rock shaft 102 carries a pair of upstanding arms 103 (Figs. 6 and 15) between which is pivoted a square bar 104 underlying the pushers and constituting a bail for engaging depending lugs 105 (Figs. 7 and 11) thereon to shift the pushers rearwardly. When the start-stop shaft 48 is in normal rest position as shown in Fig. 15, the bail is held in a forward position so that the pushers are free to move forwardly under control of the permutation bars. As the shaft 48 turns through the first half of its revolution, the shaft 102 is rocked in a clockwise direction as viewed in Fig. 15 and the bail 104 operates to retract any of the pushers 90 and permutation bars 38 that may be in advanced position. Continued rotation of the shaft 48 returns the bail toward rest position but the pushers do not follow the return movement due to their operative connection with the permutation bars which are held in retracted position by suitable latch means.

The means for latching the permutation bars in retracted position comprises a detent 106 (Figs. 5, 9 and 11) carried by a rock shaft 107 extending transversely of the permutation bars and engageable with upstanding lugs 108 on the bars. Rigidly secured to the rock shaft is a crank arm 109 connected by a link 110 with a horizontally projecting arm 111 formed integrally with or rigidly secured to the clutch release arm 68. When the detent 67 is moved out of the path of the arm 68, the arm is rocked in the direction of the detent by the clutch finger as above described, the arm 111 moving with the arm 68 and operating through the link 110 to move the detent 106 out of the path of the lugs 108. The permutation bars and pushers are thereby free to move forwardly under the selective control of the flags 36. A tension spring 112 acting on the crank arm 109 returns the detent to latching position and likewise returns the clutch release arm to stop position when the pressure of the clutch finger is released from the stop 62.

The bail 104 is also utilized to retract the control bar 71 in each operating cycle. To this end, a restoring bar 113 generally similar to the pushers 90 is mounted adjacent thereto for endwise sliding movement. The bar 113 is provided with a pair of depending lugs 114 (Figs. 7 and 15) ly-

ing on opposite sides of the bail 104 whereby the bar is moved forwardly and backwardly with the bail. A one-way connection between the bar 113 and the control bar is provided by a rock shaft 115 (Fig. 11) extending parallel to the shafts 93 having a lever 116 engaging in a notch 117 in the bar 113 and a lever 118 adapted to engage an upstanding lug 119 on the control bar. With this construction, the control bar and the restoring mechanism are disassociated when the bar is in retracted position. The spring 73 is therefore required to move only the bar and, due to its relatively light weight construction, the movement is effected at high speed and yet with a minimum of shock.

The crank arm 99 and link 100 are arranged to invariably stop the shaft 48 in a dead center position (Fig. 15) with the clutch 49 completely released. For this purpose, the link 100 is formed with a depending arm 120 (Fig. 15) pivoted to one end of a rod 121 yieldably secured to the frame of the machine by a coiled tension spring 122. The spring thus acts through the link and crank arm to stop the shaft in the proper position or to return it thereto in the event of overrun after the clutch is released.

Blanking mechanism

Before presentation to the pushers 90, each row of pins 8 is blanked, that is, the pins are restored to non-pushed position as shown in the case of the upper and lower rows of pins in Fig. 17. Blanking is effected simultaneously with the retraction of the pin pushers 90 by the action of a blanking member 123 (Fig. 15) which, as herein shown is in the form of a wedge-shaped plate having one end rigid with a rock shaft 124. A crank arm 125 fast on the shaft is connected by a link 126 to one of the arms 103 on the pusher restoring rock shaft 102. Thus, when the shaft 102 is rocked to restore the pushers, the blanker arm is shifted in a direction to engage a set of the chain pins and move the pins outwardly to blank position.

Means for erasing recorded signals

Suitable means is provided for enabling the operator to erase an incorrectly recorded signal such as results from striking the wrong key. For this purpose, an eraser in the form of a flat plate 128 (Figs. 6, 7 and 9) is slidably mounted in suitable guides above the pin pushers 90 so as to line up with the row of pins last engaged by the pushers. The plate 128 is connected at its rearward end to an arm 129 fast on a shaft 130 on which is mounted an arm 131 connected by a link 132 with an arm 133 on a shaft 134. A tension spring 135 acting on the arm 131 tends to hold the eraser in retracted position.

The shaft 134 is arranged to project through the front cover plate of the machine adjacent the keyboard 6 and is provided with a manually operable lever 136 (Fig. 1) by which it may be rotated to move the eraser forwardly against the action of the spring 135 to push any unpushed pins in the row with which it is aligned. Thus, the operator may erase an incorrectly recorded signal to prevent its transmission by the transmitting mechanism.

Chain advance during pin setting

In each operating cycle of the signal recording mechanism above described, the inner run of the pin chain is advanced past the pushers 90 in an upward direction as viewed in Figs. 7 and 15. The

chain advance is effected in steps equal in length to the pitch of the chain so as to position a blank row of pins opposite the pushers for recordation of the next signal. The advance is produced by sprocket wheels 139 which engage the side edges of the chain at a point where the chain is guided in a way formed by inwardly facing channels 140 in side members 141 of the supporting frame as shown in Figs. 7 and 9.

The sprockets 139 are fast on a horizontal shaft 142 which is driven from the start-stop shaft 48 (Fig. 18) through a suitable speed reducing gear train interposed between a driving gear 143 on the start-stop shaft 48 and a gear 144 on the shaft 142 (Figs. 4, 7, 10 and 18). In the particular embodiment illustrated, the gear train comprises two pairs of gears 137 and 137^a, 138 and 138^a, and idler gear 145, (Figs. 4, 7, 10 and 18), the pairs of gears being fast on shafts 137^b, 138^b, respectively, journaled in the frame of the machine. The idler gear 145 is carried on a shaft 145^b. The gear 137 meshes with the driving gear 143 on the start-stop shaft and gear 137^a meshes with gear 138. Gear 138^a meshes with idler gear 145, which in turn meshes with the gear 144 on the sprocket wheel shaft. By reason of this geared driving connection, the chain is advanced in timed relation to the retraction of the pushers 90 by the crank arm 99 of the start-stop shaft. Due to the positioning of the crank arm, the pushers are retracted substantially simultaneously with the start of the chain advance so that the chain pins are not dragged across the faces of the pushers.

Means for disabling chain drive mechanism

Means is provided for temporarily disabling the chain drive mechanism at the recording position to permit the chain to run freely there-through for the purpose of repeatedly transmitting signals recorded on the chain as when testing a line. While any suitable clutch means may be employed for this purpose, the preferred construction comprises an arrangement whereby the intermediate gear 145 of the chain drive gear train may be withdrawn from mesh with its companion gear 144 to interrupt the chain driving connection.

