No. 869,557. PATENTED OCT. 29, 1907.

J. DOYLE.

SAFETY MECHANISM FOR RAILWAY TRAINS.

APPLICATION FILED MAY 22, 1906.

6 SHEETS—SHEET 1.

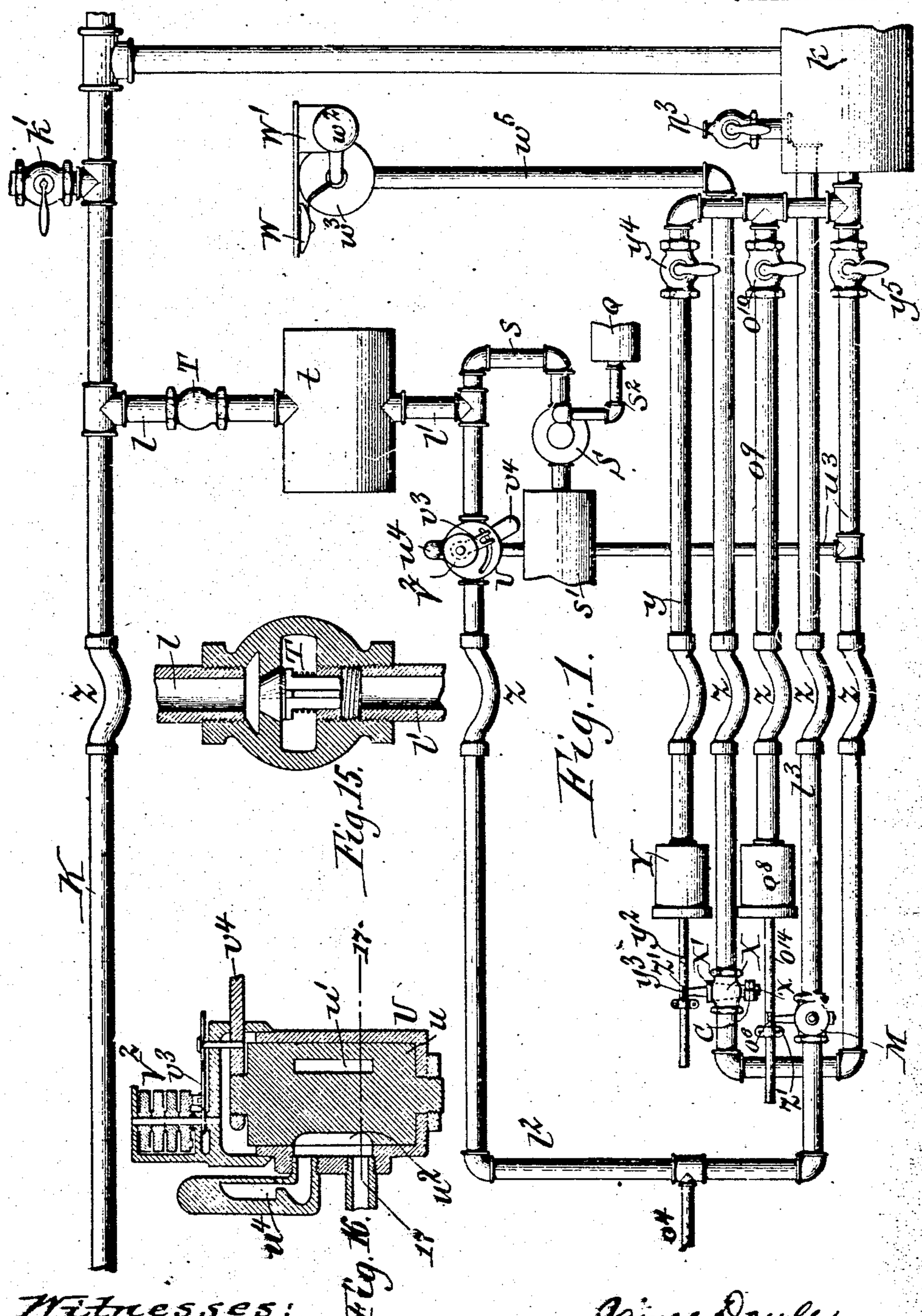

Fig. 1.

Fig. 15.

Witnesses:
Louis W. Gratz.
Ruth Farrell.

James Doyle Inventor.
by Geyer & Popp
Attorneys.

