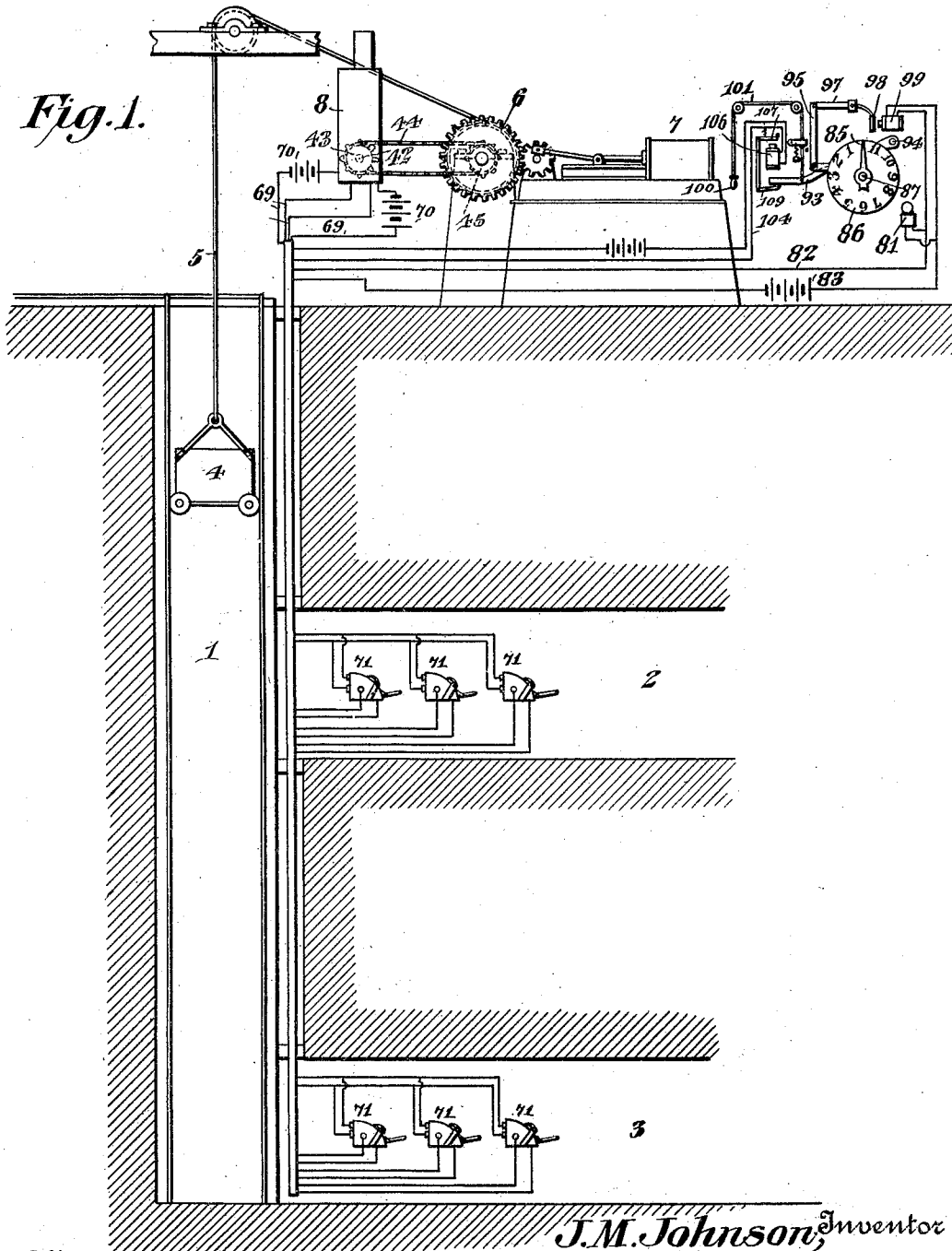


J. M. JOHNSON.
RECORDING MECHANISM.
APPLICATION FILED FEB. 21, 1908.

935,661.

Patented Oct. 5, 1909.
8 SHEETS—SHEET 1.



Witnesses

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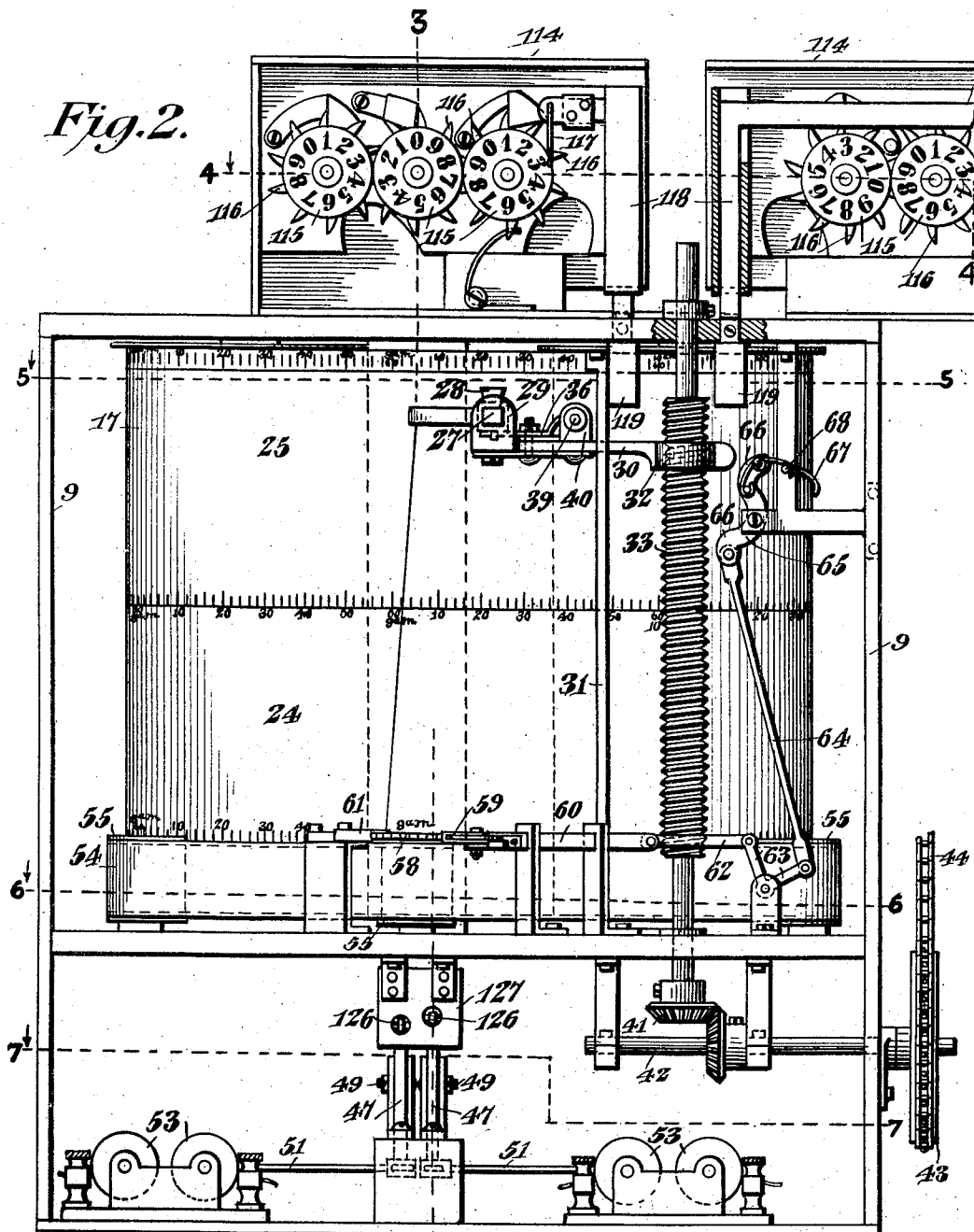
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 8 SHEETS—SHEET 2.

Fig. 2.



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935,661.

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8 SHEETS—SHEET 4.

Fig. 4.

