

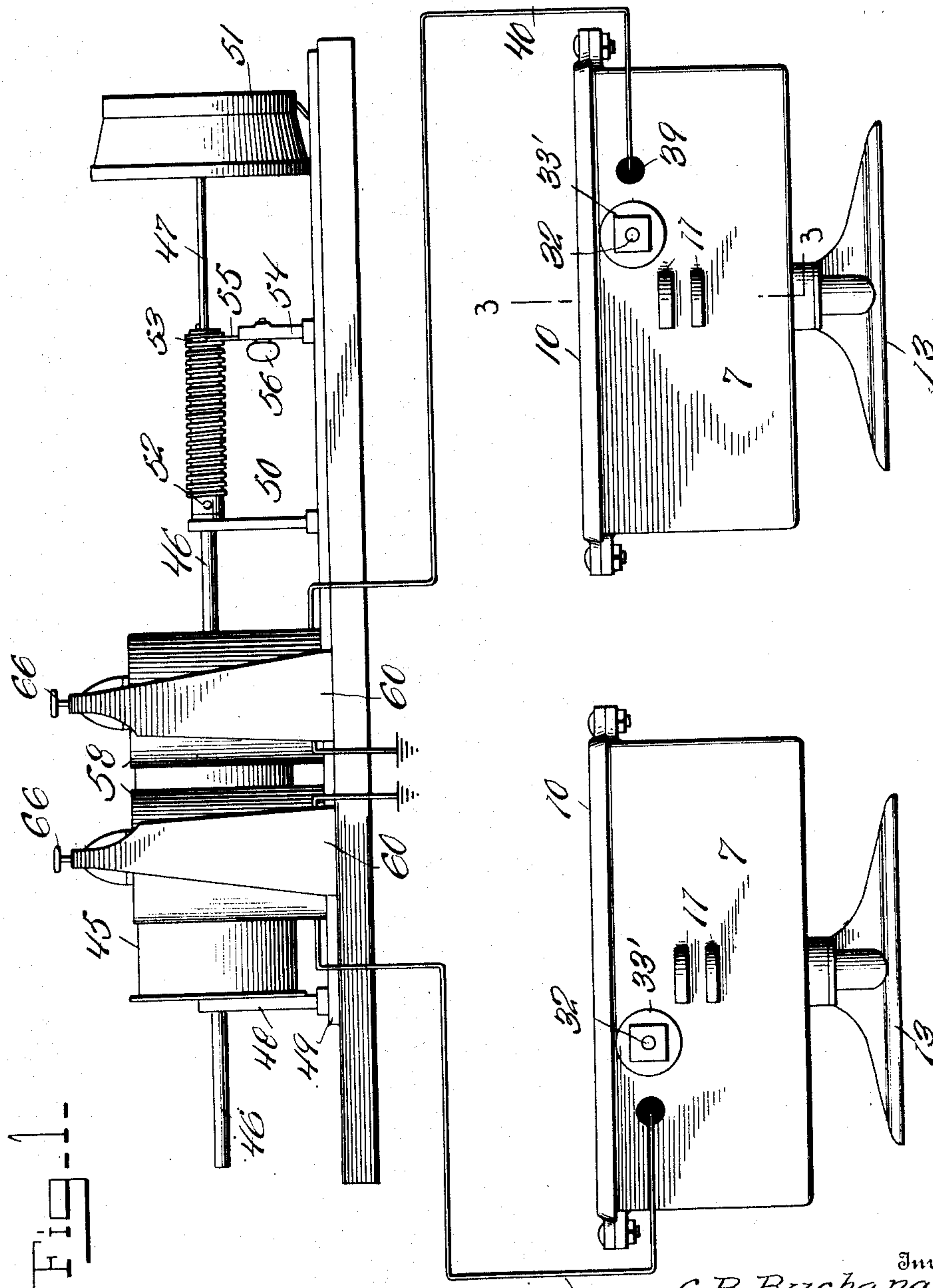
No. 887,309.

PATENTED MAY 12, 1908.

C. B. BUCHANAN & C. C. JOHNSON.  
AUTOMATIC HEADWAY RECORDER.

APPLICATION FILED SEPT. 8, 1906.