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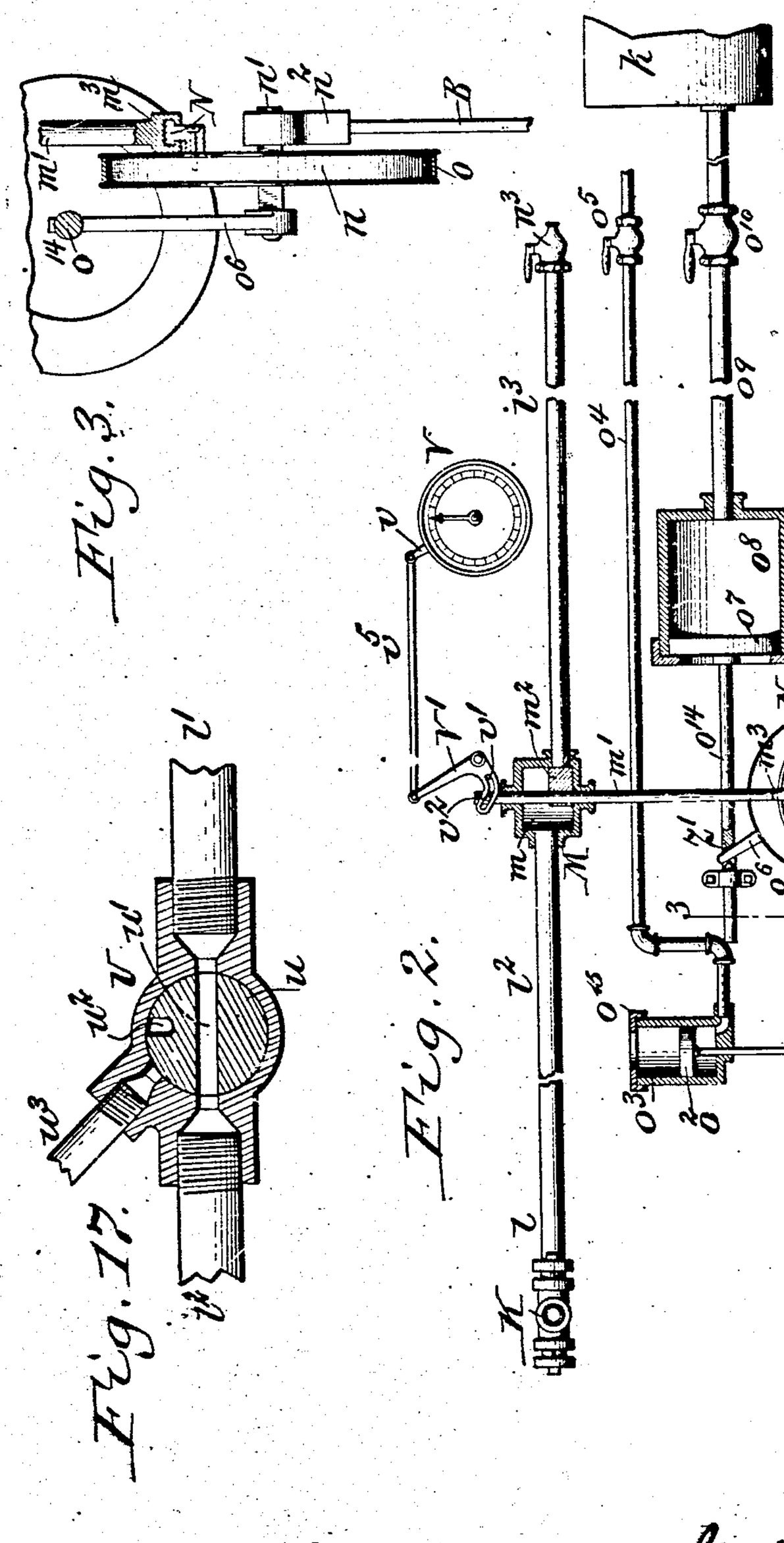

Fig. 3.

Fig. 2.

Fig. 4.

Witnesses:
Louis W. Gratz
Ruth Isabell.

James Doyle, Inventor
by Geyer & Popp
Attorneys.

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Fig. 6.

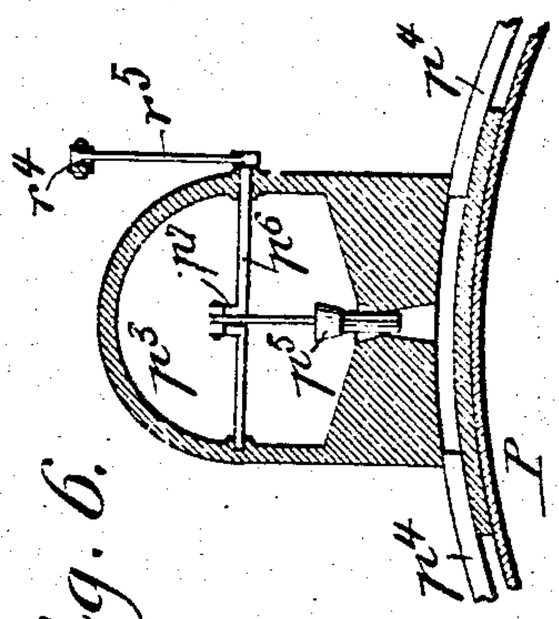


Fig. 19.

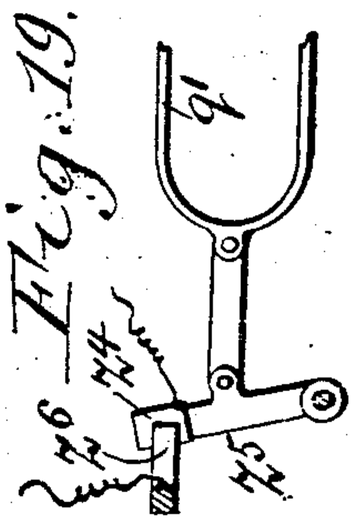


Fig. 4.