As shown in Figs. 6 and 9, shaft 145^b on which the gear 145 is mounted is slidably supported on the frame members 141 for endwise movement. Manually operable means is provided for moving the shaft 145^b between active and inactive positions. In the present instance, this means comprises a rock shaft 147 (Figs. 6 and 7) having one end projecting through one side wall of the base 4 and carrying an operating lever 148 (Fig. 3) by which the shaft may be rotated between two positions corresponding to the two positions of the shaft 145^b. An over-center device comprising a tension spring 149 (Fig. 6) connected by an arcuate link 150 with a crank arm 151, fast on the shaft 147, operates to hold the shaft in either of its two positions.

Fast on the inner end of the shaft 147 is a gear sector 152 (Figs. 6 and 7) adapted to mesh with the toothed lower end of an arm 153 pivoted at 154 on the frame of the machine, the gear sector operating to rock the arm about its pivot in response to rotation of the shaft. The upper end of the arm engages in a groove in a collar 155 rigid with the intermediate gear shaft 145^b. Thus, the shaft 145^b may be shifted manually to move the intermediate gear 145 into or out of mesh with the gear 144 to render the

chain driving mechanism effective or ineffective as required.

With the chain advancing mechanism at the recording position disengaged, the chain advancing mechanism at the transmitting position will therefore be effective to advance the chain past both positions. Accordingly, the chain may be run past the feeler mechanism to transmit previously recorded signals repeatedly while the recording mechanism remains idle. Such transmission provides a convenient means of testing lines or other equipment to determine whether or not they are in proper operating condition.

Transmitting mechanism

The signals mechanically recorded upon the storage chain in the manner above described are utilized, in the present instance, to control the actuation of a series of switches 161 (Fig. 18) which determine the polarity of the current applied to the transmitting contacts 162 of a conventional rotary distributor. It will be appreciated, of course, that the stored signals may be utilized to control devices other than switches to effect a selective operation, and that the switches themselves may be used for other than the transmission of telegraph signals if desired.

In the particular embodiment herein shown, the switches 161 are of the bipolar type and each comprises an insulated contact strip 163 movable between two contact elements 164 and 165. The contact elements 164 are mounted on a common metal plate 166 connected to a suitable source of current of one polarity as, for example, one pole of a battery 167, while the contact elements 165 are carried on flat springs 168 connected by a common clamping member 169 to the other pole of the battery.

Each contact strip 163 is connected to one of the stationary distributor contacts 162 so that the polarity of the contacts is varied in accordance with the position of the contact strips. A rotating distributor arm 171 engages the contacts 162 successively to connect the contacts to a telegraph circuit or line 172 whereby signal impulses are transmitted over the line in well known manner.

Switch actuating mechanism

The switches 161 are actuated selectively in accordance with the setting of the pins 8 in the row operatively associated with a pin-feeling mechanism. The feeling mechanism comprises a set of five feelers in the form of horizontally disposed bars 175 (Figs. 18 and 23) having offset, laterally projecting arms 176 arranged for operative association with the respective pins in any one transverse row. The bars 175 are slidably supported in parallel guideways formed by a movable frame 177 conveniently called the reader frame, (Figs. 23 to 26) pivoted to swing about a horizontal axis.

The pivotal axis of the frame is spaced laterally of the feelers to enable them to swing around the closed end of the chain loop and thereby feel the pins next beyond the row aligned with the eraser 128. For this purpose the frame is provided at one end with a laterally projecting arm 178 carrying a pivot pin 179 adapted to be supported in a bearing 179^a (Fig. 18) of the machine frame at one side of the pin chain 1. A bracket 178^a (Figs. 10 and 19) secured to the other end of the frame 177 on the opposite side of the chain supports the other end of the frame

on a shaft disposed in axial alignment with the pivot pin 179.

The movements of the feeler bars 175 are transmitted to the switches through the medium of arms 180 (Figs. 18 and 25) which project laterally from the respective bars and terminate on the pivotal axis of the frame 177. The ends of the arms 180 are disposed within the bifurcated ends of lugs 181 which project upwardly in a common plane from a set of five slides 182 slidably supported for endwise movement toward and from the switches 181. Each of the slides is formed with a forwardly projecting rod-like member 183 extending through suitable apertures in a pair of spaced parallel frame members 184 and having a suitable tip 185 adapted to engage the movable switch member or strip 186 of one of the switches 181. A compression spring 186 interposed between one of the frame members 184 and a collar 187 rigid with the rod tends to shift the slide 182 in a direction such as to move the tip out of engagement with the switch member thereby permitting the switch member to engage the contact 184. The movement of the slide is transmitted to the associated feeler through the medium of the connection provided by the arms 188 and 181 whereby the feeler arm 176 is brought into operative engagement with the chain pin 8 providing the pin is in unpushed position. Thus, unpushed pins are enabled to block the slides 182 against movement so that the switch members are held in engagement with their associated contacts 185 while pushed pins are ineffective to block the slides thus and permit the switch members to engage their associated contacts 184.

The slides 182 and feelers 175 are normally held in an advanced position by means of a pivoted ball 188 (Figs. 10 and 18) arranged to be retracted periodically to allow the slides and feelers to move under the influence of their respective springs as above described. To this end, the ball is connected by a rod 189 with a pivoted lever 190 carrying at its free end a cam follower 191 cooperating with a cam 192 fast on a cyclically operated shaft 193. A spring 193^a acting on the lever 190 holds the follower in engagement with the cam.

The shaft 193 is arranged to be driven in timed relation to the movement of the distributor arm 171 through the medium of a clutch 194 (Figs. 10 and 18 to 20) adapted to be controlled by the distributor. The clutch may be of the same type as the clutch 49, hereinbefore described, and includes a driving member 195 and a driven member 196 gear connected to the shaft 193. A gear 195^a rigid with the member 195 is arranged to mesh with the motor driven gear 47 so that the clutch member is rotated continuously. The driven member of the clutch is provided with a finger 197 (Figs. 19 to 22) adapted to cooperate with suitable stops to engage or disengage the clutch.

