3 Sheets—Sheet 1.

(No Model.)

J. B. IVEY.

AUTOMATIC RECORDING SIGNAL FOR RAILROADS.

No. 422,790. Patented Mar. 4, 1890.

Fig. 1.

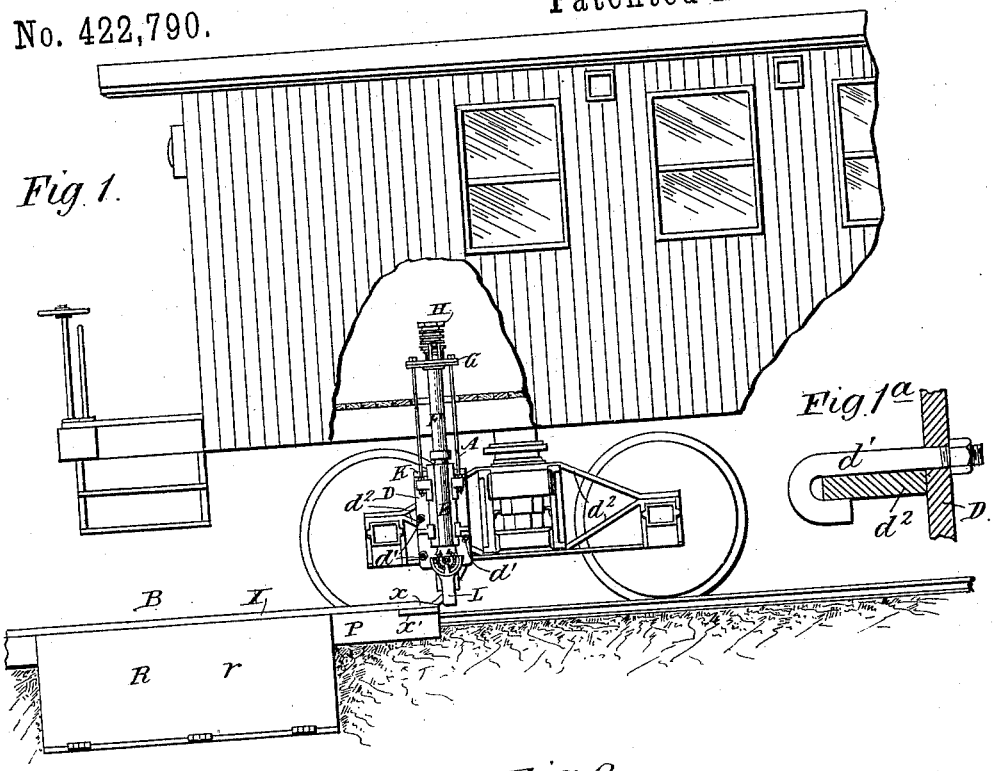


Fig. 1a

Fig. 2

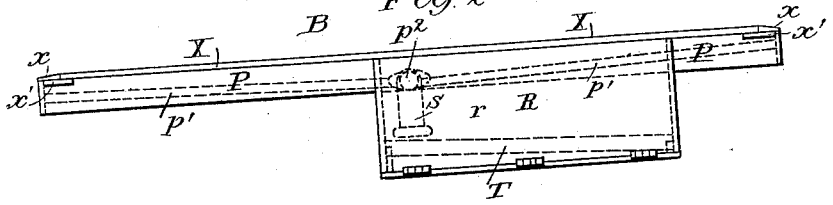


Fig. 3.

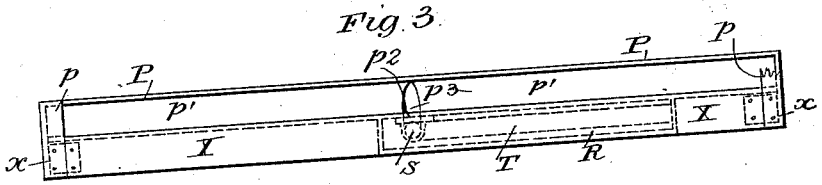
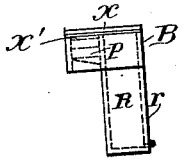


Fig. 4.



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3 Sheets—Sheet 2

(No Model.)

J. B. IVEY.

AUTOMATIC RECORDING SIGNAL FOR RAILROADS.

No. 422,790. Patented Mar. 4, 1890.

Fig 5.