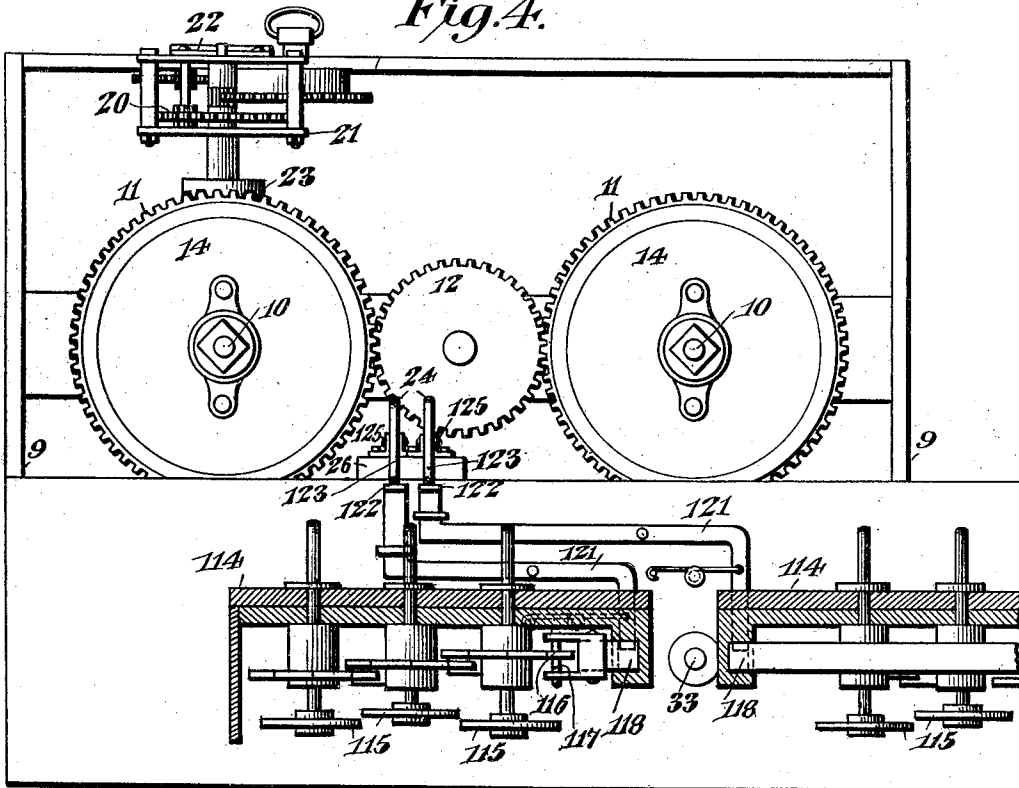
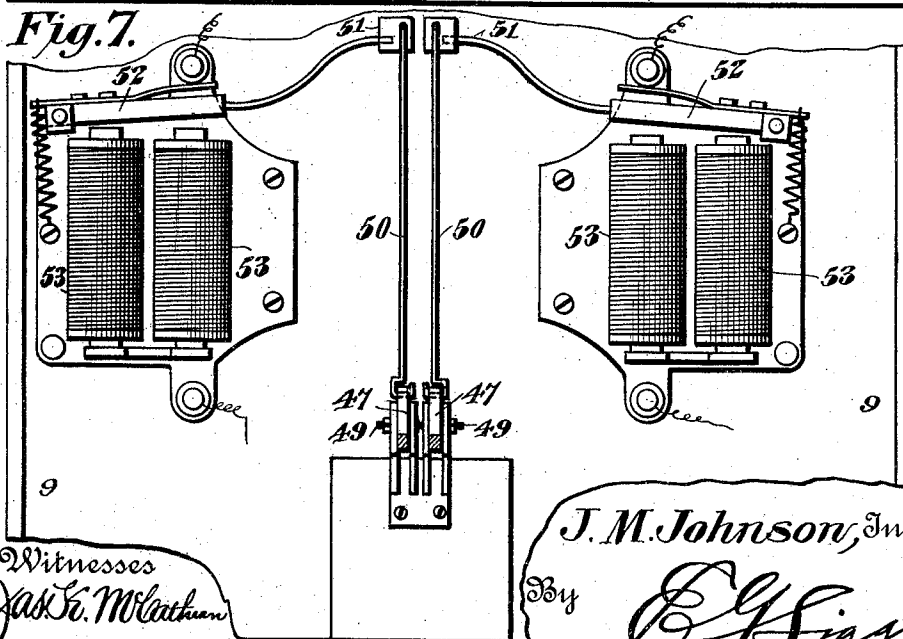


Fig. 7.



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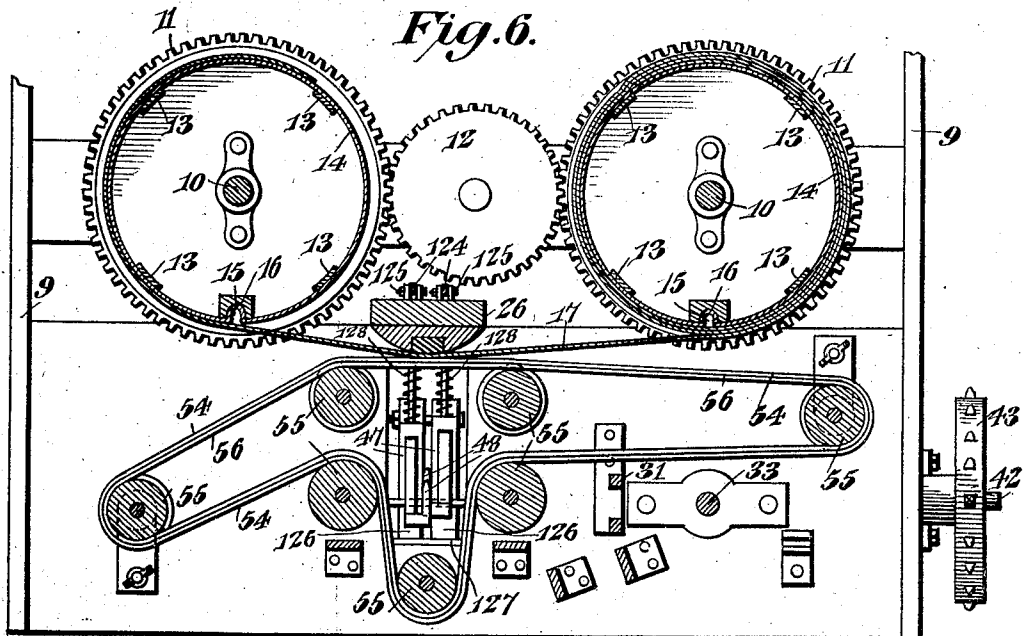
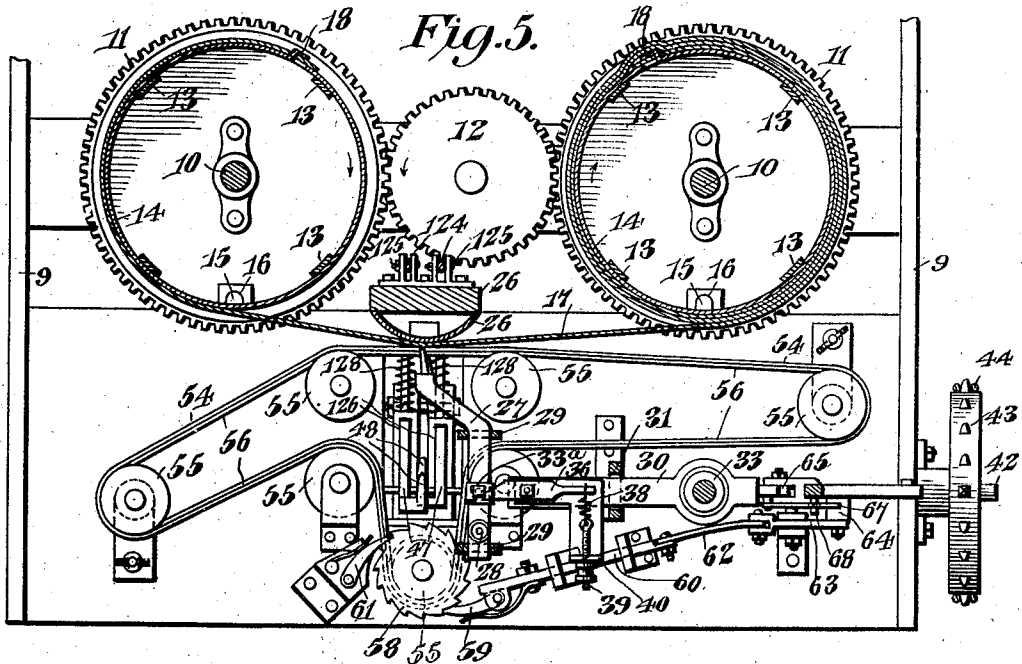
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8 SHEETS—SHEET 5.



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Fig. 8.

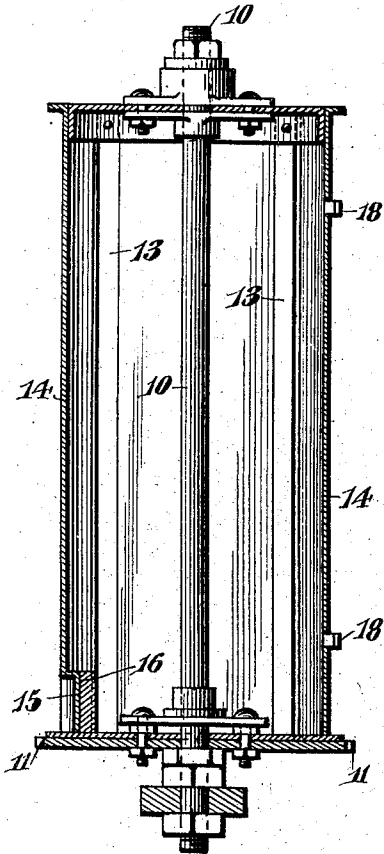


Fig. 15.