Distributor control of clutch

In order to synchronize the operations of the pin feelers and switch actuating slides with the movements of the distributor arm, the clutch 194 is arranged to be controlled by an impulse produced by the distributor arm in engaging a so-called "cadence" contact 198 (Fig. 18). Engagement of this contact closes a circuit through the winding of an electromagnet 199 (Figs. 18 and 19) having an armature 200 pivoted at 201 for

movement transversely of the path of the clutch finger 197. The armature is formed with a pair of laterally spaced offset forwardly extending arms 202, 203 constituting stops adapted to be interposed in the path of the clutch finger to disengage the clutch. The stops are so arranged that the driven member of the clutch is limited to a single revolution in each operating cycle, one stop acting to block the finger when the magnet is energized and the other acting when the magnet is deenergized. Due to the spacing of the arms, the clutch finger is released only when the magnet armature moves from deenergized to energized position.

Presentation of signals to feelers

In the ordinary operation of the storing transmitter, successive rows of pins 8 are presented to the feelers by the advance of the outer run of the chain relative to the feelers either with or independently of the movement of the chain car depending on whether or not the signal recording apparatus is in operation. When the signals in storage are reduced to the point at which the chain car has reached its limit position as defined by a limit stop 170 (Figs. 4, 6 and 7), the frame 177 will occupy the position shown in Fig. 23. Assuming that the recording mechanism is inactive, movement of the chain relative to the chain car is prevented by the sprocket 139. Since the chain car can move no further, the portion of the chain associated with the feelers is thus held stationary. Under these conditions, the feelers are advanced around the closed end of the chain loop by swinging the frame 177 toward the pin-setting mechanism as shown in Fig. 24.

The advance of the chain and feeler frame is effected by a common drive mechanism including a horizontal shaft 206 (Fig. 18) coaxial with the pivot of the frame and driven from the start-stop shaft 193 by gears 207 and 208. The shaft 206 is formed to provide a pinion 209 (Fig. 9) which, through speed reducing idler gears 210 and 211 drives a gear 212 fast on a horizontal shaft 213 journaled in the frame 177 and carrying a sprocket wheel 214 which engages one edge of the outer chain run. An over-center device including a tension spring 215 acting on a crank arm 216 fast on the shaft 206 operates to stop the shaft in the same position after each operating cycle.

When there are more than a predetermined minimum number of signals in storage between the recording and feeling points, in this instance nine signals, the oscillatory feeler frame occupies the position shown in Figs. 23 and 25 with the feeler arms 176 diametrically opposite the pin pushers 90. With the frame thus positioned, rotation of the sprocket 214 in a clockwise direction as viewed in Fig. 23 will advance the outer run of the chain past the feelers in a direction to shorten the length of the chain between the recording and feeling points. The successive rows of pins are thus presented to the feelers by movement of the chain relative to the stationary frame.

When the number of signals in storage has been reduced below the predetermined minimum number, the chain supporting car will have reached its limiting position and the closed end will be positioned as shown in Figs. 23 and 24. Rotation of the sprocket 214 accordingly swings the frame 177 about its pivot in a direction toward the pin pushers, new rows of pins being

thus presented to the feelers by movement of the frame relative to the chain. This movement of the frame may continue until the feelers are operatively associated with the pins of the row next beyond the eraser 128 as shown in Fig. 24.

Automatic interruptions and restart of transmission

Suitable means is provided for automatically terminating the distributor control of the chain and frame advancing clutch and for preventing untimed release of the clutch when all of the signals in storage have been transmitted. To this end, the frame 177 is rendered operative as the last signal in storage is transmitted, to actuate a device herein termed a spacing detent adapted to interrupt transmission by appropriately controlling the clutch 194. In the present instance, the frame 177 carries a projecting pin 218 (Fig. 19) which, as the frame approaches the position shown in Fig. 24, is adapted to engage a lever 219 fast on a shaft 220 which carries at its outer end a lever 221 to which is attached a plunger 222. The plunger is slidably supported on a suitable guide 222^a (Fig. 8) and its lower end is adapted to engage an offset lug 223 formed on a pivoted spacing detent 224. A tension spring 225 (Figs. 8, 19 and 21) acting on an arm 226 rigid with the shaft 220 tends to rotate the shaft in a direction such as to move the plunger out of engagement with the detent.

Loosely mounted on the shaft 220 adjacent the arm 221 is a finger member 227 which is urged downwardly against a stop lug 228 on the arm by a spring 229. The outer end of the finger is inclined forwardly and downwardly and terminates in an ear 230 adapted to engage a lug 231 formed on an upwardly extending side member 232 of the spacing detent 224 when the detent is in its normal position as shown in Fig. 19.

The parts are so arranged that, as the next to the last available row of pins is read, the shaft 220 is rocked in a clockwise direction by the action of the pin 218 of the feeler frame and the plunger 222 engages the lug 223 to rock the spacing detent about its pivot. The finger 227 follows the arm 221 in its downward movement until stopped by the lug 231, but the arm 221 and plunger 222 continue to move downwardly, and upon the reading of the last row of pins, the detent becomes disengaged from the ear 230 (Fig. 22). Thus the finger 227 is released to the action of its spring 229 to impart a rapid movement to the detent by the cam action of its inclined outer end and the detent moves out of engagement with the plunger and into operated position.

The spacing detent carries a stop 233 which, when the detent is moved to operated position, is interposed in the path of the clutch finger 197 at a point substantially diametrically opposite to the stop 202. During the movement of the detent, the clutch finger will have traveled approximately one-half revolution and comes to rest against the stop 233 where it rests until the reader frame 177 is returned toward normal position by the recording of additional signals on the chain. As the frame moves back, the plunger 222 is first raised due to the action of the spring 225 and, through the action of the stop lug 228, the finger 227 is moved out of holding engagement with the lug 231 of the spacing detent.

Suitable latch means is provided for retaining the spacing detent in operated position after the withdrawal of the finger 227 and until the

distributor reaches a point in its operating cycle at which transmission of signals may be properly initiated. As shown in Figs. 19 to 22, the latch means comprises a rod or link 234 secured at one end to the side member 232 of the spacing detent and arranged to project forwardly over the magnet armature 200. The link is formed with an enlarged end portion 235 on which are formed four downwardly projecting escapement teeth 236 adapted to operatively engage an upstanding tooth 237 on the armature 200 and thus hold the spacing detent in operated position against the action of its restoring spring 238. The four escapement teeth 236 of the latch device are staggered as shown in Fig. 20 so that a plurality of beats of the armature 200 are required to fully release the spacing detent upon the first energization and deenergization of the magnet 199 following the recordation of signals on the pin chain and the consequent movement of the feeler frame away from its limit position, the tooth 237 slips off of the first tooth 236 and engages the second tooth 236 as the armature is operated and then slips into engagement with the third tooth 236 when the armature is released. The link 234 is permitted to move back somewhat in this operation but not sufficiently to withdraw the stop 233 from the path of the clutch finger. Upon the next beat of the magnet, the tooth 237 engages the last tooth 236 when the armature is operated, and on moving out of such engagement upon release, frees the latch so that the spacing detent may be fully retracted by its spring 238. The stop 233 is thus moved out of the path of the clutch finger 197 permitting the clutch to rotate until stopped by engagement of the finger with the stop 202. Normal transmission is resumed upon the next beat of the magnet as above described.