5 SHEETS—SHEET 1.



Witnesses

G. R. Thomas  
My S. Chandler.

Inventors  
C. B. Buchanan  
and  
C. C. Johnson  
By *Charles Chandler*  
Attorneys

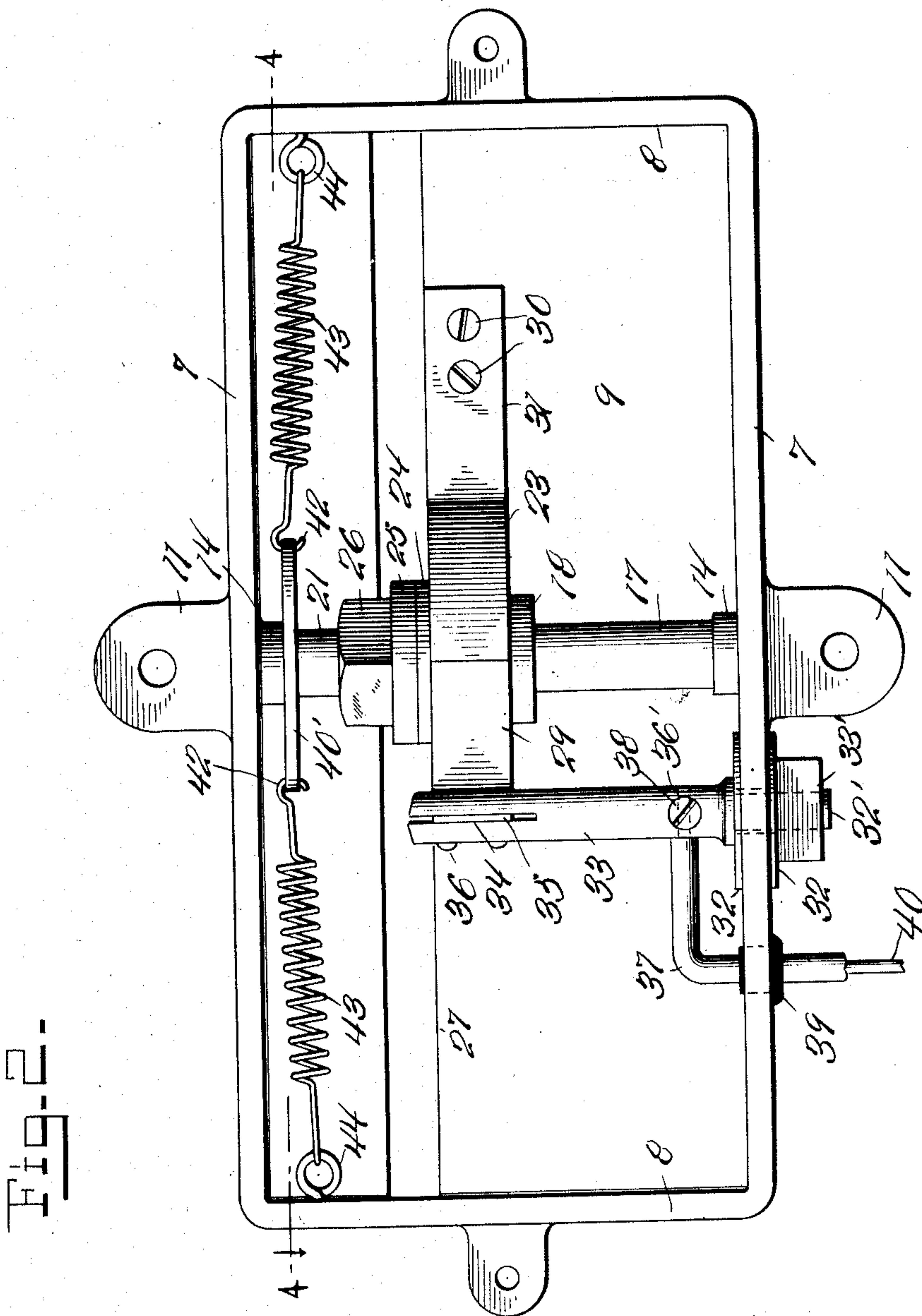
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6 SHEETS—SHEET 2.