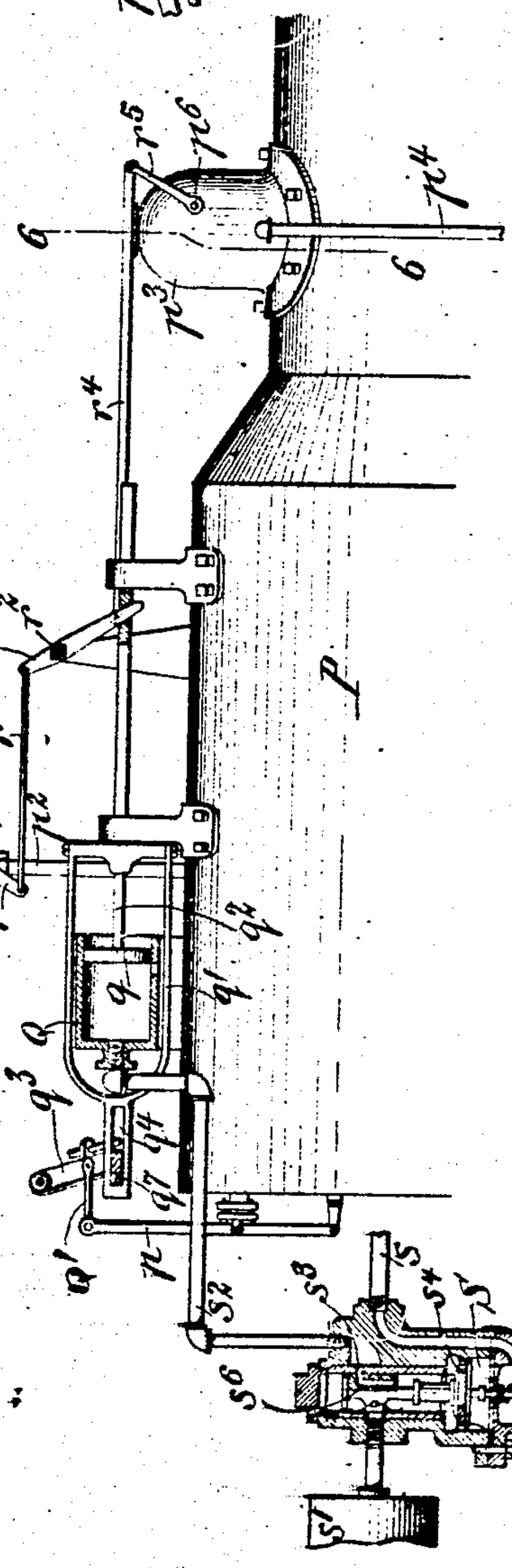
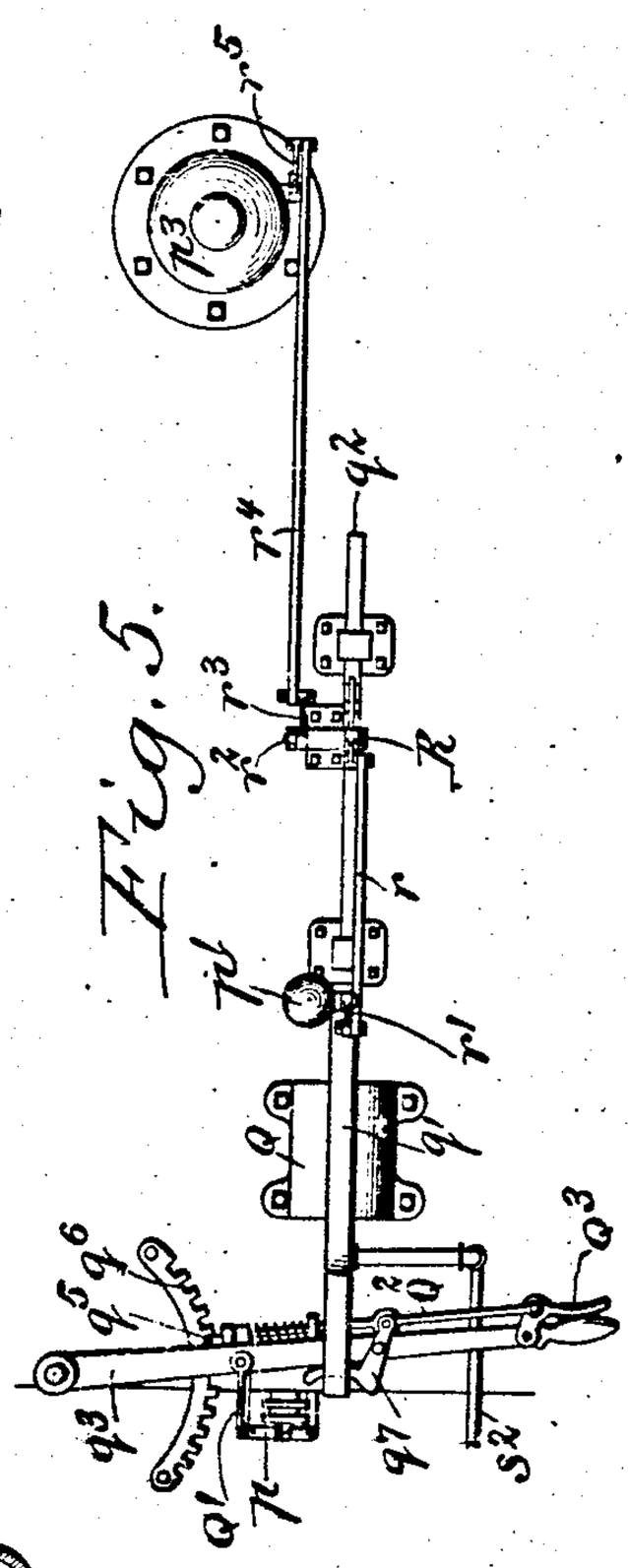


Fig. 5.



Witnesses:
Louis W. Gratz
Ruth Tarbell

James Doyle
Inventor
by Geyer & Popp
Attorneys

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6 SHEETS—SHEET 4.

Fig. 8.