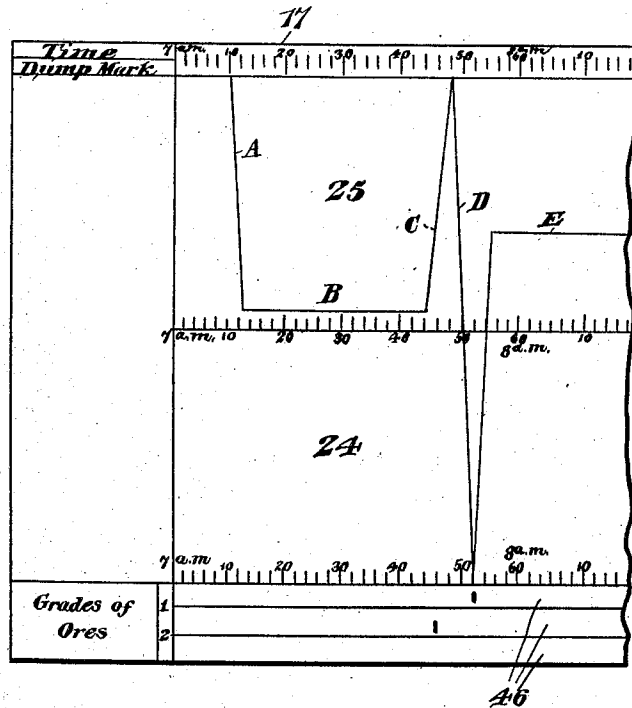


Fig. 10.

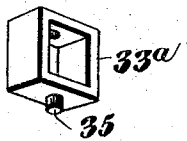


Fig. 11.

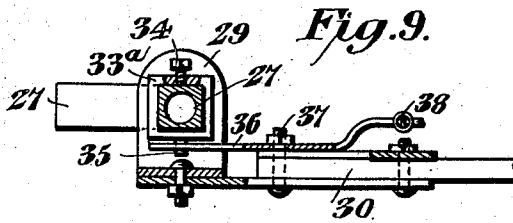
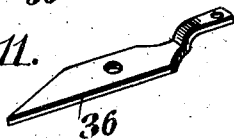
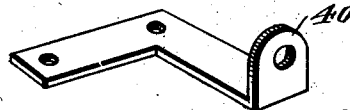


Fig. 12.



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APPLICATION FILED FEB. 21, 1908.

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Patented Oct. 5, 1909.

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Fig. 16.

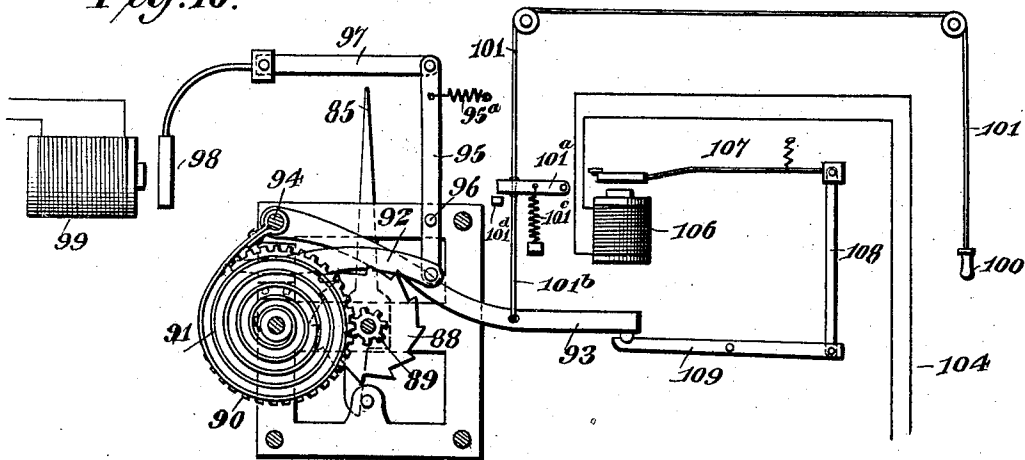


Fig. 17.

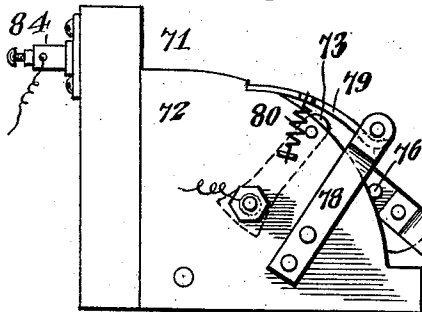


Fig. 18.

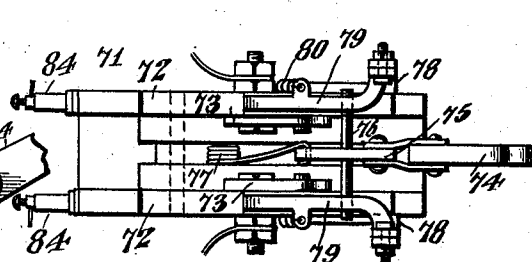


Fig. 19.

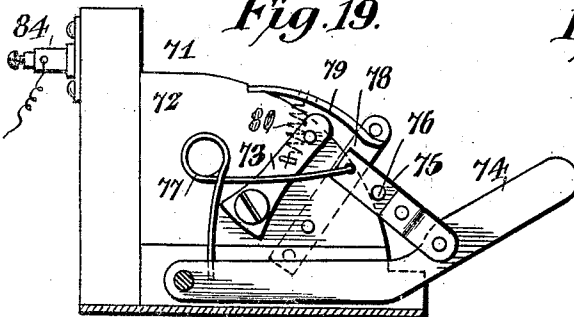
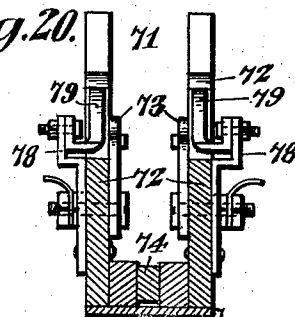


Fig. 20.



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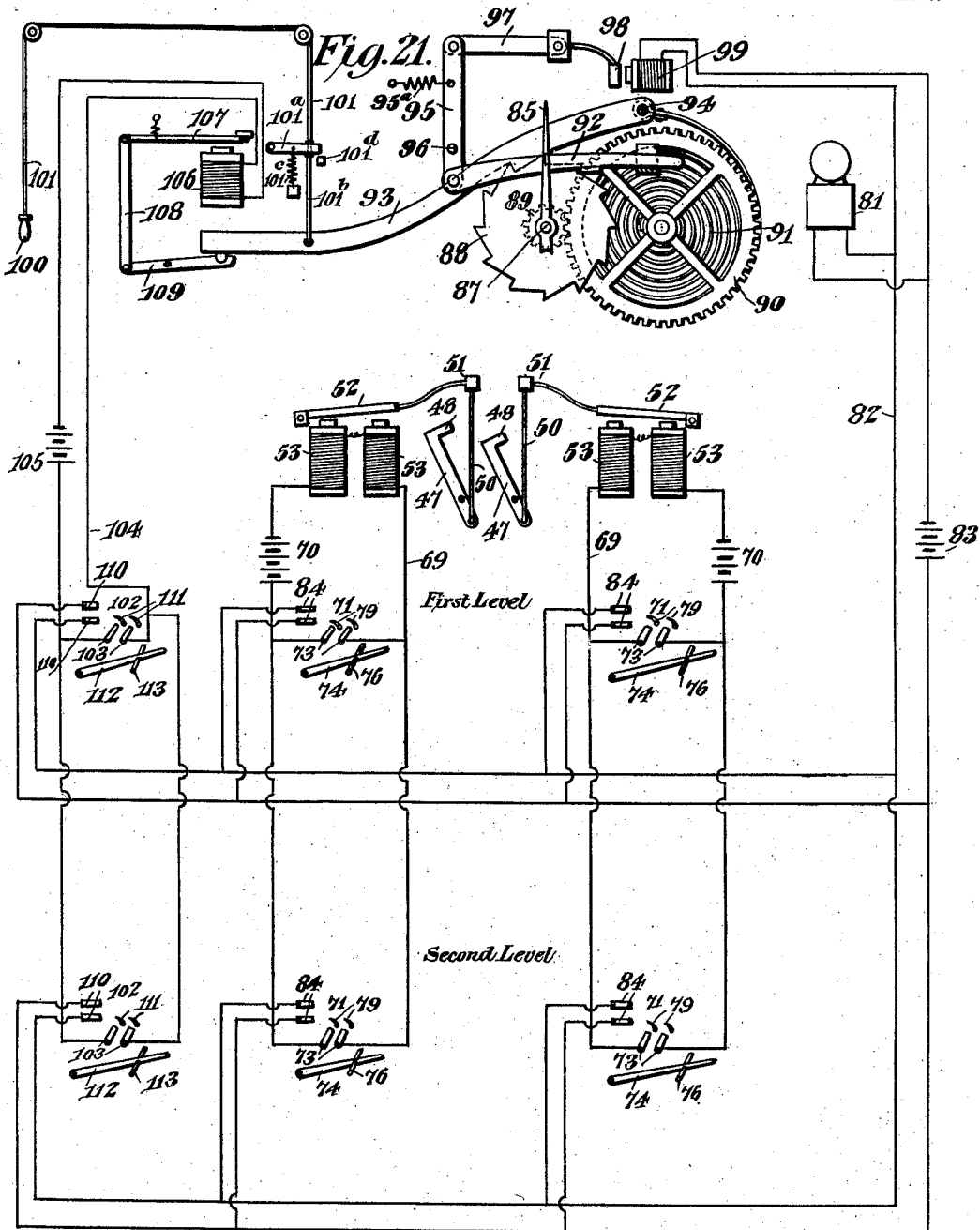
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RECORDING MECHANISM.