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Jy. E. Chandler.

Inventors

*C. B. Buchanan*  
and *C. C. Johnson*

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*Candace Crane*

Attorneys

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Inventor

and C.B. Buchanan  
C.C. Johnson

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G. R. Thomas

W. E. Chandler

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*Charles, Charles*

Attorneys



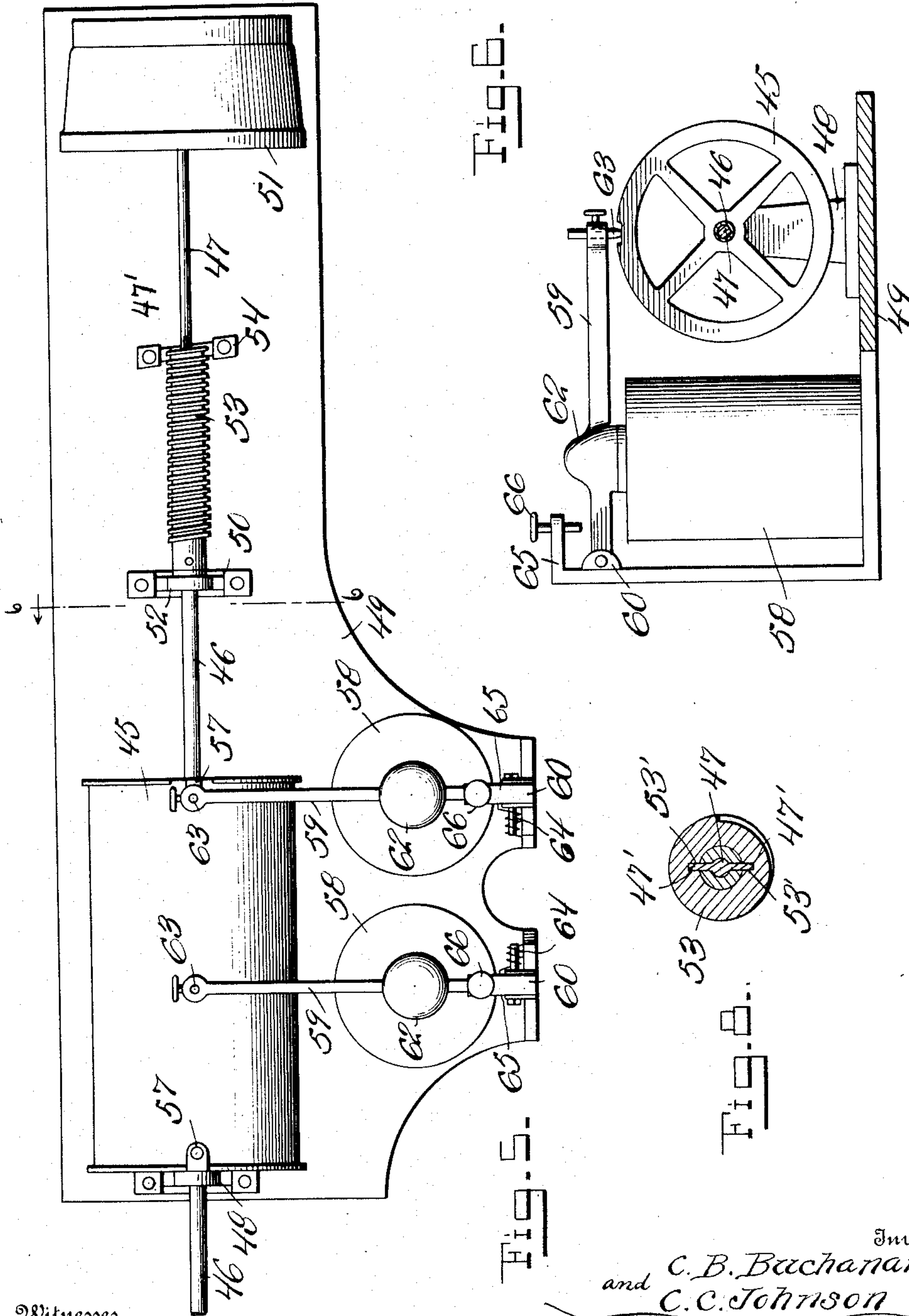
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H. E. Chandler.