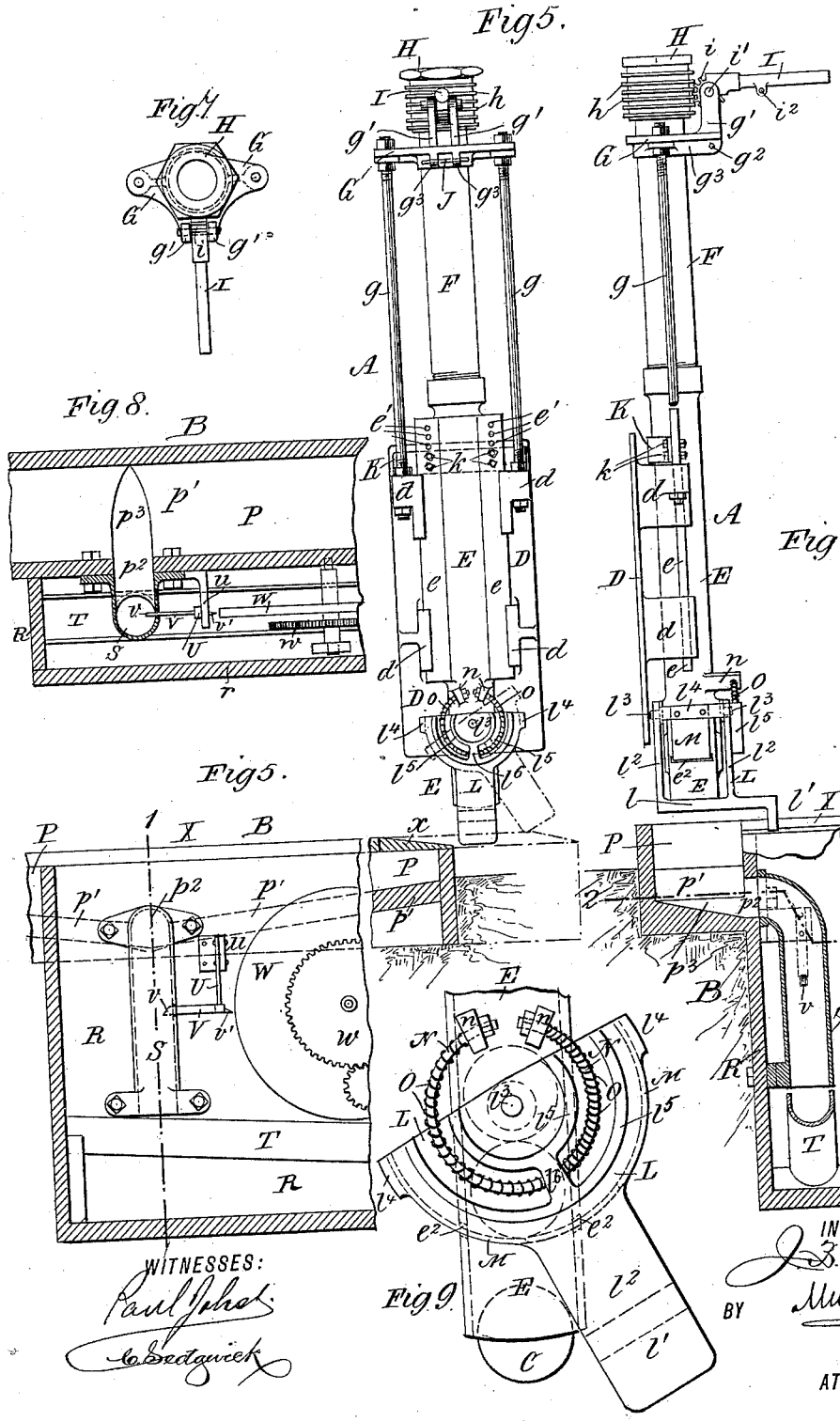

Fig 4.

Fig 8.

Fig 6.

Fig 7.

Fig 9.

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(No Model.) 3 Sheets—Sheet 3.

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No. 422,790. Patented Mar. 4, 1890.

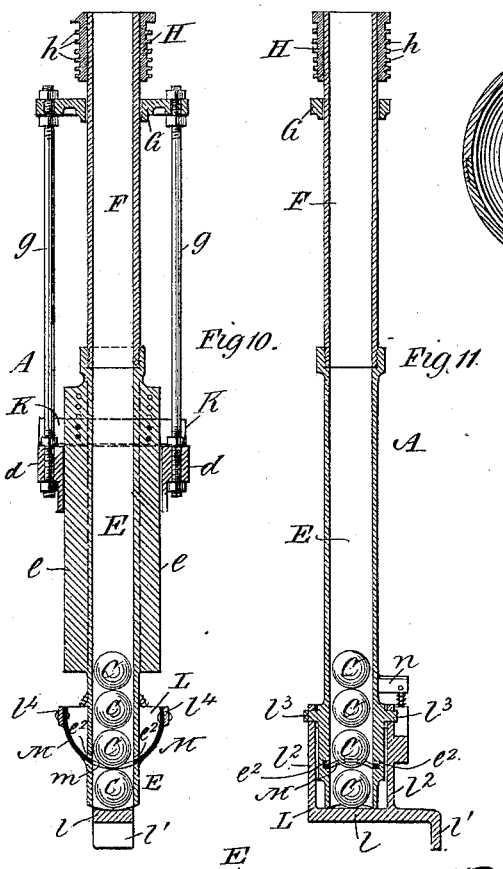

Fig. 10.