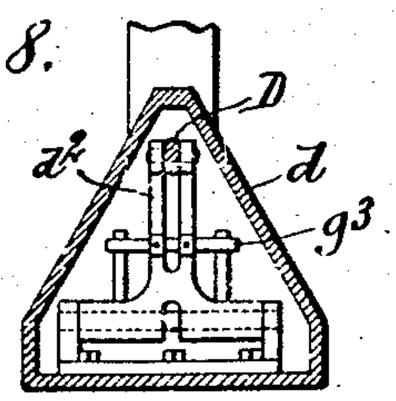
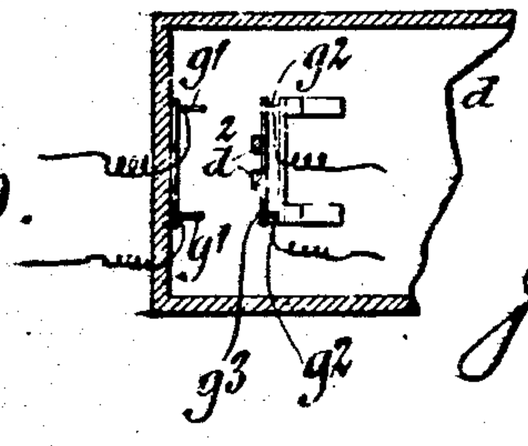


Fig. 7.

Fig. 9.



Witnesses:
Louis W. Gratz.
Ruth Tarbill.

James Doyle
Inventor
by Geyer & Popp
Attorneys.

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J. DOYLE.

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6 SHEETS—SHEET 5.

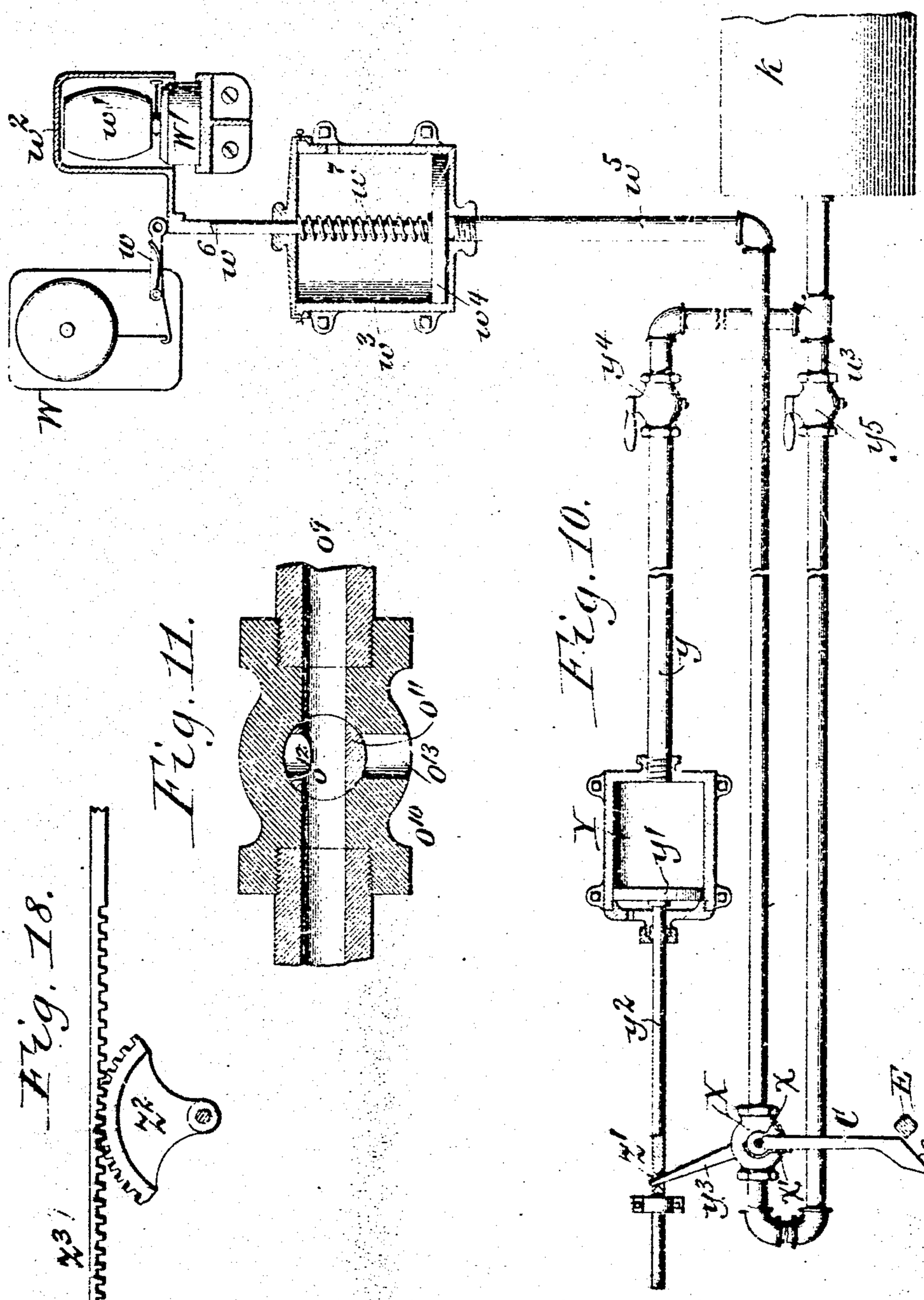

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

Witnesses:
Louis W. Gratz.
Ruth Tarbell.

James Doyle Inventor
by Geyer & Popp
Attorneys.