By

Inventors  
C. B. Buchanan  
and  
C. C. Johnson  
*Charles Chandler*  
Attorneys

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5 SHEETS--SHEET 5.

LINE		DATE		190
LOCATION				
NORTH EAST		SOUTH WEST		
P.M.	A.M.	P.M.	A.M.	
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35
36	37	38	39	40
41	42	43	44	45
46	47	48	49	50
51	52	53	54	55
56	57	58	59	60

59

58

56

Fig. 7.

Witnesses

G. R. Thomas  
W. E. Chandler.

Inventors

and C. B. Buchanan  
C. C. Johnson

By

*Charles Chandler*

Attorneys



# UNITED STATES PATENT OFFICE.

CYRUS BALDWIN BUCHANAN AND CHARLES C. JOHNSON, OF RICHMOND, VIRGINIA.

## AUTOMATIC HEADWAY-RECORDER.

No. 887,309.

Specification of Letters Patent.

Patented May 12, 1908.

Application filed September 8, 1906. Serial No. 333,859.

*To all whom it may concern:*

Be it known that we, CYRUS B. BUCHANAN and CHAS. C. JOHNSON, citizens of United States, residing at Richmond, in the county of Henrico, State of Virginia, have invented certain new and useful Improvements in Automatic Headway-Recorders; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to recording systems for electric railways and has for its object to provide a system which will indicate the number of minutes between each car and the car following or preceding it, and also the time at which cars pass given points.

In the operation of electric railways it has been found necessary, in order to maintain schedules, to have time points along the routes to enable the trainmen to gage the speed of their cars and keep them on schedule time. It has therefore been found necessary to have inspectors stationed along the routes or at terminals to check the passing time of cars.

By the use of our automatic headway recorder located at time points along the routes, there will be eliminated the necessity of having inspectors to make records of the time cars leave terminals or time points, and there will be given a complete record on the record sheet, of the time every car passes these points, which record sheet compared with the schedule time tables will show every car that is ahead or behind time and allow the operator to locate the same.

The invention resides, broadly speaking, in the provision of a record-receiving mechanism actuated by clock work and including a drum to which the record sheet is attached, means arranged adjacent to the drum for contact therewith to indicate on the record sheet the time the various cars pass certain points, and a circuit closer arranged to be actuated by the trolley carried by the car, to actuate the said indicating means.

It is not the intention of the system to individualize the cars but merely to indicate the general time apart they are traveling and the construction of the system is such that it may be installed at any point or points along the routes where it is desired to keep a record of the movement of the cars.

With the above and other objects in view the invention consists in the construction and

arrangements of parts shown in the accompanying drawings in which,

Figure 1 is a view of the system showing the circuit closer and the recording mechanism in side elevation. Fig. 2 is a detailed top plan view of the circuit closer, the top of the case for the same being removed. Fig. 3 is a detail vertical transverse sectional view thereof on the line 2—2 of Fig. 1. Fig. 4 is a detail vertical longitudinal sectional view on the line 4—4 of Fig. 2. Fig. 5 is a detail plan view of the recording mechanism. Fig. 6 is a detail vertical plan transverse sectional view on the line 6—6 of Fig. 5. Fig. 7 is a detail view of the sheet upon which the record is made and Fig. 8 is an end view of the screw and driving shaft.

Referring more specifically to the drawings and more particularly to the circuit closing mechanism, the circuit closer is shown as comprising a casing having sides 7 and ends 8, and bottom 9 and a cover or top 10. The case is preferably rectangular in form and is provided upon the outer face of each of its sides and corresponding points with spaced apertured ears 11 between each part of which is bolted or otherwise secured the strain insulators 12 which are in turn connected to the trolley poles (not shown). Projecting downwardly from the under side of the casing and extending longitudinally thereof is a trolley wire hanger 13 of usual construction.

From the foregoing it will be seen that the casing for the circuit closing mechanism is in circuit with the trolley wire but that the casing is insulated from the span wires and supports.