Fig. 11.

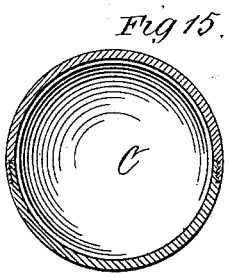

Fig. 15.

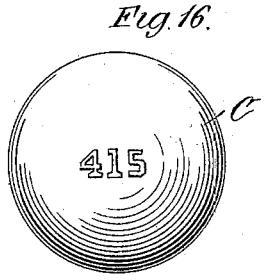

Fig. 16.

Fig. 17.

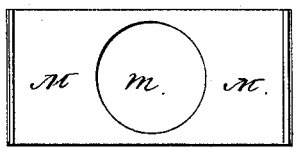

Fig. 18.

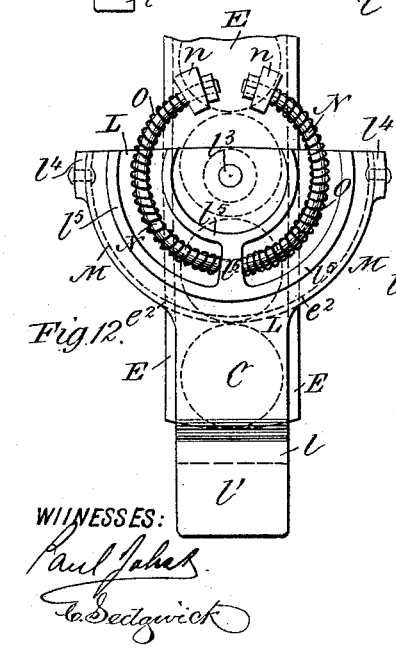

Fig. 12.

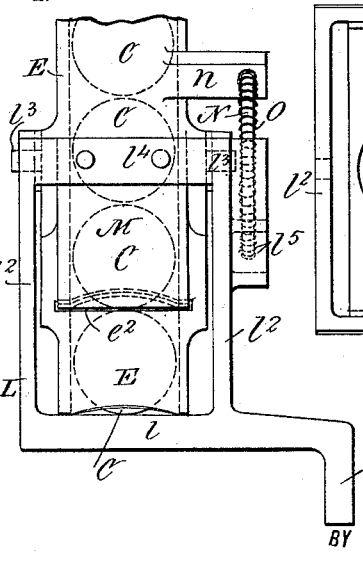

Fig. 13.

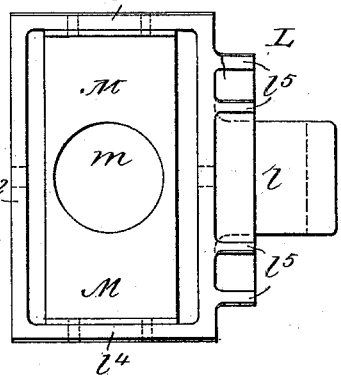

Fig. 14.

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UNITED STATES PATENT OFFICE.

JAMES BURNETT IVEY, OF MACON, GEORGIA.

AUTOMATIC RECORDING-SIGNAL FOR RAILROADS.

SPECIFICATION forming part of Letters Patent No. 422,790, dated March 4, 1890.

Application filed September 24, 1889. Serial No. 324,901. (No model.)

To all whom it may concern:

Be it known that I, JAMES BURNETT IVEY, of Macon, in the county of Bibb and State of Georgia, have invented a new and Improved Automatic Recording-Signal for Railroads, of which the following is a full, clear, and exact description.

My invention relates to a signal for railroads which will automatically record the time of the passage of any engine, tender, car, or train past any station or other point along the line, and also give particulars regarding its attendants and the nature of its load; or will deliver messages to station-agents, train or track men, or other employés of a railroad.

The invention has for its object to provide a simple, inexpensive, and efficient signal apparatus of this character.