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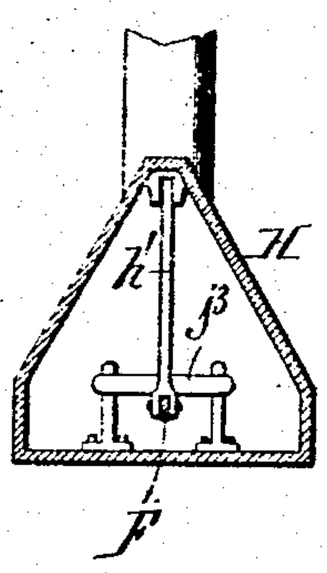
J. DOYLE.

SAFETY MECHANISM FOR RAILWAY TRAINS.

APPLICATION FILED MAY 22, 1906.

6 SHEETS—SHEET 6.

Fig. 13.



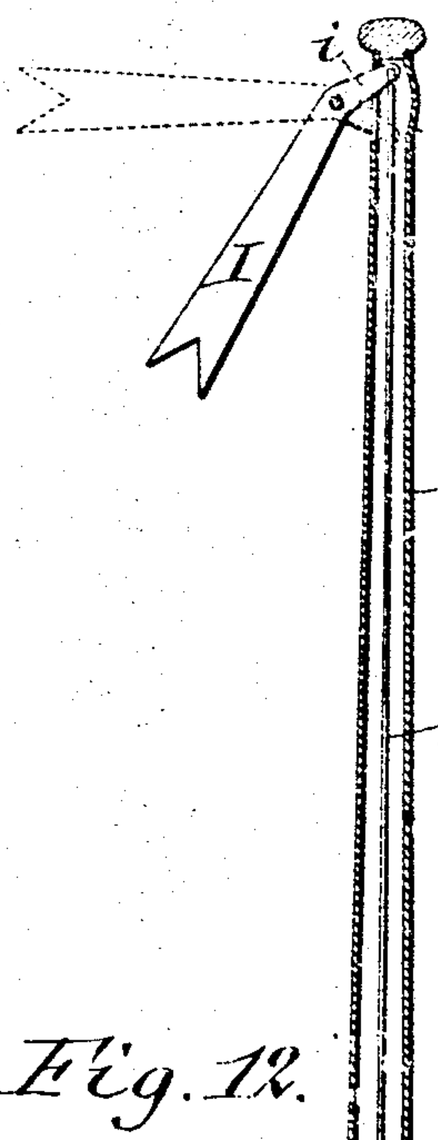
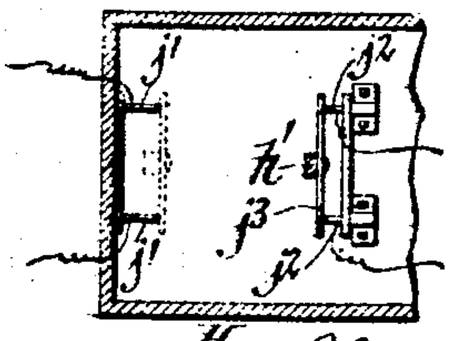


Fig. 12.

Fig. 14.



Witnesses:
Louis W. Gratz.
Ruth Tarbell

H James Doyle, Inventor
by Geyer & Popp
Attorneys.

UNITED STATES PATENT OFFICE.

JAMES DOYLE, OF NIAGARA FALLS, NEW YORK.

SAFETY MECHANISM FOR RAILWAY-TRAINS.

No. 862,557. Specification of Letters Patent. Patented Oct. 29, 1907.

Application filed May 22, 1906. Serial No. 318,157.

To all whom it may concern:

Be it known that I, JAMES DOYLE, a citizen of the United States, and residing at Niagara Falls, in the county of Niagara and State of New York, have invented a new and useful Improvement in Safety Mechanism for Railway-Trains, of which the following is a specification.

The object of this invention is to provide improved and efficient means whereby the propelling mechanism of a locomotive or train is automatically arrested and an audible signal is given when the train passes a semaphore set at danger position and whereby an audible and visual signal is given in case the train passes a semaphore set at caution position.

In the accompanying drawings consisting of six sheets: Figure 1 is a diagrammatic view showing the main parts of my improved locomotive controlling and signaling mechanism. Fig. 2 is a fragmentary sectional elevation showing the tripping device and adjacent parts of the emergency apparatus. Fig. 3 is a vertical cross section of the same, on an enlarged scale, in line 3—3, Fig. 2. Fig. 4 is another fragmentary sectional elevation showing the throttle valve, sander and whistle operating devices of the emergency apparatus. Fig. 5 is a top plan view of the same. Fig. 6 is a cross section in line 6—6, Fig. 5. Fig. 7 is a vertical transverse section of the emergency semaphore and the mechanism whereby the same coöperates with the emergency apparatus of the locomotive. Fig. 8 is a vertical section in line 8—8, Fig. 7. Fig. 9 is a fragmentary horizontal section in line 9—9, Fig. 8. Fig. 10 is a fragmentary longitudinal sectional elevation showing the tripping device and adjacent parts of the cautionary apparatus. Fig. 11 is a sectional view showing the construction of the valves which control the pressure medium for resetting the emergency and cautionary apparatus. Fig. 12 is a vertical transverse section of the cautionary semaphore and the mechanism whereby the same coöperates with the cautionary apparatus of the locomotive. Fig. 13 is a vertical section in line 13—13, Fig. 12. Fig. 14 is a fragmentary horizontal section in line 14—14 Fig. 12. Fig. 15 is a sectional view of the check valve whereby the compressed air is permitted to pass from the usual train pipe to some parts of the controlling and signaling mechanism. Fig. 16 is a sectional view of the cut out valve whereby the automatic controlling and signaling mechanism is separated from the ordinary brake mechanism of the locomotive. Fig. 17 is a horizontal section in line 17—17, Fig. 16. Fig. 18 is a fragmentary view showing a modification of part of the mechanism for restoring the main emergency and cautionary valves. Fig. 19 is a fragmentary view showing the manner of applying part of my invention to electrically propelled trains.