935,661.

Specification of Letters Patent.

Patented Oct. 5, 1909.

Application filed February 21, 1908. Serial No. 417,093.

To all whom it may concern:

Be it known that I, JOHN MORGIE JOHNSON, a citizen of the United States, residing at Ishpeming, in the county of Marquette and State of Michigan, have invented a new and useful Recording Mechanism, of which the following is a specification.

The present invention was devised more particularly for making records of mine operations, but undoubtedly many features thereof are useful in connection with other work of a somewhat analogous character.

One of the primary objects is to provide novel and practical mechanism of a comparatively simple nature that will record the operation of elevating mechanism, showing the number of trips or loads, the places from which such loads are taken together with all stops, delays and the like.

Another and important object is to provide means for recording the character or grade of ore or other material transported, and the levels or places from which the same are taken.

Still another object is to provide a signaling system which, while useful *per se*, also combines with the afore-mentioned means or mechanism to produce a semi-automatic apparatus in which the signal to the operator of the hoisting mechanism effects the operation of the recording means.

The preferred embodiment of the invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a diagrammatic view of a mine, showing the recording system installed. Fig. 2 is a view in elevation of the recording mechanism. Fig. 3 is a vertical sectional view on the line 3—3 of Fig. 2. Figs. 4, 5, 6 and 7 are respectively horizontal sectional views on the line 4—4, 5—5, 6—6 and 7—7 of Fig. 2. Fig. 8 is a vertical sectional view through one of the winding drums. Fig. 9 is a detail vertical sectional view through the marking device. Fig. 10 is a detail perspective view of the yoke located on the marking device. Fig. 11 is a similar view of the lever for holding said marking device to its work. Fig. 12 is a perspective view of the bracket associated with said lever. Fig. 13 is a detail perspective view of the actuating device for one of the registers. Fig. 14 is a detail perspective view of the guide for the marking device. Fig. 15 is a face view of a portion of one of the record sheets. Fig. 16 is a

vertical sectional view through the visual signal mechanism looking from the rear. Fig. 17 is a side elevation of one of the circuit closers. Fig. 18 is a top plan view of the same. Fig. 19 is a longitudinal sectional view therethrough. Fig. 20 is a cross sectional view therethrough. Fig. 21 is a diagrammatic view illustrating the various electric circuits.

Similar reference numerals designate corresponding parts in all the figures of the drawings.

Recording mechanism for the elevating means.—As illustrated diagrammatically in Fig. 1, a mine with two levels is illustrated, the shaft being designated by the reference numeral 1, and the two levels being respectively designated 2 and 3. Elevating mechanism operates in the shaft, and may be in the form of a skip 4 or any other suitable device. The same is raised and lowered by means of a cable 5, which is connected to a hoisting drum 6 operated by an engine 7. Connected to the hoisting drum 6 and operating therewith is recording mechanism, illustrated in Fig. 1 at 8. Taking up this recording mechanism, in detail, as illustrated in Figs. 2–15 inclusive, a suitable frame 9 is employed, in which are mounted a pair of stationary vertical shafts 10 having gear wheels 11 journaled on their lower ends, said gear wheels being in mesh with an intermediate idler 12. These shafts are surrounded by skeleton frames 13, secured to the gear wheels 11, and on said frames are detachably slipped winding drums 14, preferably in the form of open ended cylinders. These cylinders have at their lower ends inset lugs 15 that engage in sockets 16 carried by the skeleton frames and consequently the drums and frames are held against relative rotation. One of these drums is designed to carry a record receiving sheet 17 that is unwrapped therefrom, and wound upon the other drum, as will be evident by reference to Fig. 5. Said other drum is therefore provided with suitable tines 18 to engage the end of the sheet. For the purpose of removing the record sheet when the receiving drum has the same thereon, said drum is provided at its lower end, and as shown particularly in Fig. 3 with an opening 19 so that the rolled sheet can be grasped between the finger and thumb, and withdrawn from the drum or cylinder when said cylinder is detached from the skeleton frame. The

drums are operated by a suitable time movement shown and designated generally by the reference numeral 20. This time movement may be of any suitable character so that it is absolutely accurate. It is carried by a frame 21 that is hinged as shown at 22 to the rear side of the main supporting frame, and has a gear wheel 23 in mesh with one of the gear wheels 11. By having it hinged, it may be swung downwardly and out of the way, as illustrated in Fig. 3 in order to permit the drums to be readily removed and replaced.

By referring to Fig. 15, it will be noted that the record sheet 17 has its main portion divided into two longitudinal spaces 24 and 25, the margins of said spaces being provided with scales indicative of the divisions of time, as will be evident, and it will be clear that as the winding drums are revolved by the time movement, this sheet will be slowly unwound from one drum, and wound upon the other. Interposed between the drums is a vertical platen 26 across which the sheet operates, and cooperating with this platen on the exposed face of the sheet is a vertically movable recording or marking device 27 preferably in the form of a fountain pen having a suitable filling funnel 28. The pen, as shown, is slidably mounted in a pair of upstanding ears 29 carried by a supporting arm 30 that is vertically slidable in a guide 31, and has a threaded engagement 32 with a vertically disposed rotating screw shaft 33. The marking device 27, as clearly illustrated in Fig. 5, has its rear end offset and mounted on said marking device between the ears 29, is a yoke 33^a. This yoke is ordinarily secured against movement on the marking device by a set screw 34, and has a depending pintle 35 borne against by one end of a lever 36 that is journaled between its ends, as shown at 37 on the arm 30. A spring 38, connected to the other end of the lever and to an adjusting screw 39, serves to yieldingly maintain the marking device or pen against the record sheet 17. The adjusting screw 39 is carried by a supporting bracket 40 fastened to the arm 30, as will be clear by reference to Figs. 5, 9 and 12.

The screw shaft 33 is journaled in two horizontal bars of the supporting frame 9, and is geared at its lower end, and as illustrated at 41 to a horizontally disposed shaft 42. This shaft extends in any suitable direction and projects from the frame. It has secured thereto a sprocket wheel 43, and the sprocket chain 44, passing around the wheel 43, also passes around a sprocket wheel 45 carried by the hoisting drum. It will be understood that the gearing between said hoisting drum and the vertical screw shaft 33 is such that the operation of said drum from the second to the first level, will

rotate the screw shaft sufficiently to carry the marking device across the lower space 24 of the record sheet, and a movement of said drum sufficient to elevate the skip from the first level to the dumping point will carry the marking device from the intermediate line of division to the dump mark indicated on said record sheet.

The operation of this portion of the mechanism is believed will now be obvious. The time movement operates at a proper rate of speed, to carry the record sheet past the marking point, according to the time indicated on said record sheet. The said sheet having been properly started, will continuously operate, and therefore the marking device or pen will make a continuous line thereon. If the winding drum is rotated to lower the skip to the first level, a line as A in Fig. 15 will result, for the screw shaft 33 being simultaneously rotated, will carry the pen downwardly. After reaching the level if a delay occurs, a horizontal line, as B will show the length of such delay, and if the skip is now elevated to the dumping mark, another upwardly extending line C will be the result. If for instance, the skip is then lowered to the second level, the line D will clearly show the same, and if a break down or other accident occurs, to cause the skip to stop at an intermediate point, a horizontal line E will show the same, and also clearly indicate the length of the delay. Thus a complete record of the operation of the elevating mechanism will be produced.

It will of course be understood that the mechanism may be used in connection with any number of levels, two being shown in the present instance, merely for the sake of simplicity. Also these levels may be located at various depths requiring only the change in the arrangement of the record sheet and in the gearing which is interposed between the winding device and the vertical screw shaft 33. It is also worthy of note as illustrated, particularly in Fig. 2 that the threads on the screw shaft 33 terminate short of the horizontal bars, in which said shaft is threaded. This is important for the reason that if the winding drum for any reason should be operated beyond the limits of movement of the marking device, said device will merely disengage from the threads and prevent breakage of the parts. It will be understood that a number of the detachable cylinders may be employed in order that no great delay may take place in changing the record sheets, particularly when the mine is operated continuously.

Grade recording mechanism.—It will be noted by reference to Fig. 15 that the lower margin of the record sheet 17 is provided with longitudinal lines of spaces 46, in which the grades of ores elevated are recorded.