Secured at corresponding points upon the inner side of the casing and preferably at the middle thereof are bearing plates 14 which are provided with openings 15 for the reception of the reduced ends 16 of a shaft 17, the shaft being in this manner mounted for rocking movement in the casing. The shaft 17 is provided adjacent its middle with a collar 18 and has its portion adjacent the collar and to one side thereof squared as at 19 for a purpose hereinafter described, and the portion of the shaft beyond the squared portion 19 is screw threaded as at 20, the shaft is reduced as at 21, and a portion of the adjacent end 16 of the shaft is squared as at 22. The circuit closing mechanism comprising a disk 23 which is preferably formed of fibrous material and which is engaged upon the squared portion 19 of the shaft 17 and abutting the



collar 18. A washer 24 is also engaged upon this portion of the shaft as is also one end of an arm 25, the said arm being provided with a squared aperture for this purpose. A nut 26 serves to hold the disk 23 and the arm 25 against lateral movement and is engaged upon the screw threaded portion of the shaft. The arm 25 projects downwardly from the shaft 17 with which it is connected, extends through a slot 27 formed in the bottom 9 of the casing, and has its lower end suitably arranged, as at 28, in position to contact with the trolley wheel or trolley harp, it being understood that the arm in this manner will be oscillated to rock the shaft 17 in a corresponding direction. The object in thus rocking the shaft is to move the disk 23 to bring a contact segment carried thereby into simultaneous contact with contact arms mounted within the casing as will now be described.

The contact segment mentioned above is indicated by the numeral 29, is arcuate in form and is countersunk into the periphery of the disk 23 as shown in the drawings. Secured to the bottom of the casing at one of its ends and by means of screws 30 is a spring contact arm 31 which extends upwardly at an angle to the bottom of the casing and bears against the under side of the disk 23 but normally out of contact with the contact segment thereon. Insulating washers 32 are disposed upon the one side of the casing and have their openings registering with an opening in the said side of the casing, and engaged through the said opening in the washers and side of the casing is the reduced threaded end 32' of an arm 33, and engaged upon the said threaded end of the arm and outwardly of the casing is a nut 33' which serves to hold the arm securely in fixed position. The arm 33 is bifurcated at its outer end as at 34 for the engagement therewith of a spring contact arm 35, the said contact arm being held securely in the bifurcation 34 by means of screws 36 which are engaged through the spaced portions formed by the bifurcation in the arm. The said spring contact arm 35 projects downwardly from the arm 33 and under all conditions bears against the contact segment 29 upon the disk 23. The arm 33 is provided adjacent its junction with its sleeve 32, with an opening 36 for connection with the arm of a conductor wire 37, and a set screw 38 is engaged in a thread bearing formed in the arm and communicating with the opening 36 therein. The conductor wire 37 extends through an insulating sleeve 39, which is engaged in an opening formed in the side of the casing from which the arm 33 projects, and is connected with a main conductor wire 40. There are two such wires 40 and two circuit closing mechanisms connected to each recorder, when it is desired to record with one recorder the time of cars going in both directions on double track.

It will be understood that the conductor wire 37 from one circuit closing mechanism connects with one of the main conductor wires 40 and that the wire 37 of the other circuit closing mechanism connects with the other wire 40 for the purpose stated.

A plate 40' is provided with a rectangular opening 41 to permit engagement of the plate upon the squared portion 22 of the shaft 17 for regulating the movement therewith, the said plate having portions which extend in diametrically opposite directions from the shaft 17. The apertures 42 are formed in the ends of these portions of the plate and engaged through each of the said apertures is one end of the helical spring 43 which is engaged at its opposite end with a screw-eye 44 carried by the corresponding end of the casing. From the foregoing it will be observed that when the arm 25 is rocked, the arm 31 will be thrown into circuit with the trolley wire through the medium of the casing, and that the spring 43 will serve to return the shaft and arm to their original positions.