Similar letters of reference indicate corresponding parts throughout the several views.

A represents the wheeled running gear or truck of the locomotive or other part connected with the same such as the tender, which may be of any suitable construction and upon which part of my improved controlling and signaling mechanism is mounted. On one side of this truck, preferably the right, are mounted two trip arms B C one of which B is connected with the emergency or propulsion controlling mechanism and the other, C with the cautionary or signaling mechanism so that either of these mechanisms is operated when the respective trip arm is moved out of its normal position. As shown in Fig. 7 these trip arms are arranged vertically and transversely side by side emergency trip arm B being on the outer side and the cautionary trip arm C on the inner side and extending with its lower end between the corresponding end of the emergency trip arm. These trip arms are pivotally supported at their upper ends and connected with their respective controlling mechanisms while their lower ends are beveled rearwardly, as shown at *b*, *c* Figs. 2 and 10, and adapted to engage with two trip bars or tappets D, E. By beveling the trip arms the same strike the trip bars with a glancing blow, thereby causing the arms to be shifted gradually and avoiding undue wear and shock of the parts connected with said arms. The trip bars are arranged adjacent to the road bed of the locomotive, preferably adjacent to each other and each bar is movable horizontally into and out of the path of the trip arm with which it is intended to coöperate. The cautionary trip bar D is of such length and arranged sufficiently lower than the emergency trip bar E so that when the same is projected into operative position it will clear the emergency trip arm and engage only with the cautionary trip arm while the emergency trip bar is shorter than the cautionary trip bar so that when it is projective it will only engage with the emergency trip arm.

Any suitable means may be provided for operating the emergency trip bar but I prefer those shown in Figs. 7—9 of the drawings which are constructed as follows: *d* represents a housing which incloses the emergency trip bar and which has an opening d^1 in its front side through which the front end of the emergency trip bar moves into and out of the path of the emergency trip arm. Within the housing the emergency trip bar is supported by a vertically swinging link d^2 pivoted horizontally on the bottom of the housing while its upper end is pivoted to the emergency trip bar near the front end thereof. At its rear end the emergency trip bar is connected with the lower arm d^3 of an elbow lever the upper arm d^4 of which is connected by a rod *f* with the heel f^1 of a danger semaphore F. The latter is pivoted to swing vertically on the upper end of the hollow column or post f^2 which rises from the housing *d* and through which the rod passes. The construction and operation of

this mechanism connecting the danger semaphore and the emergency trip bar is such that while the danger semaphore is in its depending safety position the emergency trip bar is retracted within the housing but when this semaphore is elevated into its horizontal danger indicating position, the emergency trip bar will be projected into the path of the emergency trip arm on the locomotive. As shown in Fig. 7, the danger semaphore and emergency trip bar is shifted by means of a hand lever f^3 connected with the rod f but if desired the same may be shifted from an operator's office located at a distance from the semaphore by any suitable intermediate mechanism or by attachment to any semaphore system. The semaphore is preferably counter balanced by a weight f^4 arranged on the upper arm d^4 of the elbow lever. While the emergency trip bar is in its retracted position the opening in the front end of the housing is closed by a gravity door f^5 which is pivoted at its upper end to the housing above said opening, as shown.

It is desirable for the operator in the office to know whether the danger semaphore and the parts connected therewith have been properly shifted into one position or another and for this purpose indicating means are provided which are constructed as follows:- G, G^1 represent two electric bells or similar indicators which are included in separate electric circuits which comprise batteries g and insulated electric terminals or contacts g^1 g^1, g^2 g^2 within the housing. The terminals of the two indicators are arranged on opposite sides of the front supporting link or any other part of the trip bar or elbow lever that may be selected and the latter is provided with a bar or bridge g^3 of metal which is adapted to connect either pair of terminals g^1, g^1 or the pair g^2, g^2 upon moving the emergency trip bar into either of its extreme positions, whereby either one or the other indicator G, G^1 gives a signal to the operator at the office.

The cautionary tripper bar is arranged in a housing H and movable into and out of its operative position through an opening in the front thereof which is normally closed by a door h. The front end of the cautionary trip bar is supported by a vertically swinging link h^1 which connects the same with the top of the housing and its rear end is connected with the lower arm h^2 of an elbow lever which has its upper arm h^3 connected by a rod h^4 with the heel i of a cautionary semaphore I. The latter is pivoted on a hollow post i^1 which rises from the housing H and through which the rod h^4 passes. The cautionary semaphore is counter balanced by a weight i^2 on the upper arm h^3 of the elbow and is shifted into one position or the other either by a hand lever i^3 connected with the rod h^4 or from a distant operator's office by means of intermediate mechanism or by attaching it to any semaphore system in use.

When the cautionary semaphore is down the cautionary trip bar is retracted into an inoperative position and when it is up the cautionary trip bar is projected into its operative position. The operator is notified as to the position of the cautionary semaphore and its trip bar by means of two electric bells or similar signals J, J arranged in electric circuits having battaries j and pairs of insulated contacts j^1, j^1 j^2, j^2 arranged on opposite sides of the link h or on any part of the trip bar or lever working the same that may be selected, and an insulated metal bar j^3 arranged on said link and adapted to connect either of said pairs of contacts upon being turned to the limit in either direction by the cautionary trip bar with which the same is connected.