The invention consists in certain novel features of construction and combinations of parts of the apparatus, which comprises a carrier on the train, a series of signal-balls adapted thereto, and a receiver at the road-bed for the balls delivered from the carrier, all as hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation illustrating my improvement as applied to a caboose-car and the road-bed, the car being partly broken away. Fig. 1ª is a detail sectional view, showing how the signal-ball carrier is held to the car-truck frame. Fig. 2 is a side elevation of the signal-ball receiver or pocket, which is set in the road-bed alongside the railroad-track. Fig. 3 is a plan view of the receiver. Fig. 4 is an end view thereof. Fig. 5 is a side view of the signal-ball carrier or holder of the apparatus and broken sectional side view of parts of the ball-receiver at the road-bed, and drawn to a larger scale. Fig. 6 is a rear view of the parts shown in Fig. 5, with the ball-receiver in transverse vertical section on the line 1 1 in said figure. Fig. 7 is a plan view of the top of the signal-ball carrier. Fig. 8 is a detail sectional plan view of the ball-receiver, taken on the irregular line 2 2 in Fig 6. Fig. 9 is an enlarged side view of the lower end of the ball-carrier with its striker and valve device swung to one side to allow a ball to drop from the carrier. Fig. 10 is a vertical central sectional side view of the signal-ball carrier. Fig. 11 is a vertical central sectional view of the ball-carrier, taken at right angles to Fig. 10. Fig. 12 is an enlarged side view of the lower end of the ball-carrier in normal or central position and drawn to the same scale as Fig. 9. Fig. 13 is a rear view of the parts shown in Fig. 12. Fig. 14 is a plan view of the ball-carrier striker and trip-valve device. Figs. 15 and 16 are sectional and side views, respectively, of one of the signal-balls of the apparatus; and Figs. 17 and 18 are respectively vertical sectional and plan views of the upper valve of the striker device.

My improved recording-signal for railroads comprises, generally speaking, three instrumentalities—viz., a carrier A, to be connected to a locomotive-engine, caboose, or other car; a receiver B, located on the road-bed alongside the railroad-track, and a series of signaling balls or bodies C, which are automatically dropped by the carrier into the receivers B, and are marked with or contain instructions, reports, or messages or data, which are to be delivered along the line of railroad.

I will particularly describe the ball-carrier, the ball-receiver, and the balls in the order named, as follows:

The signal-ball carrier A is made with a face-plate D, provided with four lugs *d*, arranged in upper and lower pairs and having vertical grooves in which are fitted loosely opposite side flanges or wings *e e* on a barrel E, which thus may slide up and down. Into the top of the barrel is screwed or otherwise fitted an upper pipe or tube F, which passes loosely through a cap or head plate G, which is rigidly held to the upper pair of face-plate lugs *d d* by stay-rods *g g*, having bolt ends with nuts screwed on them both above and below the cap and the lugs. To the top of the tube F is screwed or otherwise fixed a collar H, provided with a series of annular parallel horizontal ribs or flanges *h*, forming a vertically-ranging toothed rack, which is normally engaged by a segmental pinion *i*, formed at the inner end or head of a lever I, which, by a pin *i'*, is fulcrumed to and between the upper

ends of two lugs g' g', rising from the cap G. The collar H may be cast with a narrow vertically-ranging series of teeth to form a rack only about as wide as the pinion i engaging it; but by providing the annular series of ribs or flanges h on the collar a rack will always be provided for engagement by the lever-pinion, no matter what may be the position into which the collar may be turned while fastening it by screw-threads or otherwise to the top of the tube F, or in whatever position the tube itself may be left after screwing it into the top of the barrel E. The lever I is provided with a lug having a hole i^2, which, when the lever is pressed down, may be brought to coincide with holes g^2, made through two lugs g^3 g^3 on the under side of the cap or head plate, so as to allow a pin J to be passed through the holes g^2 i^2 in the lever and cap lugs, in order to lock the lever in a lowered or vertical position, for a purpose hereinafter explained. The barrel-wings e e are provided with vertically-ranging series of holes e' e', through which are passed bolts k, holding to the wings and barrel a cross-bar or stirrup K. The opposite ends of this stirrup rest on a pair of the lugs d d of the carrier face-plate D and sustain the carrier-barrel E, its tube F, and the top collar H on the lugs. The face-plate carrying the lugs is itself supported by bolting or clamping it to the arch-bar frame of a diamond-truck or to an equalizer-bar resting on the truck-axle boxes of an engine, tender, or car, or to a frame carried directly by the driving-axle boxes of an engine moving along the railroad-track. Figs. 1 and 1ª of the drawings show how hook-bolts d' may be used to hold the face-plate D to the bar d^2 of the truck-frame of a caboose-car and allowing the upper open end of the carrier-barrel to project a little through and above the floor of the car to permit signal-balls to be conveniently dropped into it by a freight-conductor or trainman. When the carrier is held to the truck of an engine, the barrel will project within the cab to allow balls to be dropped into it by the engineer or fireman. By shifting the bolts k to other holes e' of the barrel-wings the barrel, tube, and collar E F H may be sustained by the stirrup K at various heights on the face-plate lugs, so as to keep a swinging striker and valve device L held to the lower end of the barrel, and hereinafter described, at any required distance above the trip-plate of the signal-ball receiver B. This adjustment, by means of the holes e', is used in order to cause the striker and valve to operate properly with relation to said trip-plate should the axle-boxes carrying the frame or bar d^2, supporting the carrier, be higher or lower than the track, it being understood that this vertical adjustment by shifting the yoke-bolts k is only a limited one, made in order to accommodate the variations occurring in the diameter of wheels when exchanging them or when their treads or tires wear down in service under the engine, tender, or car provided with the carrier. The yoke K may be arranged so as to adjustably support the ball-carrier barrel by means of the lower pair of lugs d d of the face-plate, if desired.