This recording mechanism is preferably constructed as follows: By reference to Fig. 3, it will be seen that two hammers 47 are employed, though any number may be provided depending on the number of grades of ore or material which it is desired to make record of. These hammers respectively have their heads 48 movable against the different spaces in vertical alinement with the marking device. They are pivoted, as shown at 49, between their ends, and their lower ends are connected by links 50 to swinging arms 51 that are attached to the armatures 52 of electro-magnets 53. Interposed between the hammer heads 48 and the record sheet is an inking ribbon 54 that passes around a plurality of rollers 55, and has retaining cords 56 on its margins, which cords engage in grooves 57 formed in the peripheries of the rollers. A step-by-step movement is given to the ribbon in order that a fresh portion will always be located in the paths of movement of the hammers. To this end, one of the rollers has a ratchet wheel 58 secured to its upper end, and referring to Figs. 2 and 5, it will be noted that a spring-pressed dog 59, carried by a reciprocatory bar 60, operates on the ratchet wheel. Another spring-pressed dog 61, engaged with the ratchet wheel, prevents the retrograde rotation of said wheel, and consequently a similar movement on the part of the ribbon. The reciprocatory bar 60 has a link connection 62 with a bell crank lever 63, and this lever in turn has another link connection 64 with a swinging actuating lever 65. The lever 65 has outstanding cam shoulders 66, either of which swings into the path of movement of the pen supporting arm 30 when the other is moved out of said path. A spring 67, carried by the lever 65 and operating against a pin 68, serves to hold said lever 65 in either of its two positions. With this construction therefore upon every upward and downward movement of the pen supporting arm, the lever 65 will be caused to rock back and forth, thus through the connections 62, 63, and 64, effecting a reciprocation of the bar 60, and causing the dog 59 to effect a movement of the ratchet wheel 58 and of the ribbon.

The electro-magnets 52 are in independent circuits 69 that include suitable sources of electrical energy 70, and these circuits extend downwardly to the different levels where they are provided with circuit closers or switches which are designated as a whole by the reference numeral 71. As shown, each closer comprises side plates 72 to which are attached terminals 73 and a swinging operating lever 74 pivoted to and between the side plates 72 has pivoted thereon, a swinging arm 75 that carries a cross bar 76. This bar operating on the edges of the walls 72, is movable across the terminal 73, thus

connecting the same, and closing the circuit. A spring 77 serves to yieldingly hold the arm downwardly with the cross bar 76 upon the walls 72. Brackets 78 are fastened to said wall 72, and have elevating dogs 79 pivoted to their ends and extending over the free ends of the terminals 73, these dogs being held downwardly upon the edges of the side walls 72 by springs 80. With this construction therefore, if the cross bar 76 is in its rearmost position in rear of the dogs 79, upon the forward movement of the lever 74, the cross bars 76 will operate beneath the dogs 79 and engage the terminals 73, said cross bar will then pass beneath the free ends of the dog 79 and consequently upon the return movement of the operating lever 74, the cross bar 76 will ride upon the dogs 79 and will be bridged thereby from the terminals so that the circuit will not again be closed. Upon the closure of either of the circuits 69, it will be evident that the electro-magnet in that circuit will be energized. Consequently the armature 52 being operated, will cause the hammer connected thereto to be swung and the head, striking the ribbon, will cause a mark upon the record sheet in one of the spaces intended for recording the grade of ore. The operator therefore in the mine at the desired level, uses this mechanism to indicate the grade of a skip of ore that is about to be elevated, but the circuit closer also constitutes a part of the mechanism for signaling the engineer or operator of the hoisting mechanism, and this signaling mechanism is constructed and associated with the recording means as follows.

Signaling mechanism.—An electric bell of any well known form and designated 81, located in the engine house or at the proper point with relation to the hoisting mechanism, is included in an electric circuit 82 and also includes a suitable source of electrical energy 83. This circuit extends down into the mine, and has spaced terminals 84 secured in the circuit closers 71, and in the path of movement of the cross bars 76 of said circuit closers. It will thus be clearly evident that when a skip is to be hoisted from the mine, the person in control at the level from which it is to be hoisted, has only to operate the proper lever 74 indicating the grade of ore in the skip. Upon the initial movement of said lever, the circuit 69 will be closed to make a record of the grade of ore upon the record sheet, and directly thereafter the cross bar 76 of the circuit closer will connect the terminals 84 of the circuit 82, whereupon the bell 81 will be sounded, and any number of strokes of the bell may be made, provided the arm 74 is not completely returned over the bridges 79. The record of the grade of the ore therefore also acts as a record against the engineer in charge of the hoisting mechanism, for the mark made by

the hammer will indicate in connection with the mark made by the pen, whether or not there was delay in answering the signal to raise the load. There is also preferably employed a visual signal for the engineer, the same comprising a rotary pointer 85 that operates over a dial 86 properly numbered as shown. The pointer 85 is connected to a shaft 87 on which is mounted a ratchet wheel 88 and a pinion 89. The pinion 89 is in mesh with a gear wheel 90, to which is connected a return spring 91. An actuating dog 92 operates on the ratchet wheel 88 to effect a step by step rotation thereof and a consequent winding of the spring 91. The return movement of said ratchet wheel after its movement by the dog 92 is prevented by a swinging dog 93 pivoted at one end, as shown at 94, and thus being movable into and out of coaction with the ratchet wheel.

The operating dog 92 is connected to the lower end of a lever 95 fulcrumed between its ends, as shown at 96 and having a link connection as illustrated at 97 with the armature 98 of an electro-magnet 99. This electro-magnet is in the circuit 82 with the bell 81 and therefore every time said circuit is closed, the armature 98 will be actuated. This will cause the movement of the dog 92, and the consequent rotation of the pointer 85, the dog 93 preventing the return of said pointer after each movement. However, if the arm or dog 93 is raised, the spring 91 reacting on the wheel 90 and pinion 89, will immediately return the pointer to zero. This movement of the dog 93 is effected by a suitable handle 100 having a cable connection 101 with a lever 101^a which in turn has a cable connection 101^b with the dog, said handle being disposed in a convenient position to be grasped and operated by the engineer in charge. To the lever is connected a return spring 101^c which normally maintains said lever against a stop 101^d. It sometimes may happen, however, that the engineer is not present or for some other reason, it is desired to repeat the signal. It will be evident that the mechanism must be such that a repetition of the signal will not operate the recording mechanism, and also it is necessary that such repetition will not merely advance the pointer 88. Therefore at each level there is provided an additional circuit closer 102 illustrated in the diagrammatic Fig. 21 and constructed exactly the same as those already set forth. The terminals 103 of this circuit closer are a part of a circuit 104 that includes a source of electrical energy 105 and an electro-magnet 106. This magnet has an armature 107 cooperating therewith, and a link 108 connected to the armature is connected to a lever 109. The lever 109 has one end disposed beneath the end of the dog 93. The other terminals 110 of the circuit closer 102, are connected to the

circuit 82. Bridge dogs 111 are mounted over the terminals 103. An actuating lever 112 forms a part of the circuit closer 102 and has attached thereto the usual cross bar 113 corresponding in all respects to the cross bar 76 of the above described circuit closers. Assuming therefore that a signal has been given to the engineer at the top of the shaft, and it is desired from any cause to repeat the same, the operator at the level from which the load is to be taken, operates the circuit closer 102. As the cross bar 113 moves over the terminal 103 the circuit 104 will be closed, thus energizing the magnet 106, which draws its armature 107. As a result the lever 109 will be operated, which will raise the dog 93 so that the pointer will return to its original or zero position. The movement of the lever 112 of the circuit closer, being continued, the cross bar 113 will strike the terminals 110, thus closing the circuit 82 and the signal can be repeated. The return of the lever 112 and cross bar 113 to its original position will not effect the operation of the dog 93, as said cross bar 93 will be bridged from the terminals 103 by the dogs 111.

Registering mechanism for the loads.— Besides recording the number of loads of different grades of ore on the record sheet, registering mechanism is also provided so that the number of loads can be ascertained at any time at a glance without the necessity of an inspection of the complete record sheet. To this end, there is mounted upon the supporting frame 9, a plurality of registers 114, the number of such registers depending on the number of grades of ores to be recorded and registered. Thus in the present embodiment, of the invention, two are illustrated, though it will be evident that any number can be employed. These registers may be of any well known type. In the present form, each consists of three number wheels 115, each of those having the lower orders of digits, being provided with means for effecting an increment of movement of the next upon each complete rotation. Operating on the teeth 116 of the wheel having the lowest order of digits, is a swinging yoke 117 that is carried by a vertically reciprocating actuating bar 118. These bars have pivoted to their lower ends, abutment blocks 119 that are located in the path of movement of the supporting arm 30 of the marking device or pen. The actuating bars 118 furthermore have notches 120 in their rear sides, as shown in Fig. 13, and holding dogs 121 pivotally mounted between their ends on the supporting frame, as shown in Fig. 4, engage in the notches. The dogs 121 have their free ends upturned, as illustrated at 122, and as shown in Figs. 3 and 4, these ends are located in the path of movement of the offset terminals 123 of levers 130

124, fulcrumed between their ends, as shown at 125 upon the platen 26. Reciprocating yokes 126 horizontally disposed and embracing the hammers 47 are mounted in hangers 127 and have their rear ends pivotally connected to the levers 124. These yokes are urged forwardly by springs 128, shown in Fig. 2.