The propulsion controlling mechanism of which the emergency trip arms forms a part is best shown in Figs. 1—6 and constructed as follows:—K represents the train line or pipe of the air brake mechanism of the train, k the main air reservoir which receives the compressed air from the usual air-pump of the brake system and stores the same, and k^1 the engineer's valve whereby the air in the train pipe and connecting passages may be permitted to escape for reducing the pressure and applying the brakes in a well known manner. l, l^1, l^2, l^3 represent the different sections of a branch air blow-off pipe which connects with the main train pipe and contains a main or emergency valve M between the sections l^2, l^3 which is opened during the normal operation of the mechanism, permits the air in the train pipe and connecting passages to escape and causes the brakes to be applied in the same manner as when the engineer's valve k^1 is opened. The main valve M of the emergency brake mechanism may be variously constructed but it preferably consists of an upright cylindrical case or body m connected on opposite sides with the pipe sections l^2, l^3, a valve rod or stem m^1 sliding vertically through the case m, and a sliding gate or stopper m^2 secured to said rod within the valve case and operating to open or close the outlet port of said case. The lower end of the valve rod is provided with head m^3 having an undercut or T shaped groove in its under side which receives the correspondingly shaped edges of a cam N whereby the cooperating parts of the cam and valve rod are interlocked. The valve cam N is arranged on the side of a disk or wheel n which is rigidly secured to a horizontal transverse axle or shaft n^1. Upon turning the disk in direction or the other, the cam N opens or closes the gate or stopper of the main valve M. With one end of the shaft n^1 the upper end of the emergency trip arm is connected so that the disk and cam are compelled to move backward together with said trip arm when the latter during its forward movement with the train strikes the emergency trip bar but when the emergency trip arm moves backwardly with the train this arm is shifted without effecting the disk and cam upon engaging the emergency trip bar.

The preferred means for connecting the emergency trip arm with the cam and disk consists in hanging said trip arm loosely at its upper end on said shaft n^1 and securing an abutment or stop n^2 on the axle adjacent to said pivot with which the trip arm engages during its backword movement. By this means the cam shaft n^1 is coupled with the trip arm B during the backward movement of the latter but said trip arm is permitted to move forwardly independent of the cam shaft, thereby preventing disarranging or breaking of parts of the emergency mechanism if the emergency trip bar is struck by the companion trip arm during the backward movement of the train.

When the danger semaphore is set and the emergency trip bar is projected the latter is engaged by the emergency trip arm on the train, whereby the latter is turned

backwardly and the cam N opens the main valve, thereby applying the brakes.

In order to regulate the escape of the air from the train pipe in accordance with the load of the train or other conditions when the main valve M is open a hand regulated valve n^3 is arranged at the end of the branch pipe section l^3 as shown in Fig. 1. This regulating valve is so constructed that when screwed down as far as possible it will leave an opening sufficient to make service application of brakes and may be opened to emergency position to suit requirements of train to be hauled, valve discharge may be set from service application to emergency application at will of engineer.

For the purpose of holding the trip arm B rigid so that snows alongside of track will not operate said trip arm and also to prevent the emergency trip arm B from being thrown violently beyond its movable extreme position and disarranging or injuring parts when this arm strikes the emergency trip bar, a retarding device is provided comprising a brake band o applied to the periphery of the disk n and secured at one end to a fixed part of the truck, a brake lever o^1 having one of its arms connected with the other end of the brake band, a piston o^2 connected by a rod with the other arm of the brake lever, a cylinder o^3 containing the piston o^2, and a pipe o^4 connecting the working end of the cylinder o^3 with the branch pipe section l^2 and containing a hand valve o^5. The compressed air in the branch pipe is conducted by the pipe o^4 into the cylinder o^3 causing the piston therein to be moved in the direction for turning the brake lever so as to tighten the band o on the disk, thereby frictionally retarding the rotation of the emergency trip arm B. The upward or effective movement of the piston o^2 is limited by a stop o^{15} at the upper end of the cylinder o^3. The piston o^2 is always held against the stop o^{15} when the valve o^5 is open and its effect on the brake band is regulated by means of an adjusting nut o^{16} bearing against the lever o^1 and working on a screw threaded extension o^{17} of the rod o^{18} which connects with the piston o^2. After the brake mechanism and the other parts controlling the propulsion of the train have been applied the main valve M may be again closed and the emergency trip arm B restored to its normal depending position by any suitable means but preferably by a restoring arm o^6 connected with the cam shaft n^1, a piston o^7 connected by a rod o^{14} with the restoring arm, a restoring cylinder o^8 containing the piston c^7, and a pipe o^9 connecting the pressure end of the cylinder o^8 with the main reservoir K and containing a valve o^{10}, as shown in Figs. 1 and 2. The rotary plug o^{11} of this valve has a I shaped port o^{12} as shown in Fig. 11, whereby the restoring cylinder may be connected with the main air reservoir for moving the piston o^7 in the direction for restoring the valve cam N and trip arm B to their initial position or the air outlet of the main reservoir may be closed and the cylinder o^8 connected with a vent port o^{13} in the case of the restoring valve which leads to the atmosphere so as to reduce the resistance offered to the valve cam N and trip arm B when actuated by engagement of the latter with the emergency trip bar.