From the aforesaid description it is obvious that when the carrier is properly sustained by the yoke K resting on the face-plate lugs to support the pendent trip-lug l' of the striker L at proper height to be swung either forward or backward by contact with the trip-plate of the ball-receiver B, and that when the lever I is in a horizontal position, as shown in Figs. 5 and 6 of the drawings, by swinging this lever downward to a vertical position the lever-pinion i will, by engaging the rack h of the carrier-collar, lift the entire barrel E, with its extension-tube F, and striker and valve device L, together with the striker trip-lug l', clear above the trip-plate of the receiver, so as to prevent operation of the striker and valve by the trip-plate, and consequently prevent dropping of a ball from the carrier into the receiver. The lever I may in this manner be lowered by hand in order to lift the carrier-barrel and its attachments temporarily while passing by any one or more of the receivers B along the track, and when the lever is released or allowed to rise the barrel will drop by gravity until its yoke K rests on the lugs of the face-plate. If it is desired to lock the lowered lever I in order to hold the carrier and attachments raised permanently or for a considerable time, this may be done by placing the pin J in the holes g^2 i^2 of the cap and lever; or the pin may be passed through the holes g^2 and in front of the lever.

I particularly describe the striker and valve device L as follows, with more special reference to Figs. 5 and 6 and 9 to 14, inclusive, of the drawings: The striker has a lower valve-plate l, which is fixed to side plates l^2 l^2, extending upward next the lower end of the barrel E and fulcrumed thereto by pins or trunnions l^3 l^3 in such a manner that the valve-plate l will swing clear of the lower convexed end of the barrel. The valve-plate l is extended outward and then downward to form the striker-lug l' above mentioned. To front and rear upper cross-bars l^4 l^4 of the striker are fixed the opposite ends of a semicircular upper valve-plate M, which is curved downward in the arc of a circle having the trunnion-pins l^3 as a center, and passes through slots e^2 made in the front and rear walls of the barrel E. The lowest point of the valve-plate M is as high above the lower end of the barrel and the valve-plate l as the diameter of one of the signal-balls C of the apparatus, or a trifle more. The valve M has a central opening m a little larger than one of the balls C, and through this opening the balls held in the carrier may pass downward successively to the lower valve-plate l of the striker. The outside plate l^2 of the striker is preferably provided with a couple of semicircular flanges or ribs l^5 l^5 and a cross-bar or lug l^6, connecting them at the center. In two lugs n n on

the barrel E above the striker are rigidly held the opposite ends of a curved rod N, the center of which passes loosely through the striker-lug l^6, and on this rod between the lugs n l^6 are loosely placed two spiral springs O O, which, by normally expanding between the lugs, hold the lower valve-plate l of the striker device L centrally below the open lower end of the carrier-barrel E, and also hold the upper valve M, with its opening m, in line with the bore of the barrel. The springs O O being of equal resistance, it is obvious that should the striker be swung either forward or backward by contact of its lug l' with the receiver or any other object firmly fixed alongside the railroad-track the valve-plate l will be swung from beneath the barrel E, so as to drop the lowermost ball C, which had rested on said valve-plate l, and simultaneously the upper valve M will pass beneath the next to the lowest ball in order to prevent its dropping until the entire striker device is retracted and held back into its normal position by the springs. Upon this retraction all the balls in the barrel will fall as the lowest one drops through the opening m of the valve M down to the now closed valve l, ready to be dropped the next time the striker is swung on its trunnions. Fig. 9 of the drawings illustrates the dropping of a ball from the carrier-barrel. The ribs or flanges l^5 on the striker are not essential; but they protect or guard the springs O, and therefore are preferred in practice. Any other suitable spring or retracting device for the valved striker may also be employed.