Assuming now that the actuating bars 118 are in their elevated positions and are locked by the dogs 121, and also assuming that a loaded skip at one of the levels is about to be elevated, one of the switches 71 is operated, and as already explained, one of the hammers is actuated to record the load upon the record sheet. The hammer in turn operates one of the yokes 126, causing the movement of the lever 124 and of the dog 122, which thus releases the actuating bar 118, and permits it to fall. The yoke 117 therefore drops beneath the lower tooth 116 of the number wheel 115, and as the skip reaches the dumping point, the pen carrying arm 30 will strike the depending block 119 of the depressed actuating bar, causing the same to move upwardly and rotating the number wheel one increment. Thus the operation of the register is dependent upon the load properly reaching the surface. It will thus be seen that the mechanism disclosed, records the operation of the elevating mechanism, produces a record of the grades of ore, the number of loads and the levels from which they are taken, besides recording the time at which the different loads are ready to be hoisted, and maintaining a check against those in charge of the hoisting mechanism. Both oral and visual signals are provided for the operator in charge of the hoisting mechanism, with means for repeating signals without causing confusion and without effecting improper operations of the recording mechanism, while registering mechanism, dependent on the recording means, is provided for showing the number of loads of the different grades actually elevated, preventing mistakes or fraud in the operation of the recording means.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art, without further description, and it will be understood that various changes in the size, shape, proportion, and minor details of construction, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is:—

1. In a system of the character set forth, the combination of a car movable back and forth between predetermined points, and a mechanism for operating the same,

with a recording mechanism including a screw, connecting means between the screw and car-operating mechanism for rotating the screw alternately in opposite directions during the back and forth movement of the car, a marking device operated by the screw from one end of the latter to the other, a record sheet carrying means disposed in co-operative relation with the marker, and a register operated by the marking device each time the latter reaches the end of its movement in one direction.

2. In a system of the character set forth, the combination with a holder for a record receiving means, of a recording device comprising a movable supporting arm, a marking device slidably mounted on the arm, a lever fulcrumed on the arm and engaged with the device, a spring operating against the lever to hold the device in coaction with the record receiving means, and means for effecting the operation of the recording device.

3. In a system of the character set forth, the combination with record receiving means, of a screw shaft, a supporting arm engaged with and operated by the screw shaft, said arm having ears, a reciprocatory marking device slidably mounted in the ears and co-operating with the record receiving means, a lever fulcrumed on the arm and engaged with the marking device, and a spring connected to the arm and to the lever.

4. In an apparatus of the class described, the combination of a supporting frame, a pair of drums mounted on the frame, a gearing between the drums, a driving means movably mounted on the frame and including a pinion engaged and disengaged with one of the members of the gearing by the movement of the driving means, devices for securing a record sheet to the drum, a screw mounted on the frame and located parallel with and in front of one of the drums, a marker carried by and movable longitudinally of the screw, a guide on the frame for preventing turning of the marker with the screw, another marker mounted on the frame, means for operating the last-mentioned marker independently of the screw, an inking ribbon arranged in coöperative relation with the second marker, and means actuated by the first marker for moving the inking ribbon.

5. In a recording system, the combination of a car movable back and forth between prescribed points, a recording mechanism located at one of the points and including means for holding a movable sheet on which the movements of the car are indicated, a load marking device, and means located at each of the other points for operating the marking device to make a record on the said sheet.

6. In a recording system, the combina-

tion of a car movable back and forth between prescribed points, a device for holding a continuously-movable record-receiving means, a marker associated with the said device and movable synchronously with the car for indicating the trips of the latter and the stopping and starting points, a load marking means associated with the said device, and manually controlled devices located at the said points for operating the marking means.

7. In a recording system, the combination of a car movable back and forth between prescribed points, a holder for a record-receiving means, a mechanism for driving the same at a uniform speed, a marking device cooperating with the said holder, a mechanism operating synchronously with the car for moving the marking device with the car and also stopping and starting the same simultaneously with the car, marking means cooperating with the said holder for the record-receiving means, and controlling devices located at the said points for actuating the marking means.

8. In a recording system, the combination of a car movable back and forth, a mechanism for operating the car, a device for holding a record-receiving means, a marker cooperating with said device, a driving connection between the mechanism and marker for moving the latter synchronously with the car, means for continuously driving the holding device for the record-receiving means, a plurality of marking devices adapted to make entries on the record-receiving means, and controlling means located at points along the line of travel of the car for operating the marking devices independently.

9. In a recording system, the combination of a car movable back and forth, a motor-operated mechanism arranged at a fixed point and operatively-connected with the car, a continuously-driven holding device for a record-receiving means, a marker movable over the said means, a driving connection between the mechanism and marker for operating the latter by the former in synchronism with the car, an operator's signal at the said mechanism, and devices located at different points along the line of travel of the car to operate the signal.

10. In a recording system, the combination of a car movable back and forth, a motor-operated mechanism arranged at a fixed point and operatively-connected with the car, a continuously-driven holder for a record-receiving means, a marker movable over the said means, a driving connection between the mechanism and marker for operating the latter by the former in synchronism with the car, an operator's signal at the said mechanism, devices located at different points along the line of travel of

the car to operate the signal, marking devices associated with the holder for the record-receiving means, and controlling means located at the said points for operating the marking devices.

11. In a system of the character set forth, the combination with a supporting frame, of spaced drums, each journaled at one end only in the supporting frame and including a cylinder that is detachable from the other end, gearing connecting the drums, a time movement geared to one of the drums for rotating said drums, a platen located between the drums, a reciprocatory recording device cooperating with the platen and movable longitudinally thereof, means for effecting the reciprocation of the device, and a hammer recording device cooperating with one extremity of the platen.

12. In a system of the class described, the combination of a car movable back and forth between certain points, a recording means operating simultaneously with the car for indicating the movement of the latter, a registering device normally out of operation, and means located along the line of travel of the car for controlling the registering device to be operated by the recording means.

13. In a system of the class described, the combination of a holder for a continuously-operated record-receiving means, a recording instrument movable back and forth over the same in a direction at right angles to the line of movement thereof, a car-operating mechanism operatively connected with the instrument for moving and stopping the instrument with the car, load-recording devices cooperating with the record-receiving means, and electrical means controlled from different points along the line of travel of the car for operating the recording devices.

14. In a system of the character set forth, the combination with a holder for a continuously operated record receiving means, and a car traveling back and forth between prescribed points, of a recording hammer movable into and out of coaction with the record receiving means, and manual means at each of the said points for effecting the movement of the recording hammer to enter a record on the record-receiving means.

15. In a system of the character set forth, the combination of a holder for a record-receiving means, and a car traveling back and forth between prescribed points, a mechanism for continuously operating the holder, a recording device continuously bearing on the record-receiving means, a mechanism for moving the device with the car, a pivoted recording hammer, and manually-controlled means located at one of the said points for swinging the hammer into and out of coaction with the record-receiving means of another record on the latter.

16. In a system of the character described, the combination of a holder for a record sheet, means for operating the holder, a platen over which the sheet moves, a recording instrument adapted to bear on the sheet and movable back and forth longitudinally of the platen, a car-operating mechanism connected with the instrument for moving the latter, a registering device, an actuator for the registering device, a lock therefor mounted on the platen and adapted to be released by the marker upon reaching the limit of its movement in one direction.

17. In a system of the character described, the combination of a holder for a continuously-operated record-receiving means, a marker movable back and forth in cooperative relation with the holder, a registering device, an actuator for the latter, a member slidably mounted on the actuator and located in the path of the marker, a lock for holding the member raised out of the path of the marker, and a load-recording means and arranged to release the lock.

18. In a system of the character described, the combination of a holder for a record sheet, a platen therefor, a vertically-movable marking device, a register, an actuator therefor, a vertically-movable member on the actuator disposed in the path of the marking device, a lock carried by the platen for holding the member in raised position out of the path of the marker, and means controlled from a distant point to release the lock to permit the member to drop into the path of the marking device.

19. In a system of the character described, the combination of a car-operating mechanism, a recording device independent of the car and connected with the mechanism for recording the movements of the car, a registering device associated with the recording device and normally disposed out of cooperative relation with the same, and electrical means for throwing the registering device into cooperative relation with the recording device to be operated by the latter.

20. In a system of the class described, the combination of a car-operating mechanism, a registering device for registering the number of loads carried by the car, a recording means including an element movable simultaneously with the car for indicating the trips and stops of the latter, and electrical means for operatively relating the registering device with the said element for causing the latter to operate the former at the end of a load-carrying trip of the car.

21. In a system of the character set forth, the combination with a holder for a record receiving means, of a plurality of hammers movable into and out of cooperation with different but aligned portions of the record receiving means, means for separately operating the hammers on their striking

strokes, and spring-pressed members slidably supported for returning the hammers to normal position and yieldingly holding the same in such position.

22. In a system of the character described, the combination with a continuously-movable record sheet holder, a plurality of pivoted hammers movable into and out of coaction with the record sheet on the holder, an inking ribbon interposed between the hammers and holder, a step by step device for moving the ribbon, a single reciprocal element movable periodically into and out of engagement with the device for actuating the ribbon, separate electric circuits, means included in each circuit for operating the hammers independently, and a plurality of circuit-closing devices in each circuit.