Manual interruption of transmission

Means is provided for enabling the operator to interrupt signal transmission in any operating cycle of the transmitting apparatus. This means comprises a link 241 (Fig. 21) slidably supported in guides 242 and 242^a (Fig. 8) and having a hooked end portion 243 adapted to engage a projection 244 on the spacing detent. The link is formed with a notch 245 which drops over the edge of the guide 242 when the link is withdrawn to the left as viewed in Fig. 8 and holds the link in this position against the action of a tension spring 246 tending to move the link to the right. With the link in this position, the spacing detent is rocked into operated position and the stop 233 is interposed in the path of the clutch finger 197.

The means for shifting the link 241 into latched position comprises a rock shaft 247 journaled in the frame of the machine and having one end projecting through the casing 5 at one side of the keyboard as shown in Fig. 1. A manually operable lever 248 fast on the projecting end of the shaft provides means for rocking the shaft between "on" and "off" positions. Mounted on the inner end of the shaft 247 is a double ended finger 249 one end of which is adapted to engage a notch 250 in the link 241 and shift the link to the left when the shaft is rocked to "off" position. The other end of the finger 249 is adapted to engage the end of the link and raise the notch 245 out of latching engagement with the guide 242 when the shaft is rocked to "on" position, thus releasing the spacing detent to the control of the escapement mechanism 236, 237. The latter mechanism releases the detent in the manner above described

so that transmission is resumed in synchronism with the distributor.

Signal storage indication

In order to facilitate supervision of a group of storing transmitters, each machine is equipped with means for providing a visual indication of the amount of message matter, that is, the quantity of signals in storage, and for operating a distinctive signal when the stored signals fall below a predetermined minimum which may be varied according to the requirements of each particular installation.

As herein shown, the indicating and signal control mechanisms are operated by movements of the storage chain car as signals are recorded on or transmitted from the chain as above described. To this end, an arm 251 (Figs. 4 and 29) is pivoted at one end on a stud 252 concentric with the axis of rotation of the storage chain car and secured at its other end to the car adjacent the end carrying the chain supporting sprockets 16. Rigid with the arm 251 is a pinion 253 adapted to engage a gear sector 254 mounted on a horizontally disposed shaft 255. Rigid with the gear sector 254 is a second gear sector 256 adapted to engage the toothed lower end of an arm 257 loosely mounted on the stud 252. The arm is formed with an enlarged arcuate end portion 258 constituting a visual indicator which is positioned behind a window 259 (Figs. 1 and 2) in the front wall of the casing 5.

Any suitable indicia for designating the number of signals in storage may be provided on the indicator. As herein shown, the end portion 258 is divided lengthwise into a plurality of equal sections each painted a different color designating a predetermined number of signals in storage on the chain. As the chain car turns about its axis, the arm 257 is rocked proportionately by the action of the pinion 253 and gear sectors 254 and the differently colored sections of the indicator 258 are thus moved into register with the window 259. Thus, the operator or supervisor by merely noting the color displayed through the window can determine the approximate amount of message matter in storage on the pin chain.

When the number of signals in storage approach the point at which the keyboard is automatically locked, that is, when the supply of blank links is exhausted, the attention of the operator or supervisor is called to this condition by the operation of suitable signal means which, in the present instance, comprises an electric lamp 260 (Fig. 29). As herein shown, the energizing circuit of the lamp is held open and the lamp unlighted as long as there are less than the maximum number of signals in storage. When the signals exceed this number, the lamp circuit is closed automatically to light the lamp.

The means for controlling the lamp circuit comprises a switch having a fixed contact 261 carried on an insulating plate 262 and a movable switch member in the form of a flat spring 263 supported at one end on a bracket 264 so that the tension of the spring tends to hold it in engagement with the contact 261. The switch and a suitable resistance 265 are connected in series in the lamp circuit which may be supplied with current from any suitable source.

The switch is controlled through the medium of a lever 266 of insulating material pivoted at one end on a bracket 267 and having its other end underlying the spring 263. Rigid with the lever 266 is a second lever 268 adapted for en-

gagement with one of a plurality of spaced teeth 269 formed on the arcuate edge of a segmental member 270 which is mounted on a horizontal shaft 271 supported in axial alignment with the shaft 255. When the lever 268 is in engagement with one of the teeth 269, the lever 266 raises the movable switch member out of engagement with the contact 261 thereby interrupting the circuit of the signal lamp. Conversely, the switch member is permitted to move into switch closing position when there is no tooth in position to engage the lever 268.

As herein shown, the shaft 271 is arranged to project at the back of the machine and is provided with a rigid finger 272 (Fig. 4) by which it may be rocked to move the teeth 269 into operative position selectively. This position is defined by an adjustable stop in the form of a pin 273 adapted to be set in one of a plurality of spaced apertures 274 in the frame of the machine. In the present instance, six apertures corresponding to the six teeth 269 are provided. The spacing of the apertures is such that when the stop is in the first aperture, for example, the first tooth 269 will be positioned in engagement with the lever 268, with the stop in the second aperture, the second tooth will be in operative position, and so on. A tension spring 275 acting on the segment tends to hold the arm in engagement with the stop.

Fast on the shaft 255 which carries the gear sector 254 is an arm 276 adapted upon rotation of the shaft to engage a lug 277 formed on the segment 270 thereby rocking the segment in a clockwise direction to move the tooth 269 out of engagement with the lever 268. Since the movement of the shaft 255 is proportionate to the movement of the chain car and therefore to the number of signals in storage, the segment is shifted to close the signal lamp switch upon the car reaching a predetermined point in its travel. The particular point at which this occurs is determined by the initial position of the segment 270 as defined by the stop 273 or, in other words, by the distance through which the arm 276 must travel before engaging the lug 277. In the present instance, the spacing of the apertures 274 is such that the segment may be adjusted in steps corresponding to fifty links of the chain. Thus, by varying the position of the stop, the signal mechanism can be set so that the signal lamp will be lighted whenever the number of signals in storage exceeds a predetermined number such as 50, 100, 150, 200 or 250 signals.