I will now particularly describe the signal-ball receiver B with more special reference to Figs. 1 to 6, inclusive, of the drawings. The receiver is made with a ball-catching trough P, having considerable length, and a shorter and deeper box R, into which the balls pass from the trough. The receiver-trough and box are laid in or on the road-bed alongside of and parallel to the railroad-track. The trough P is long enough to assure the dropping of a ball into it from the carrier on the engine or car when a train is running at a high speed. The trough is open at the top, excepting short top pieces p p, one being at each of its ends, which arrangement prevents the signal-balls from bouncing out when they strike the end of the trough. The trough-floor p' is made to slope to the place where a side opening p^2 is provided for the passage of the balls into the box R. The drawings show this opening p^2 at the center of the trough; but, if preferred, the opening may instead be at either end of the trough, and in either case the trough-floor slopes downward to said opening in the first case from both ends and in the second case from one end of the trough. At the opening there is provided a depression or valley p^3 to guide the ball through the opening into the box. The box R is provided with a vertically-ranging tube S open at the bottom and connecting by an upper bend or elbow with the opening or passage p^2 between the trough and the box. The tube or conduit S opens into the top of an inclined trough or channel T, which is held at the bottom of the box in order to finally receive the balls. To the side or top of the box R is held by a suitable bracket or lug u an elastic rod or plate U, which at its free end carries a marker-arm V, projecting at one beveled end v through the side of the ball-tube S, and at its other end carrying a prick-point v', or it may be a punch or stamp, adapted when the marker is forced endwise by passage of a ball C through the tube S to mark, punch, or stamp a ribbon or band held at the periphery of a wheel or spool W. This spool is rotated by any suitably-arranged clock-work w, so that the ribbon or band marked or graduated in hours and minutes will indicate by the prick, punch, or stamp on it the precise time when each ball was dropped from the train's carrier. As the balls delivered in the channel T lodge one behind the other in the order in which they were dropped from the carrier, it will always be easy to tell which ball caused any particular mark on the ribbon or band. This ribbon or band may either be wound on a spool or roller or may be stretched between rollers or held in any other approved manner adapting it to receive the impression of the marker. One side r of the box R is hinged as a door in order to give access to the interior of the box to authorized persons holding the key of a lock r', by which the door is secured.

The dropping of the balls from the carrier is effected by contact of the swinging striker and valve device L with a long top board or plate X, which forms or may form the top of the box R, and extends therefrom each way to the ends or nearly to the ends of the trough P. This trip-plate X is provided with or supplemented by ends formed, preferably, by separate cross-pieces x x, projecting inward over the ends of the trough to form the short top pieces p p hereinbefore mentioned, so as to prevent jumping of the signal-balls from the trough. The end pieces x x are beveled downward toward their outer edges and the opposite ends of the trough, so as to act gradually on the striker L in swinging it in order to drop a ball from the carrier. I will also apply cleats x' x' under the end pieces x x, in order to sustain them by means of and at the ends of the main trip-plate X.

It will be understood that the carrier-barrel E, with the striker and valve device L, may be used without the pipe or tube extension F, and either with or without the collar H and lever I, which could be used directly on the barrel E, if desired; but the construction with the extension-tube F is preferred, as it increases the ball-carrying capacity of the device for use on railroads where signal-stations are numerous along the line.

With the aforesaid description a brief general statement of the operation of the appa-

ratus will suffice, as follows: The signal-balls C having been placed in proper order in the tube F and barrel E, so as to be dropped at the successive stations to be signaled, it is obvious that as the train moves forward and the carrier-lug l' strikes the beveled end piece x of the trip-plate X of any receiver B the striker and valve device L will be swung rearward, so as to close the valve M and open the valve-plate l, thus causing the lowermost signal-ball C to drop into the receiver-trough P, whence it passes to the box R, tube S, and channel T, meanwhile forcing back the marker V and compelling it to prick, punch, or stamp the ribbon or band on the wheel W, in order to indicate the time of delivery of the ball. As the carrier-lug l' passes off the rear end of the receiver trip-plate X, the springs O O instantly retract the striker and valve device L into a vertical position, thereby closing the valve l and opening the valve M, in order to allow another signal-ball to drop down to the valve l, ready to be delivered into the next receiver whose trip-plate X actuates the striker in the manner hereinbefore explained.

The signal ball or body C may be made hollow in one piece with one or more holes communicating with its interior, or in two detachable parts, as shown in Fig. 15 of the drawings, so as to contain reports giving particulars as to the character of the train or the number of cars and the nature of their load, or orders to station-agents, track-men, and others along the line of railroad. The signal-balls may also be made solid, and may be marked on their exterior with any desired information—as, for instance, the recognized number of the train—as shown in Fig. 16 of the drawings.