23. In a system of the character described, the combination of a car-operating mechanism, a recording device including a movable element for indicating the movements of the car, a registering device arranged to be operated by the said element when the car reaches the end of a load-carrying trip, means for holding the registering device out of coaction with the said element, and a second means operated at the beginning of the load-carrying trip for actuating the first-mentioned means to throw the registering device into coaction with the said element.

24. In a system of the character set forth, the combination with a holder for a record-receiving means, of a car movable between different points, a recording instrument for intermittently making a record on the record-receiving means of the points from which and of the time when the loads are taken by the car, and a recording device movable toward and from the instrument for making a substantially continuous record on said record-receiving means of the trips of the car between the said points and of the time required for the trips.

25. In a system of the character set forth, the combination with a holder for a record-receiving means, of a car, an operating mechanism therefor, a load-recording hammer movable into and out of coaction with the said means, means for operating the hammer prior to the travel of the car with its load, load-moving recording means including a device movable toward and from the instrument for making a substantially continuous record on the record-receiving means, and mechanism for starting, stopping and moving the device in synchronism with the car.

26. In a system of the character set forth, the combination with a holder for a record receiving means, of a movable recording device for tracing a continuous line, said device cooperating with the record receiving means, a ribbon extending over a portion of the said means, an operating screw for the

device having its thread terminating at one end adjacent the ribbon to stop the said device before reaching the latter, a recording instrument movable into and out of coaction with the record receiving means, and manually controlled means for intermittently operating said recording instrument.

27. In a system of the character set forth, the combination with a holder for a record receiving means, of a movable support extending across the said means, a recording device carried by and movable longitudinally of the support for tracing a continuous line, said device cooperating with the record receiving means, and a recording hammer movable into and out of coaction with the record receiving means and substantially aligned with the movable recording device, a spring for returning the hammer and means for actuating the hammer.

28. In a system of the character set forth, the combination of a record sheet holder including a platen, a marker movable back and forth with respect to the platen, an endless inking ribbon extending transversely to the platen, guide rollers around which the ribbon passes, a plurality of independently-operated hammers disposed side by side and arranged to imprint through the ribbon on the record sheet in different lines, a step by step device for turning one of the rollers to move the ribbon, said step by step device including a ratchet wheel and pawls, and means for reciprocating one of the pawls by the movement of the said marker to turn the ratchet wheel.

29. In a system of the character described, the combination of a record device including a vertically-movable reciprocatory element, a register disposed above the device, a vertically-movable actuator associated with the register and located in the path of said element for engagement by the latter upon reaching the upper limit of its movement, a latch for holding the actuator out of the path of the element against the force of gravity, manually-controlled means for releasing the latch to permit the actuator to drop into the path of the element, and means for automatically re-setting the latch after the operation of the register.

30. In a system of the character set forth, the combination with delivering and receiving drums for a record sheet, of a platen, a marking device movable along the platen, a car-operating mechanism, means independent of the mechanism for operating the drums, means connected with the mechanism for effecting the movement of the marking device, a plurality of hammers movable into and out of coaction with the platen and associated with the marking device, a mechanism for operating each hammer, and independent means located at different points

remote from the said mechanism for controlling each of the latter.

31. In a system of the character set forth, the combination with delivering and receiving drums for a record sheet, of a platen associated therewith, a marking device disposed in constant cooperation with the platen, a car-operating mechanism, means operating independently of the car-operating mechanism for driving the drum, means permanently connected with the said mechanism for moving the marking device in synchronism with the car of the said mechanism, and a plurality of pivoted hammers that swing into and out of cooperation with the platen to make marks on different portions of the record sheet, electro-magnets having armatures connected to the hammers, and separate means located at different points for independently energizing each of the magnets.

32. In a system of the character set forth, the combination with a holder for a record receiving means, of a plurality of marking devices that cooperate therewith, an inking ribbon associated with one of the devices, and operating means for the ribbon actuated by the other device.

33. In a system of the character set forth, the combination with a holder for a record receiving means, of mechanism for continuously operating the same, a movable marking device cooperating with the record receiving means, means for moving the marking device, another marking device movable into and out of coaction with the record receiving means and associated with the first marking device, means for moving said second device into and out of such coaction, an inking ribbon associated with the second marking device, and means actuated by the first device for effecting an intermittent movement of the ribbon.

34. In a system of the character set forth, the combination with a holder for a record receiving means, of mechanism for continuously operating the same, a movable marking device cooperating with the record receiving means, means for moving the marking device, another marking device movable into and out of coaction with the record receiving means and associated with the first marking device, means for moving said second device into and out of such coaction, an inking ribbon associated with the second marking device, and means actuated by the first device for effecting an intermittent movement of the ribbon, said means including a roller having a ratchet wheel, a dog coacting with the ratchet wheel, and an operating device connected to the dog and located in the path of movement of the first marking device.

35. In a system of the character described, the combination with a holder for a record

receiving means including a platen, of a screw shaft, means for rotating the same, a marking device associated with the platen and engaged with the screw shaft, a hammer movable into and out of coaction with the platen, means for actuating the hammer, a ribbon interposed between the hammer and platen, a roller about which said ribbon operates, a ratchet wheel connected to the roller, a dog operating on the ratchet wheel, a swinging lever having bearing portions located in the path of movement of the marking device, connections between the lever and the dog, and means for holding the lever in different positions when actuated by the marking device.

36. In a system of the character described, the combination with load elevating mechanism including a load-carrying car, of load recording means, a signal associated with the elevating mechanism, and common means for effecting the operation of the load recording means and the signal.

37. In a system of the character described, the combination with load elevating mechanism, of load recording means, operating means therefor, a signal associated with the elevating mechanism, operating means for the signal, and common means for controlling the movement of both the said operating means.

38. In a system of the character set forth, the combination with load elevating mechanism, of load recording means, electrically operated mechanism for operating the recording means, a signal associated with the load elevating mechanism, electrically operated means for operating the signal, and a common circuit closer for effecting the operation of both mechanisms.

39. In a system of the character set forth, the combination with elevating mechanism, of load recording means including an electrically operated hammer, an electric circuit including the hammer and a circuit closer, and an electric signal for the elevating mechanism including a circuit and said circuit closer.

40. In a system of the character set forth, the combination with elevating mechanism, of load recording means including an electrically operated hammer, an electric circuit including the hammer and a set of spaced terminals, an electric signal for the elevating mechanism including an electric circuit having another set of spaced terminals, and a circuit closer movable to positions to connect the terminals of the different sets.

41. In a system of the character set forth, the combination with elevating mechanism, of electrically operated load recording mechanism, an electrically operated signal for the elevating mechanism, a device movable in opposite directions for effecting the operation of the recording mechanism and the sig-

nal, and means for holding the device inactive as to the recording mechanism during the movement of said device in one direction.

42. In a system of the character set forth, the combination with load elevating means, of electrically operated load recording mechanism including a circuit having spaced terminals, an electrically operated signal for the elevating mechanism including a circuit having spaced terminals, a circuit closer movable in opposite directions to connect the spaced terminals of the different circuits, and means for holding the closer out of engagement with the terminals of the recording mechanism circuit when said closer is moved in one direction.

43. In a system of the character set forth, the combination with load elevating mechanism, of electrically operated load recording mechanism including a circuit having spaced terminals, an electrically operated signal for the elevating mechanism including a circuit having spaced terminals, a swinging circuit closer movable in opposite directions to connect the spaced terminals of the different sections, and bridge dogs pivotally located over the terminals of the recording mechanism circuit and holding the closer out of engagement with said terminals during the movement of the closer in one direction.

44. In a system of the character described, the combination with load elevating mechanism, of load recording means, a signal associated with the elevating mechanism, common means for effecting the operation of the load recording means and the signal, and means for operating the signal independently of the load recording means.

45. In a system of the character set forth, the combination with load elevating mechanism, of load recording means, electrically operated mechanism for operating the recording means, a signal associated with the load elevating mechanism, electrically operated means for operating the signal, a common circuit closer for effecting the operation of both mechanisms, and a separate circuit closer for effecting the operation of the signal independently of the operation of the load recording means.

46. In a system of the character set forth, the combination with load elevating mechanism, of load recording means, a visual signal associated with the elevating mechanism and movable from and to a set position, common means for controlling the operation of both the load recording means and the movement of the visual signal from its set position, and separate means for resetting and repeating the operation of the signal without operating the recording means.

47. In a system of the character set forth, the combination with load elevating mechanism, of electrically operated load record-

ing means, an electrically operated visual signal associated with the elevating mechanism and movable from and to a set position, a circuit closer for controlling the operation of the load recording means and the movement of the visual signal from its set position, electrically controlled means for resetting the visual signal, and common means for effecting the operation of the latter controlling means and for repeating the operation of said signal without operating the recording means.

48. In a system of the character set forth, the combination with load elevating mechanism, of a signal associated therewith, a combined load and signal recorder, and means for operating the signal and the recorder.