Full storage stop

Means is provided for locking the signal recording mechanism against further operation when the full capacity of the storage chain is reached. This means comprises an arm 278 (Fig. 27) fast on a horizontal shaft 279 and having a laterally projecting end portion 280 adapted to ride over the arcuate edge of the chain car side plate 10. A tension spring 281 holds the arm in engagement with the plate. The edge of the plate is formed with a notch 282 disposed to receive the end of the arm as the chain car moves into its full storage limit position.

Fast on the other end of the shaft 279 is an arm 283 (Figs. 8 and 27) adapted to be interposed in the path of the clutch finger 63 when the shaft is rocked incident to the arm 278 entering the notch 282. The arm 283 thus acts as a stop for disengaging the clutch 49 and thereby preventing operation of the start-stop shaft 48.

The position of the arm 283 is such that disengagement of the clutch is effected following the recordation of a signal on the last available blank link of the chain, hence the pin pushers 90, permutation bars 38 and control bar 71 are held in advanced position. The latter bar locks the keyboard against further operation in the manner hereinbefore described.

Summary

It will be apparent from the foregoing that the invention provides a signal storing device or storing transmitter of novel and improved construction. The keyboard-controlled signal recording mechanism embodies an advantageous combination and arrangement of elements which prevents false recordation of signals in case a key is held depressed for an extended period or in case a key is operated before the preceding signal has been properly recorded. Moreover, operation of the recording mechanism is prevented when all available links of the pin chain have been used for storing signals.

The improved storing transmitter also embodies novel control and supervisory means operating in conjunction with the transmitting mechanism. This includes means by which transmission may be interrupted and restarted both manually and automatically, together with means for coordinating the operation of the transmitting mechanism with a rotary distributor to insure operation of these elements in proper timed relation after such interruption. Signals recorded on the storage chain may be transmitted repeatedly when desired for testing lines or other equipment of the telegraph system.

The supervisory equipment includes means of an advantageous character for providing a visual indication of the amount of message matter in storage on the pin chain storage medium. Moreover, means is provided for displaying a distinctive signal in the event that the number of signals in storage exceed a predetermined number, which number may be varied at will to suit the particular conditions under which the machine is operated.

I claim as my invention:

1. In a keyboard-controlled mechanism, in combination, a series of permutation elements, a plurality of manually operable key levers, a pivoted control member for each key lever having a flag adapted to control said permutation elements selectively, means providing an operative connection between a key lever and its associated control member for rendering the key lever effective when operated to rock the member and thereby move the flag thereof into controlling relation to said permutation elements, and means cooperating with said control members to prevent the operation of a second member while a previously operated member is in operated position.
2. In a keyboard-controlled mechanism, in combination, a series of permutation elements, a plurality of manually operable key levers, a pivoted control member for each key lever having a flag adapted to control said permutation elements selectively, means providing an operative connection between a key lever and its associated control member for rendering the key lever effective when operated to rock the member and thereby move the flag thereof into controlling relation to said permutation elements, and means cooperating with said control members effective to hold the operated member in controlling position

and to prevent operation of the other control members.

3. In a keyboard-controlled selector mechanism, in combination, a series of permutation elements, a plurality of flags for selectively controlling said elements, a pivoted member supporting each flag and adapted to be rocked about its pivot to move the flag into controlling relation to said permutation elements, a key individual to each member for rocking the member, and a common member operable in response to the actuation of a key and adapted to cooperate with the flag of the actuated key to retain the flag in controlling relation to the permutation elements for a predetermined interval.

4. In a machine of the class described, in combination, a series of reciprocable elements to be operated in permutational combinations, a permutation bar operatively associated with each of said elements and movable therewith, means supporting said bars for endwise movement, means tending to move said bars to an operative position, a detent operative to hold said bars in an inoperative position, a keyboard having a plurality of keys, a control member for each key adapted to be moved into controlling relationship to said permutation bars when the key is operated, a control bar supported adjacent said permutation bars for endwise movement parallel thereto, means for moving said control bar to an operative position upon actuation of any one of said keys, and means on said control bar cooperating with means on the control member of the actuated key for holding the member in controlling relation to the permutation bars for a predetermined interval.

5. In a keyboard-controlled selector mechanism, in combination, a series of permutation elements, a plurality of pivoted control members operatively associated with said permutation elements for selectively controlling the elements, a key individual to each control member adapted when operated to rock the member about its pivot into controlling relation to said permutation elements, a locking bar having a series of slots normally positioned to provide passages for said control members when the latter are rocked about their pivots, and means for shifting said locking bar relative to said control members to withdraw the slots from the paths of said members and thereby prevent operation of more than one control member at a time.

6. The combination of a pin-setting mechanism and a pin feeling mechanism arranged adjacent each other in opposed relation, an endless flexible medium carrying groups of movable pins adapted to be set in signal combinations, said medium being arranged in the form of an elongated loop adapted to move bodily in an endwise direction between said mechanisms, means for advancing said medium past said setting mechanism to present successive groups of pins thereto for setting, means for advancing the medium past said feeling mechanism to present successive groups of set pins thereto, and means interposed between said mechanisms operable to erase the set condition of the pin groups prior to their presentation to the feeling mechanism.

7. In a signal storing device, in combination, a signal storing medium comprising a flexible member having parallel rows of adjustable pins, a mechanism for setting the successive rows of pins in signal combinations, a start-stop shaft, a clutch for driving said shaft with a step-by-step movement, keyboard-controlled means for

controlling said mechanism and for effecting engagement of said clutch, driving means operated by said shaft normally effective in each movement thereof to advance said medium relative to the pin-setting mechanism a distance equal to the spacing of said rows of pins to present a blanked row of pins to the setting mechanism, manually operable means for disconnecting said driving means, and other driving means operable to advance the medium relative to the setting mechanism when said first driving means is disconnected.

8. In a signal storing device, in combination, a signal storing medium comprising a flexible chain having parallel rows of adjustable pins, a pair of sprockets engaging the side edges of the chain to support the same, a mechanism for setting the successive rows of pins in signal combinations, a start-stop shaft, a clutch for driving said shaft with a step-by-step movement, keyboard-controlled means for controlling said mechanism and for effecting engagement of said clutch, means for advancing said medium a predetermined distance in each revolution of said shaft comprising a gear rigid with said sprockets, a second gear driven by said shaft, and an intermediate gear meshing with said first and second gears, means for shifting said intermediate gear out of mesh with one of said other gears, and other means for advancing the chain independently of said shaft.

9. The combination of a pin-setting mechanism and a pin-feeling mechanism arranged adjacent each other in opposed relation, an endless flexible medium carrying groups of movable pins adapted to be set in signal combinations, said medium being arranged in the form of an elongated loop adapted to move bodily in an endwise direction between said mechanisms, two independently operable advancing means, one for moving one run of the loop in one direction past said setting mechanism to present successive groups of pins thereto, the other advancing means being operable to move the opposite run of the loop past said feeling mechanism to present successive groups of set pins thereto, and means for rendering one of said advancing means effective to advance both runs of the loop past said setting and said feeling mechanisms.