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

1. In railroad-signals, the combination, with a tubular or hollow carrier on a train and signal balls or bodies adapted to the carrier, of a receiver on the road-bed into which the carrier delivers the balls, substantially as herein set forth.

2. In railroad-signals, the combination, with a valved carrier on a train and signal balls or bodies adapted to the carrier, of a trip device on the road-bed operating the passing carrier-valve to automatically drop a signal-ball from the carrier, substantially as herein set forth.

3. In railroad-signals, the combination, with a valved carrier on a train and signal balls or bodies adapted to the carrier, of a ball-receiver on the road-bed provided with a trip device which automatically operates the valve of the passing carrier to drop a signal-ball from the carrier into the receiver, substantially as herein set forth.

4. In railroad-signals, the signal-ball carrier made with a support, a barrel fitted adjustably thereto and provided with a valve device adapted to drop balls from it, and a yoke or cross-bar adapted for adjustable connection to the barrel and sustained by the barrel-support, substantially as described, whereby the barrel may be adjusted vertically on a train to cause its valve device to operate properly with relation to a trip device on the road-bed, as set forth.

5. In railroad-signals, the signal-ball carrier made with a support, a barrel fitted adjustably thereto and provided with a valve device adapted to drop balls from it, a yoke or cross-bar sustaining the barrel on the support, a rack on the barrel, and a pinion engaging the rack, substantially as described, whereby on turning the pinion the barrel may be adjusted to render its valve inoperative to prevent dropping of balls from the carrier, as set forth.

6. In railroad-signals, the signal-ball carrier made with a support, a barrel fitted adjustably thereto and provided with a valve device adapted to drop balls from it, a yoke or cross-bar sustaining the barrel on the support, a rack on the barrel, and a lever sustained from the barrel-support and provided with a pinion engaging the rack, substantially as herein set forth.

7. In railroad-signals, the signal-ball carrier made with a support, a barrel fitted adjustably thereto and provided with a valve device adapted to drop balls, a yoke or cross-bar sustaining the barrel on its support, a rack on the barrel, a lever sustained from the barrel-support and provided with a pinion engaging the rack, and a detent locking the lever to hold the barrel raised to prevent operation of the signal-ball-delivery valve, substantially as herein set forth.

8. In railroad-signals, the signal-ball carrier made with a support, a barrel fitted adjustably thereto and provided with a valve device adapted to drop balls, a yoke or cross-bar sustaining the barrel on its support, a rack on the barrel, consisting of a series of annular parallel ribs or flanges, and a pinion adapted to the rack, substantially as described, whereby the pinion will engage the rack to allow vertical adjustment of the barrel by it however the barrel on its rack may be turned, as set forth.

9. In railroad-signals, the combination, with a support having lugs d and a barrel E, having wings e, loosely fitting the lugs, and provided also with a swinging striker L, having valves l M, of a yoke K, held to the flanges e and resting on the lugs d to sustain the barrel, substantially as herein set forth.

10. In railroad-signals, the combination, with a support having lugs d and a barrel E, having wings e, loosely fitting the lugs and provided with vertically-ranging series of holes e', and provided also with a swinging striker L, having valves l M, of a yoke K, held adjustably to the barrel-wings by bolts passing through the wing-holes e', substantially as herein set forth.

11. In railroad-signals, the combination,

with a support having lugs *d* and a barrel E, having wings *e*, fitted loosely in the lugs and provided with a swinging striker L, having valves *l* M, of an auxiliary tube F on the barrel E, a head-plate G, sustained from the barrel-support, a rack on the tube F, and a lever L, fulcrumed to the head-plate and having a pinion *i*, engaging said rack, substantially as herein set forth.

12. In railroad-signals, the signal-ball carrier made with a barrel receiving the balls and provided near its outlet with a transverse slot, combined with a striker and a valve device hung to the barrel and having two valves, one working across the barrel-outlet and the other swinging through the barrel-slot and provided with a passage for the balls, substantially as herein set forth.

13. In railroad-signals, the signal-ball carrier made with a barrel receiving the balls and provided near its outlet with a transverse slot, combined with a striker and valve device hung to the barrel and having two valves, one working across the barrel-outlet and the other swinging through the barrel-slot, and provided with a passage for the balls, and springs retracting the striker and valve device to normal position, substantially as herein set forth.

14. In railroad-signals, the signal-ball carrier made with a barrel receiving the balls and provided with a transverse slot e^2, combined with a striker and valve device hung to the barrel and provided with a valve *l*, working across the barrel-outlet, and a concavo-convex valve M, having a ball-passage *m* and working through the barrel-slot e^2, said striker adapted for operation by a trip device on the road-bed, substantially as herein set forth.