49. In a system of the character set forth, the combination with load elevating mechanism, of mechanism for recording the movements thereof, load recording means associated with said recording mechanism, and means for operating the load recording means to record a load placed on the elevating mechanism.

50. In a system of the character set forth, the combination with load elevating mechanism, of mechanism for recording the movements thereof, a signal associated with the elevating mechanism, load and signal recording means associated with said recording mechanism, and means for operating the load and signal recording means and the signal to record and signal that a load has been placed on the elevating mechanism.

51. In a system of the character set forth, the combination with elevating mechanism, of a record holder, a recording device associated with the record holder, means driven by the elevating mechanism for operating the recording device, a load recording instrument cooperating with the record holder, and means for operating the instrument to record a load placed on the elevating mechanism.

52. In a system of the character set forth, the combination with elevating mechanism, of a record holder, a recording device associated with the record holder, means driven by the elevating mechanism for operating the recording device, a load recording instrument cooperating with the record holder, a signal associated with the elevating mechanism, and means for operating the instrument and the signal, said instrument thereby recording the placing of a load on the elevating mechanism and also recording the operation of the signal.

53. In a system of the character set forth, the combination with record sheet carrying means, of a time movement for operating the same, a marking device cooperating with a sheet carried by said means, hoisting mechanism constituting means for moving the

marking device, a recording hammer movable into and out of coaction with said record sheet, electrically operated means for actuating the hammer including a circuit closer, a signal associated with the hoisting mechanism, and electrically operated means for actuating the signal including said circuit closer.

54. In a system of the character set forth, the combination with record sheet carrying means, of a time movement for operating the same, a marking device cooperating with a sheet carried by said means, hoisting mechanism constituting means for moving the marking device, a recording hammer movable into and out of coaction with said record sheet, electrically operated means for actuating the hammer including a circuit closer, a visual signal associated with the hoisting mechanism and movable to and from a set position, electrically operated means for moving the signal from its set position and including said circuit closer, electrically operated resetting means for the visual signal including a circuit closer, and electrically operated means for moving the signal from its set position independently of the operation of the hammer, said latter means including the circuit closer of the resetting means.

55. In a system of the character set forth, the combination with record sheet moving means, of a platen associated therewith, a screw shaft, a marking device engaged and operated by the screw shaft, said marking device being yieldingly held in associated relation with the platen, hoisting mechanism geared to the screw shaft, a plurality of load recording hammers movable into and out of coaction with the platen and disposed in substantially a line with the path of movement of the marking device, separate electrically operated actuating means for the hammers having separate circuits and separate circuit closers, electrically operated signaling mechanism associated with the hoisting mechanism and including a circuit that also includes said circuit closers, whereby upon the operation of the circuit closers the signal is also operated, and means independent of said circuit closers for resetting and actuating the signal without operating the hammers.

56. In a system of the character set forth, the combination with a register, of mechanical operating means supported adjacent the register including a recorder having a movable part arranged to move into and out of operative relation with the register.

57. In a system of the character set forth, the combination of a car, a motor supported independently of the car and in fixed position, and means between the motor and car for moving the latter back and forth, with a recording mechanism including an element moving in synchronism with the car, a regis-

tering mechanism arranged in juxtaposition with the said element, and means controlled by the recording mechanism for operating the registering mechanism by the said element each time the car reaches the end of its travel in one direction.

58. In a system of the character set forth, the combination of a car movable back and forth, a holder for a record-receiving means, load-marking devices for indicating the various points along the line of travel from which loads are taken by the car, means located at the loading points for operating the marking devices, a load-registering mechanism, an element movable synchronously with the car, and means controlled by any of the marking devices for operatively relating the said element with the registering device.

59. In a system of the character set forth, the combination with registering mechanism including geared number-carrying wheels, of a movable recording device including a motor-driven bodily-movable member, and an actuator for the registering mechanism located in the path of movement of the member and operated thereby.

60. In a system of the character set forth, the combination with registering mechanism, of a reciprocatory recording device, a motor-driven means for moving the device and a reciprocatory actuator for the registering mechanism operated by the recording device.

61. In a system of the character set forth, the combination with registering mechanism, of a holder for a record receiving means, a recording device movably associated with the receiving means, a screw rotating alternately in opposite directions for moving the device back and forth with respect to the said means, and means for supporting the device wholly on the screw and an actuator for the registering mechanism operated by the recording device, when the same reaches a predetermined position.

62. In a system of the character set forth, the combination with hoisting mechanism, of a register for the number of loads hoisted, recording mechanism operated by the hoisting mechanism for showing the operation of the latter; and means for operating the register when the recording mechanism moves to a position to show the elevation of a load.

63. In a system of the character set forth, the combination with hoisting mechanism, of a marking device, a screw shaft for operating the marking device geared to the hoisting mechanism, a register, and an actuator for the register located in the path of movement of and operated by the marking device.

64. In a system of the character set forth, the combination with a holder for a record receiving means, of a movable recording in-

strument associated therewith, a register, a traveling actuator, a motor for the actuator and means controlled by the operation of the recording mechanism and separate from the latter for controlling the operation of the register by the actuator.

65. In a system of the character set forth, the combination with a holder for a record-receiving means, of a recording hammer movable into and out of coaction therewith, a register and means between the hammer and register and controlled by the operation of the hammer for controlling the operation of the register.

66. In a system of the character set forth, the combination with a register, of an actuator therefor, operating means for the actuator, a device for holding the actuator in an inactive position with respect to the operating means, recording mechanism, and a releasing element actuated simultaneously with the said mechanism for effecting the release of the actuator from the holding device.

67. In a system of the character set forth, the combination with a register, of an actuator therefor, recording means constituting operating means for the actuator, a latch for holding the actuator in an inactive position with respect to the operating means, and recording means constituting actuating means for said latch.

68. In a system of the character set forth, the combination with a register, of an actuator therefor movable from and to a set position, operating means for moving the actuator to said set position, a latch for holding said actuator in said set position out of coöperative relation with the operating means, a recording mechanism including a marking element and means actuated by the element for operating the latch.

69. In a system of the character set forth, the combination with a register, of an actuator therefor movable from and to a set position, operating means for moving the actuator to said set position, a latch for holding it in said set position, a recording hammer, and latch actuating means associated with the hammer and released thereby to permit the actuator to move from set position into coöperative relation with the actuator.

70. In a system of the character set forth, the combination with a plurality of registers, of a plurality of actuators therefor, a recording mechanism including a marker-carrying element forming a common operating means for the actuators, and means for effecting the association and disassociation of the different actuators and the operating means to permit the operation of any register independently of the other.

71. In a system of the character set forth, the combination with a plurality of registers, of a recording device including a marker-

carrying element movable back and forth and constituting an operating device, a plurality of actuators for the registers movable into coöperative relation with the operating device to be operated when the latter has completed its full back and forth movement, and separate means for controlling the said movements of the actuators.

72. In a system of the character set forth, the combination with a plurality of registers, of an operating device, a plurality of actuators for the registers movable into and out of coaction with the operating device, and a plurality of recording instruments constituting means for controlling the said movements of the actuators.

73. In a system of the character set forth, the combination with a plurality of registers, of a movable recording device, a plurality of actuators for the registers movable into and out of coaction with the recording device, and a plurality of movable recording instruments constituting means for controlling the said movements of the actuators.

74. In a system of the character set forth, the combination with a plurality of registers, of recording mechanism including a movable marking device, a plurality of actuators for the registers movable to positions to be operated by the marking device, a plurality of recording hammers, means for separately moving the same, and means actuated by the hammers for controlling the movements of the actuators into coaction with the marking device.

75. In a system of the character set forth, the combination with a register, of a recording device constituting operating means for the register, a recording instrument constituting means for controlling the operation of the register by the recording device, and a plurality of means for independently operating the instrument.

76. In a system of the character set forth, the combination with a movable recording device, of a register, an actuator for the register movable into and out of coaction with

the recording device, and operated thereby, and means for controlling the said movement of the actuator, said means including another recording device.

77. In a system of the character set forth, the combination with a movable recording device, of a register, an actuator for the register movable into and out of coaction with the recording device and operated thereby, a latch for holding the actuator out of coaction with the recording device, and another recording device connected to the latch for operating it.

78. In a system of the character set forth, the combination with a holder for a record receiving means, of recording mechanism co-operating therewith including a reciprocatory marking device, a register, an actuator for the register movable into and out of coaction with the marking device, a recording hammer movable into and out of coaction with the record receiving means, and a latch for holding the actuator inactive, said latch being operated by the recording hammer.

79. In a system of the character set forth, the combination with a holder for a record receiving means, of a reciprocatory marking device associated therewith, a screw shaft for operating the marking device, hoisting mechanism geared to the screw shaft, a pivoted recording hammer movable into and out of coaction with the record receiving means, a register, a reciprocatory actuator for the register movable to a position to be operated by the marking device, a latch for holding the actuator out of coaction with the marking device, and operating devices for the latch engaged with and operated by the hammer.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JOHN MORGIE JOHNSON.

Witnesses:

ISAAC A. AMALI,
C. H. DAWSON.