The recording or registering mechanism of the system comprises a drum 45 which is mounted upon a shaft 46 for rotation therewith, the said shaft in turn having mounted thereon a threaded screw 53, and one end of the shaft 46 which projects beyond the corresponding end of the drum, is slidably engaged through a bearing opening in a standard 48, the said standard being mounted upon a suitable base 49. A second standard 50 is provided upon the base to one side of the end of the drum opposite to that adjacent to which the standard 48 is arranged and the said standard 50 is also arranged to receive the shaft 46 slidably therein. The shaft 47 is connected with a spring motor of the clock work type which is arranged to rotate the shaft 47 once every hour for a purpose hereinafter described. That end of the shaft 46 which extends beyond the standard 50 is enlarged at 52 and has mounted thereon a threaded screw 53 and in order to permit movement of the screw 53 longitudinally upon the shaft 47 and yet hold the same for rotation therewith, the said screw 53 is slotted as at 53' to receive a pin 47' which projects at right angles through the shaft 47. The standard 54 is mounted upon the base 49 and is provided with an upstanding tongue 55 which is held adjustably upon the standard by means of the thumb screw 56 which is engaged in the standard through the slot formed in the tongue. The upper end of the tongue 55 is cut away in the arc of a circle and is in engagement with the threads of the screw 53.

From the foregoing it is to be seen that as the shaft 47 is rotated, the shaft 46 will by reason of the engagement of the tongue 55 with the threads on the screw 53 be rotated and at the same time be moved longitudinally.



nally through the bearings 48 and 50, thus carrying the drum 45 in a corresponding direction, and a shaft 47 is of such length that when the drum has reached the limit of its movement away from the motor 51, the pin 47' will disengage from the slot in the shaft 46 and cease to act upon the shaft and drum to rotate the same thereby preventing binding or breaking of the parts of the register.

10 A record sheet 56 is arranged upon the drum 45 and held thereon by means of suitable clips 57. Upon the sheet 56 are printed lines 58 which extend longitudinally of the sheet and at a slight angle to the edge thereof, and intersecting the lines 58 are transversely extending lines 59. There are two series of such lines upon the sheet, one being for the cars traveling in one direction on the road and the other for cars traveling in the opposite direction and in each series there is a sufficient number of lines 58 to form a number of columns equal to the number of hours of the day and night, and the said columns are numbered successively at hour intervals. 15  
20 The transversely extending lines are numbered successively to indicate each minute in an hour. By reason of the fact that the columns are not parallel with respect to the longitudinal edge of the sheet, when placed upon the drum 45, a continuous helical column will be formed by the successive columns.

In order that the record sheet may be marked to indicate the progress of the cars, 35 we provide a pair of magnets 58 which are mounted upon the base 49 and a pair of arms 59 which are pivoted at corresponding ends to brackets 60 one above each of the magnets 58. The arms 59 are provided at their ends with perforating punches, inking points or the like 63 which, when the magnets are energized, contact with the record sheet 56 upon the drum 45 as will be readily understood. Engaged upon the pivot-bolt of 45 each arm is a helical spring 64 which is connected at one of its ends to the corresponding arm 59 beyond its pivotal point and at its opposite end 60 upon which the arm is mounted. The upper end of each bracket 50 60 is turned at right angles as at 65 and engaged through the said end of the bracket is a set screw 66 which limits the upward movement of the corresponding arm 59.

It is obvious from the above that as each 55 circuit closing mechanism is actuated, one of the magnets 58 will be energized to cause a mark to be made upon the record sheet and that the difference in time between the actuation of one circuit closing mechanism and 60 the next time it is actuated will be indicated upon the sheet, thereby showing the number of minutes between cars at that point on the route, and it will be further understood that one of the main conductor wires 40 is connected with one magnet and the other with

the other magnet, the other end of the magnet wires being grounded, so that a record may be had of the cars traveling in both directions along the route.

It will be understood from the above that 70 we have described our headway recorder as applied to a double tracked overhead trolley type electric road, registering cars moving in both directions. Should it be desired to register cars moving in only one direction 75 it is obvious that we would employ only one magnet and one circuit closing mechanism. For recording the passing time of cars moving in both directions on a single track we would employ either two circuit closing 80 mechanisms or mount two disks in one circuit closing mechanism with the necessary additional spring contacts conductor wires etc. but with the contact segment arranged on the opposite side of the second disk, so 85 that the cars passing in one direction would bring the contact segment on one disk into circuit and those passing in the opposite direction would bring into circuit the contact segment of the other disk. 90

While the above mechanism is described as adapted to overhead trolley roads it is evident that with some modifications in the circuit closing mechanism our headway recorder is equally as well adapted for use in 95 connection with the third rail or underground type of electric railways.