15. In railroad-signals, the signal-ball carrier made with a barrel receiving the balls and provided with a transverse slot e^2, combined with a striker and valve device hung to the barrel and having a valve *l* working across the barrel-outlet, and a concavo-convex valve M, having a ball-passage *m* and working through the barrel-slot e^2, said striker adapted for operation by a trip device on the road-bed, a curved rod N, sustained from the barrel, a lug on the striker through which the rod passes freely, and springs O O on the rod, retracting the striker and valves to normal position, substantially as herein set forth.

16. In railroad-signals comprising a tubular or hollow signal-ball carrier on the train and a ball-receiver on the road-bed, said receiver made with a trough adapted to receive the balls from the carrier and a box receiving the balls from the trough, substantially as herein set forth.

17. In railroad-signals comprising a tubular or hollow signal-ball carrier on the train and a ball-receiver on the road-bed, said receiver made with a trough adapted to receive the balls from the carrier, a box receiving the balls from the trough, and a trip-plate extending along the trough and adapted to actuate the ball-discharge device of the carrier, substantially as herein set forth.

18. In railroad-signals comprising a signal-ball carrier on the train and a ball-receiver on the road-bed, said receiver adapted to catch the balls delivered from the carrier and provided with a registry band or device and a marker adapted to imprint the band and actuated by the balls delivered from the carrier, substantially as herein set forth.

19. In railroad-signals comprising a signal-ball carrier on the train and a ball-receiver on the road-bed, said receiver made with a trough receiving the balls from the carrier and a box receiving the balls from the trough, said box provided with a registry band or device and a marker adapted to imprint the band and actuated by the balls passed into the box, substantially as herein set forth.

20. In railroad-signals comprising a signal-ball carrier on the train and a ball-receiver on the road-bed, said receiver adapted to catch the balls delivered from the carrier and provided with a registry band or device, clock-works mechanism actuating said registry-band, and a marker adapted to imprint the band and actuated by the balls delivered from the carrier, substantially as herein set forth.

21. In railroad-signals comprising a signal-ball carrier on the train and a ball-receiver on the road-bed, said receiver made with a trough adapted to receive the balls and a box receiving the balls from the trough, said box provided with a registry-band or device and clock-works mechanism actuating the band and a marker adapted to imprint the band and actuated by the signal-balls passed into the box, substantially as herein set forth.

22. In railroad-signals, the signal-ball receiver made with a trough P, having an inclined floor and a depression p^3 at the base of said incline, an adjacent box R, and a ball-passage p^2 at the depression p^3 between the trough and box, substantially as herein set forth.

23. In railroad-signals, the signal-ball receiver made with a trough P, having an inclined floor, a box R, a tube S in the box receiving the balls from the trough, and a channel T in the box receiving the balls from the tube, substantially as herein set forth.

24. In railroad-signals, the signal-ball rereceiver made with a trough P, a box R, a tube S in the box receiving the balls from the trough, a yielding marker V, sustained with one end in the tube and operated by the balls, and a registry band or device opposing the other end of the marker to be imprinted thereby, substantially as herein set forth.

25. In railroad-signals, the signal-ball receiver made with a trough P, a box R, a tube S in the box, receiving the balls from the trough, a yielding marker V, sustained with one in the tube and operated by the balls, a registry band or device opposing the other

end of a marker to be imprinted thereby, and a clock-works mechanism actuating the band, substantially as herein set forth.

26. In railroad-signals comprising a tubular or hollow signal-ball carrier on the train and a ball-receiver on the road-bed, said receiver made with a trip-plate having beveled ends and with a trough catching the balls delivered from the carrier and provided with top-plates at the ends preventing jumping of the balls from it, substantially as herein set forth.

JAMES BURNETT IVEY.

Witnesses:
VIC. A. MENORD,
MATT. R. FREEMAN.

Corrections in Letters Patent No. 422,790.

It is hereby certified that in Letters Patent No. 422,790, granted March 4, 1890, upon the application of James Burnet Ivey, of Macon, Georgia, for an improvement in "Automatic Recording Signals for Railroads," errors appear in the printed specification requiring correction as follows: In line 61, page 2, the word "than" should read *above*, in line 7, page 5, the reference letter "L" should read *I*, and in line 133, same page, the word *end* should be inserted after the word "one;" and that the said Letters Patent should be read with these corrections therein to conform to the papers pertaining to the case in the Patent Office.

Signed, countersigned, and sealed this 22d day of April, A. D. 1890.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

C. E. MITCHELL,
Commissioner of Patents.