10. In a signal storing device, in combination, signal recording and feeling mechanisms arranged adjacent each other in opposed relation, a flexible storage medium having a bight disposed between said mechanisms, means normally effective to advance one side position of said bight past said recording mechanism when the mechanism is operated and to hold the same stationary when the mechanism is idle, means for advancing the opposite side portion of said bight past said feeling mechanism to present recorded signals thereto, and means for rendering said first advancing means ineffective to hold the medium whereby said second advancing means is enabled to advance the medium past said setting mechanism while the mechanism is idle.

11. The combination of a pin-setting mechanism and a pin-feeling mechanism arranged adjacent each other in opposed relation, an endless flexible medium carrying groups of movable pins adapted to be set in signal combinations, said medium being arranged in the form of an elongated loop adapted to move bodily in an endwise direction between said mechanisms, two independently operable advancing means, one for moving one run of the loop in one direction past

said setting mechanism to present successive groups of pins thereto, the other advancing means being operable to move the opposite run of the loop past said feeling mechanism to present successive groups of set pins thereto, means operating with said first advancing means and in timed relation thereto for moving the pins of successive groups into blank position before presentation of the pins to said setting mechanism, and means for rendering said first advancing means and said blanking means ineffectual while said second advancing means advances the medium past said setting mechanism and said feeling mechanism to present set groups of pins to the latter mechanism repeatedly.

12. A signal storing medium comprising an endless flexible member arranged in the form of an elongated closed loop of arcuate shape, means supporting said loop for bodily endwise movement as a unit about a fixed axis, and means for adjusting said supporting means to vary the tension of said member.

13. A signal storing medium comprising an endless flexible member arranged in the form of an elongated closed loop of arcuate shape, roller means supporting each end of the loop, and means yieldably urging one of said supporting means in a direction to lengthen the loop whereby to hold the member under uniform tension.

14. In a signal storing device, in combination, signal recording and feeling mechanisms arranged adjacent each other in opposed relation, a flexible storage medium having a bight disposed between said mechanisms, means normally effective to advance one side portion of said bight past said recording mechanism when the mechanism is operated and to hold the same stationary when the mechanism is idle, means for advancing the opposite side portion of said bight past said feeling mechanism and to hold the same stationary when that mechanism is idle, the length of said bight increasing when the first advancing means only is operating and decreasing when the second advancing means only is operating, and means automatically operated upon the bight increasing to a predetermined point for rendering said first advancing means ineffective.

15. In a signal storing device, in combination, signal recording and feeling mechanisms arranged adjacent each other in opposed relation, a flexible storage medium having a bight disposed between said mechanisms, means normally effective to advance one side portion of said bight past said recording mechanism when the mechanism is operated and to hold the same stationary when the mechanism is idle, means for advancing the opposite side portion of said bight past said feeling mechanism and to hold the same stationary when that mechanism is idle, the length of said bight increasing when the first advancing means only is operating and decreasing when the second advancing means only is operating, and means automatically operated in accordance with the length of said bight to render one or the other of said advancing means ineffective and thereby maintain the length of the bight within predetermined limits.

16. In a storing transmitter, in combination, an endless flexible medium having a series of signal storing elements upon which signals may be stored mechanically, a keyboard-controlled recording mechanism associated with said medium, means for locking the recording mechanism inoperative, feeler mechanism associated with said mechanism and adapted to be controlled in ac-

cordance with the signals stored on said elements, means for advancing the medium to present successive elements first to said recording mechanism and then to said feeling mechanism, and a member automatically operative when the elements available for presentation to said recording mechanism become exhausted for actuating said locking means to render the recording mechanism ineffective.

17. In a storing transmitter, in combination, a signal storing medium in the form of an endless flexible member having parallel rows of adjustable pins, a mechanism for setting the successive rows of pins in signal combinations, a start-stop shaft, a rotary clutch for driving said shaft with step-by-step movement, keyboard-controlled means for controlling the operation of said setting mechanism and the engagement of said clutch, means operable in each movement of said shaft for advancing said medium a distance equal to the spacing of said rows of pins whereby to position a blank row of pins in operative relation to said setting mechanism, and means operated automatically upon the supply of blank rows of pins becoming exhausted for rendering said keyboard-controlled means ineffective to engage said clutch.

18. In a storing transmitter, in combination, a storing medium adapted to carry mechanically stored signal combinations, signal transmitting means adapted to be operated by said signal combinations, a start-stop shaft having a normal rest position, power driven means for rotating said shaft in intermittent steps, each of said steps consisting of a complete revolution of the shaft, means operable in each movement of the shaft to bring a new signal combination on said medium into operative association with said transmitting means, a control member movable between two positions, said control member being effective in one position to prevent rotation of said shaft away from rest position and effective when moved to the other position to release the shaft for movement by said power driven means, a second control member adapted when operated to arrest the movement of said shaft substantially midway in its rotative step, and latch means controlled by said first control member for retaining said second control member in operated position.

19. In a storing transmitter, in combination, a storing medium adapted to carry mechanically stored signal combinations, a feeler mechanism operable by said signal combinations, a set of transmitting switches controlled by said feeler mechanism, a start-stop member having a normal rest position, power driven means for imparting step-by-step movement to said member, means operable in each movement of the member to bring a new signal on said medium into operative association with said feeler mechanism, an electromagnet adapted to be energized periodically, said magnet having an armature adapted when the magnet is deenergized to prevent movement of said start-stop member away from rest position and releasing the member for such movement when the magnet is energized, means operated automatically when the signals on said medium are reduced below a predetermined number to arrest the motion of said member out of normal rest position, and latch means controlled by said armature for retaining said arresting means in operated position after the signals on said medium are increased above said predetermined number and until said magnet has been

energized and deenergized a predetermined number of times.

20. In a storing transmitter, in combination, a signal storing medium, a feeler mechanism, a rotary start-stop member normally held in a rest position and adapted in one stepping movement away from such position to advance said medium to present a new signal to the feeler mechanism, a first stop normally tending to move into a position to arrest the motion of said member in said normal position, a second stop, means acting automatically when the signals on said medium are reduced below a predetermined number for moving said second stop into blocking position to stop said member, latch means adapted to hold said second stop in blocking position, an electromagnet adapted to be energized periodically and operative when energized to move said first stop out of blocking position to permit movement of said member, and escapement means operated by said electromagnet for releasing said latch.