It is to be understood that we do not desire to be limited to the exact details of construction shown and described, for obvious 100 modifications will occur to a person skilled in the art.

What is claimed is:

1. In a railway signaling system, a recording mechanism comprising a sleeve shaft, a 105 drum fixedly secured upon the shaft for rotation therewith, said shaft being supported for longitudinal movement, a threaded enlargement upon the shaft, a bracket having a portion engaged in the threaded enlargement to feed the shaft longitudinally when 110 rotated, perforators adapted to make impressions upon the drum, a driven shaft received within the sleeve shaft and having means for connecting the sleeve shaft with it 115 for rotation, said means designed for disengagement from the sleeve shaft when the shaft has reached one limit of its longitudinal movement.

2. In a railway signaling system, a recording 120 mechanism comprising a sleeve shaft, a drum fixedly secured upon the shaft for rotation therewith, said shaft being supported for longitudinal movement, a threaded enlargement upon the shaft, a bracket having a 125 portion engaged in the threaded enlargement to feed the shaft longitudinally when rotated, perforators adapted to make impressions upon the drum, a driven shaft received within the sleeve shaft, said sleeve shaft be- 130



ing slotted, and a pin carried by the driven shaft and working in the slot of the sleeve shaft to rotate the same simultaneously with the driven shaft, said pin being so located as  
5 to disengage from the slot when the sleeve shaft has reached one limit of its longitudinal movement.

3. In a railway signaling system a recording mechanism comprising a sleeve shaft, a  
10 drum fixedly mounted upon the shaft, said shaft being mounted for rotary and also for longitudinal movement, a threaded sleeve fixedly held upon the sleeve shaft at one end thereof and bearing at its inner end against  
15 one of the bearings for the sleeve shaft, a bracket, an angularly disposed plate adjustably supported by the bracket and having its upper end recessed for the reception of the threaded sleeve, the purpose of the  
20 plate being to feed the sleeve when the same is rotated together with the sleeve shaft, a motor, a shaft driven by the motor and extending into the sleeve shaft, said sleeve shaft being provided with longitudinally extending  
25 grooves, a pin engaged through the motor shaft and adapted to project at its ends normally in the grooves in the bore of the sleeve shaft, the pin being so located that when the drum has reached the limit of its  
30 movement away from the motor, the pin will disengage from the grooves in the sleeve shaft to prevent actuation of the latter by the motor shaft and to consequently prevent rotation of the drum, and perforators adapted  
35 to make impressions upon the drum.

4. In a railway signaling system, a record-

ing mechanism comprising a sleeve shaft, a drum fixedly mounted upon the sleeve shaft, a threaded sleeve fixedly held upon the sleeve shaft at one end thereof and bearing at its  
40 inner end against one of the bearings for the sleeve shaft, an angularly disposed bracket, an angularly disposed plate vertically slidable in the bracket, a set screw for holding the plate in raised position, the said plate  
45 having its upper end formed with a semi-circular notch for the reception of the threaded sleeve whereby when the sleeve is rotated, the drum will be also rotated and fed in a direction away from the bracket, a motor, a  
50 shaft driven by the motor and extending into the sleeve shaft, said sleeve shaft being provided with longitudinally extending grooves, a pin engaged through the motor shaft and adapted to project at its ends normally in the  
55 grooves in the bearing of the sleeve shaft, the pin being so located that when the drum has reached the limit of its movement away from the bracket, the pin will disengage from the grooves in the sleeve shaft to prevent actua-  
60 tion of the latter by the motor shaft and consequently prevent rotation of the drum, and perforators adapted to make impressions upon the drum.

In testimony whereof, we affix our signatures, in presence of two witnesses. 65

CYRUS BALDWIN BUCHANAN.  
CHARLES C. JOHNSON.

Witnesses:

R. A. CARTER,  
J. F. CARNEAL.