21. In a storing transmitter, in combination, a signal storing medium, a feeler mechanism, a rotary start-stop member normally held in a rest position and adapted in one stepping movement away from such position to advance said medium and present a new signal to said feeler mechanism, a magnet having an armature carrying a stop adapted to arrest the motion of said member in said normal position when the magnet is deenergized and to release the member for movement when the magnet is energized, a second stop adapted to be operated to arrest said member out of normal position, means tending to withdraw said second stop to inoperative position, and latch means controlled by said magnet for preventing premature withdrawal of said second stop, said latch means comprising a link secured to said second stop and having formed thereon a plurality of teeth adapted to engage a tooth on said armature, the teeth on said link being staggered whereby they are moved into engagement with the armature tooth successively and finally released as the magnet is alternately energized and deenergized.

22. In a storing transmitter, in combination, a signal storing medium, a feeler mechanism, a rotary start-stop member normally held in a rest position and adapted in one stepping movement away from such position to advance said medium and present a new signal to said feeler mechanism, a stop adapted to arrest the motion of said member in said normal position, means operating periodically to withdraw said stop, a second stop adapted when operated to arrest the movement of said member out of said normal position, automatically controlled means for operating said second stop when the signals on said medium are reduced below a predetermined number, manually controlled means for operating said second stop independently of the number of signals on said medium, and latch mechanism controlled by said periodically operating means for holding said second stop in operated position.

23. In a storing transmitter, in combination, a signal storing medium, a feeler mechanism, a rotary start-stop member normally held in a rest position and adapted in one stepping movement away from such position to advance said medium to present a new signal to the feeler mechanism, a first stop normally tending to move into a position to arrest the motion of said member in said normal position, a second stop, manually operable means for moving said second stop into

blocking relation to stop said member, means for latching said second stop in blocking position, an electromagnet adapted to be energized periodically to withdraw said first stop from blocking position and thereby permit movement of said member, and means controlled by said electromagnet for releasing said latch.

24. In a signal storing device, in combination, an elongated flexible medium upon which signals may be stored mechanically, a keyboard controlled signal recording mechanism associated with said medium, feeler mechanism associated with said medium at a point spaced from said recording mechanism and adapted to be controlled in accordance with the signals stored on said medium, and means automatically operable to indicate the quantity of signals in storage.

25. In a signal storing device, in combination, an endless flexible medium having a series of signal storing elements upon which signals may be stored mechanically, a keyboard-controlled recording mechanism associated with said medium, feeler mechanism associated with said mechanism and adapted to be controlled in accordance with the signals stored on said elements, means for advancing the medium to present successive elements first to said recording mechanism and then to said feeling mechanism, and means operative to indicate the number of signal storage elements awaiting presentation to said feeler mechanism.

26. In a signal storing device, in combination, an endless flexible medium having a series of signal storing elements upon which signals may be stored mechanically, a keyboard-controlled recording mechanism associated with said medium, feeler mechanism associated with said mechanism and adapted to be controlled in accordance with the signals stored on said elements, means for advancing the medium to present successive elements first to said recording mechanism and then to said feeling mechanism, a member adapted to be moved proportionately to the number of signal storage elements awaiting presentation to said feeler mechanism, and a visual indicator operatively associated with said member and movable therewith.

27. In a signal storing device, in combination, an endless flexible medium having a series of signal storing elements upon which signals may be stored mechanically, a keyboard-controlled recording mechanism associated with said medium, feeler mechanism associated with said mechanism and adapted to be controlled in accordance with the signals stored on said elements, means for advancing the medium to present successive elements first to said recording mechanism and then to said feeling mechanism, and means for operating a distinctive signal when the elements available for presentation to said recording mechanism become exhausted.

28. In a storing transmitter in combination, signal recording and feeling mechanisms arranged adjacent each other in opposed relation, a flexible storage medium having a bight disposed between said mechanisms, means normally effective to advance one side portion of said bight past said recording mechanism when the mechanism is operated and to hold the same stationary when the mechanism is idle, means for advancing the opposite side portion of said bight past said feeling mechanism and to hold the same stationary when that mechanism is idle, the length of said bight increasing when the first advancing means only is operating and decreasing

when the second advancing means only is operating, and signal means operated automatically upon said bight reaching a predetermined maximum length.

29. The combination of a pin-setting mechanism and a pin-feeling mechanism arranged adjacent each other in opposed relation, an endless flexible medium carrying groups of movable pins adapted to be set in signal combinations, said medium being arranged in the form of an elongated loop adapted to move bodily in an endwise direction between said mechanisms, two independently operable advancing means, one for moving one run of the loop in one direction past said setting mechanism to present successive groups of pins thereto, the other advancing means being operable to move the opposite run of the loop past said feeling mechanism to present successive groups of set pins thereto, and signal means operated automatically when the number of groups of set pins awaiting presentation to said feeler mechanism exceeds a predetermined number.

30. In a storing transmitter, in combination, an endless flexible medium having a series of signal storing elements upon which signals may be stored mechanically, a keyboard-controlled recording mechanism associated with said medium, feeler mechanism associated with said mechanism and adapted to be controlled in accordance with the signals stored on said elements, means for advancing the medium to present successive elements first to said recording mechanism and then to said feeling mechanism, signal control means operated in accordance with the number of elements available for presentation to said feeler mechanism, and adjusting means for said signal control means operable to vary the point at which said control means becomes effective.

31. In a signal storing device, in combination, an endless flexible medium having a series of signal storing elements upon which signals may be stored mechanically, a keyboard-controlled recording mechanism associated with said medium, feeler mechanism associated with said mechanism and adapted to be controlled in accordance with the signals stored on said elements, means for advancing the medium to present successive elements first to said recording mechanism and then to said feeling mechanism, a member adapted to be moved proportionately to the number of signal storing elements awaiting presentation to said feeler mechanism, signal control means disposed in the path of said member for engagement thereby to operate a signal, and means for varying the position of said signal control means to determine the point at which said signal is operated.

32. A storing transmitter comprising, in combination, a horizontally disposed base, a manually operable keyboard arranged adjacent the front of said base, a signal storing medium in the form of a pin chain for storing signals set up by the operation of said keyboard, and means for supporting said pin chain comprising a movable frame arranged lengthwise of said base at the rear of the keyboard and supported on the base for rotation about a horizontal axis.

33. A storing transmitter comprising in combination, a horizontally disposed base, a manually operable keyboard arranged adjacent the front of said base, a signal storing medium in the form of a pin chain for storing signals set up by the operation of said keyboard, a pin chain supporting frame arranged lengthwise of said base at the

rear of the keyboard and supported on the base for rotation about a horizontal axis, and means for setting the pins of said chain under control of said keyboard including a key-controlled selector mechanism interposed between the keyboard and said frame.

34. A storing transmitter comprising, in combination, a horizontally disposed base, a manually operable keyboard arranged adjacent the front of said base, a signal storing medium in the form of a pin chain for storing signals set up by the operation of said keyboard, and means for supporting said pin chain comprising a movable frame mounted on said base for rotation about a horizontal axis.

35. In a storing transmitter having a pin chain storing medium, in combination, a hollow base structure formed to provide an oil reservoir, and means supporting said pin chain for movement through the oil in said reservoir comprising a generally C-shaped frame mounted on said base for rotation about a horizontal axis with its lower edge projecting into said reservoir.

36. The combination with a clutch having a constantly rotating driving element and a driven element, of a start-stop member normally tending to rotate under the action of said driving element and effective when held against rotation to disengage said driving and driven elements, a pair of stops each operative to hold said member against rotation and adapted when actuated to release the member for rotation, electrically operated means for actuating one of said stops, and means operated in response to a plurality of actuations of said one stop for actuating the other stop.

37. The combination with a clutch having a constantly rotating driving element and a driven element, of a start-stop member normally tending to rotate under the action of said driving element and effective when held against rotation to disengage said driving and driven elements, a pair of stops each operative to hold said member against rotation and adapted when actuated to release the member for rotation, electrically operated means for actuating one of said stops, means normally tending to actuate the other stop, and an escapement mechanism controlled by said one stop for governing the operation of said last mentioned stop actuating means.

38. The combination with a clutch having a constantly rotating driving element and a driven element, of a start-stop member normally tending to rotate under the action of said driving element and effective when held against rotation to disengage said driving and driven elements, a first stop operative to hold said member in a normal rest position and adapted when actuated to release the member for rotation, a second stop adapted to hold said member in a different rest position and effective when actuated to release the member for rotation, periodically operated means for actuating said first stop, and an escapement mechanism controlled by said periodically operated means for actuating said second stop.

39. In a storing transmitter, in combination, a horizontally disposed base, a manually operable keyboard arranged adjacent the front of said base, a signal storing medium in the form of an endless flexible member for storing signals selected by the operation of the keyboard, and means for supporting said member comprising a movable frame arranged lengthwise of the base

at the rear of the keyboard and supported on the base for rotation about a horizontal axis.

40. In a telegraph transmitter, in combination, a series of elements adapted to be set in different permutational combinations representing telegraph signals to be transmitted, a plurality of manually operable key levers, a control member and a flag associated with each key lever, said flag being operative to control the setting of permutational elements selectively, means providing an operative connection between a key lever and its associated control member and flag for rendering the key lever effective when operated to operate the member and to shift the associated flag into controlling relation to said elements, and means cooperating with the control members to prevent the operation of a second key until the previously shifted flag has been returned to normal position.

41. In a telegraph transmitter, in combination, a series of elements adapted to be set in different permutational combinations representing telegraph signals to be transmitted, a plurality of manually operable key levers, a control member and a flag associated with each key lever, said flags being operative to control the setting of permutational elements selectively, means providing an operative connection between a key lever and its associated control member and flag for rendering the key lever effective when operated to operate the member and to move the associated flag into controlling relation to said elements, and means cooperating with any operated control member to maintain the member and its associated flag in operated position for a predetermined interval.

42. In a telegraph transmitter, in combination, a series of elements adapted to be set in different permutational combinations representing telegraph signals to be transmitted, a plurality of manually operable key levers, a control member and a flag associated with each key lever, said flags being operative to control the setting of permutational elements selectively, means providing an operative connection between a key lever and its associated control member and flag for rendering the key lever effective when operated to operate the member and to move the associated flag into controlling relation to said elements, and means cooperating with said control elements to prevent the operation of a second key while the previously operated flag is in operated position and to temporarily hold the operated flag in its operated position for a predetermined interval.

43. In a storing transmitter, the combination of a flexible signal storing medium, means for recording signals on said medium, a transmission line, transmitting switches for impressing signals on said line, mechanism cooperating with said storage medium and acting to control said switches in accordance with the signals recorded thereon, a cyclically operable member operative in each cycle to render said mechanism effective to read the next untransmitted signal on the storage medium, a stop normally effective to hold said member in a rest position, a distributor operable cyclically for connecting the transmitting switches to the line in succession to transmit the impulses of a signal thereover, means controlled by said distributor in each signal cycle for withdrawing said stop to release said member for a cycle of operation, a second stop movable into the path of said member upon a decrease in stored signals below a predetermined number and effective to arrest the motion of the member inde-

pendently of said first stop, and means operable in response to the operation of said distributor only through a plurality of cycles after the signals in storage increase above said predetermined number for withdrawing said second stop to release the member for a cycle of operation.

44. The combination of a flexible signal storage medium, signal recording mechanism including a series of elements supported for movement toward and from the storage medium, power actuated means for moving selected ones of said elements to record signals on the storage medium, a signal feeling mechanism supported in operative relation to the storage medium and spaced from said recording mechanism, means for advancing the storage medium relative to said setting mechanism for recording successive signals thereon, other mechanism for advancing the storage medium relative to said feeling mechanism to present the recorded signals thereto, an eraser interposed between the recording mechanism and the feeling mechanism adapted when actuated to erase signals previously recorded on the storage medium prior to their presentation to the feeling mechanism, and manually operable means for actuating said eraser.

45. In a storing transmitter, in combination, a flexible signal storing medium, manually actuated means for recording signal combinations on said medium, means for locking the recording means against operation, signal transmitting

mechanism cooperating with the medium to transmit the signals recorded thereon, means operative upon the recording of a signal on the storage medium for advancing the medium relative to the recording mechanism to position the same for the reception of the succeeding signal, other means for advancing the storage medium relative to the transmitting mechanism to operate the same for transmitting the recording signals, and means operated in response to the exhaustion of the supply of storage medium available for recording signals for operating said locking means to lock the recording mechanism against further operation.

46. In a storing transmitter, in combination, an endless signal storing medium, keyboard controlled recording mechanism for recording signals on said medium including a shaft operable through a fixed cycle in each signal recording operation of the mechanism, signal transmitting mechanism controlled in accordance with the signals recorded on said medium, means for advancing the medium relative to said recording transmitting mechanisms, and a member operative in response to the exhaustion of the supply of storage medium available for signal recording for locking said shaft in an inoperative position to prevent further operation of the recording mechanism.

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