In addition to applying the ordinary brake mechanism in case the danger signal is set against the train, means are provided for shutting-off the steam supply to the engine cylinder, delivering sand on the track to avoid slippage of the wheels and insure prompt action of the brakes and sounding a signal whistle. The means for accomplishing the last mentioned purposes are constructed as follows:—P represents the boiler of the locomotive, p the lever of the throttle valve which controls the supply of steam to the engine of the locomotive, p^1 the main steam signal whistle which is connected with the boiler by the usual pipe p^2 containing a valve p^8, p^3 the sand hopper having its outlet provided with the delivery pipes p^4 leading to the rails adjacent to the driving wheels, p^5 the sand valve which controls the outlet of the sand hopper and p^6 a rock shaft provided with a crank p^7 which connects with said sand valve.

Q represents the cylinder of an air motor whereby the throttle valve, main signal whistle and sander are operated, q its piston, q^1 a reciprocating yoke connected at its front end with the rod q^2 of said piston, q^3 a hand shifting lever projecting through a slot q^4 in the rear part of said yoke, Q^1 a link connecting the shifting lever, q^3 with the throttle lever p, q^5 a spring pressed locking pawl or bolt mounted on the hand lever and engaging with a toothed segment q^6, q^7 an automatic releasing lever pivoted on the hand lever q^3 and having one of its arms arranged within the slot q^4 in rear of the hand lever q^3 while its opposite arm is connected with said locking bolt by a rod Q^2 and Q^3 a hand releasing lever pivoted on the operating lever q^3 and also connected with the rod Q^2 of the locking bolt q^5.

R represents a rock lever having one of its arms connected by a rod r with an arm r^1 on the plug of the main whistle while its other arm is connected with the piston rod q^2. r^2 is a rock shaft carrying the rock lever R and having an arm r^3 which is connected by a rod r^4 with an arm r^5 on the sander rock shaft. The relative arrangement of these parts is such that when the piston q is moved forwardly the yoke will first pull with the rear end of its slot q^4 on the releasing lever q^7 and turn the same in the direction for retracting the locking bolt q^5 out of engagement from the segment q^6 and then the hand lever q^3 will be turned so as to close the throttle valve and at the same time the rock shaft r^2 will be turned so as to blow the main whistle and open the sander. The slot q^4 of the yoke is of such length that when the piston q is in its retracted or inoperative position the lever q^3 is free to be moved forward for closing the throttle by hand independent of the automatic closing mechanism.

S represents the main chamber of a triple valve mechanism such as is commonly employed in air brake systems, s a pipe connecting the front or lower end of said chamber with section l^1 of the branch pipe, s^1 an auxiliary air reservoir connected with the upper or front end of the chamber S, s^2 a pipe connecting the working or front end of the cylinder Q with a port s^3 at the upper or rear end of the triple valve, s^4 a piston arranged in the lower front part of the triple valve chamber and having a leakage groove s^5 in its periphery and s^6 a valve arranged in the upper rear part of the triple valve chamber and controlling the port s^3 and connected with the piston s^4. The compressed air entering the lower end of the valve chamber S raises the piston s^4 and the valve s^6 connected therewith so that the port s^3 is closed. At the same time air passes slowly from the front to the rear end of the chamber S through the leakage groove s^5 in the piston s^4 and enters the auxiliary reservoir s^1 until

the same is filled. The instant the pressure in the branch pipes l, l^3 and connecting passages is reduced below that in the auxiliary reservoir by reason of the opening of the emergency valve M the preponderating pressure of the air in the auxiliary reservoir depresses the piston s^4 together with the valve s^6 connected therewith and opens the port s^3 so that the air from the auxiliary reservoir passes through the pipe s^2 into the cylinder Q and pushes the piston q in the direction for closing the steam throttle valve, main steam whistle and sander.

T represents a check valve arranged in the branch train pipe adjacent to the main train pipe and constructed to permit the air to move from the main train pipe to the branch train pipe but preventing a reverse movement of the air. By this means the air is prevented from being exhausted from the automatic brake operating mechanism when the pressure in the main train pipe is lowered by opening the engineer's valve for applying the brakes by hand. A supplemental air reservoir t is preferably arranged in the branch train pipe between the check valve T and the triple valve for storing ample air and retaining the pipes of the automatic brake mechanism sufficiently filled to cause the same to operate promptly.

The automatic brake applying mechanism is intended to stop the train in case the engineer overlooks or ignores the danger semaphore set against him. It frequently is necessary however to take a train deliberately a short distance beyond the danger semaphore and at such times it would be undesirable to permit the brakes and connecting parts to be applied. In order to prevent the application of the automatic braking and signaling mechanism from operating under these conditions a cut-out valve U is placed in the branch train pipe between the supplemental reservoir and the main valve M. This valve may be variously constructed but preferably has a rotary plug u having one port u^1 which is adapted to open or close the air passage between the sections of the branch air pipe which connect with the case of this valve and another port u^2 which is adapted to open or close communication between an air pipe u^3 leading to the main air reservoir and an air whistle u^4, as shown in Figs. 1, 16 and 17. Upon turning the cut-out valve into the position shown in Fig. 17 the air passage through the branch train pipe is open and the brake mechanism is in condition to work automatically but when the cut-out valve is moved in the position indicated in Fig. 16, the air passage through the branch train pipe is interrupted so that the brake mechanism will not be applied automatically but the compressed air from the main reservoir is now connected with the whistle u^4 and blows the same. The latter continues to blow in this manner during the entire time that the cut-out valve is turned to render the automatic brake mechanism inoperative, thereby notifying the engineer to restore the brake mechanism so that it will operate automatically after the emergency trip arm of the train has passed the emergency trip bar of the danger semaphore.

In order to enable the railway superintendent to discover how often an engineer has passed the danger semaphore when set against his train, means are provided for determining the same which preferably consist of a register V of any suitable construction having an actuating arm or member V^1, an elbow lever arranged adjacent to the rod m^1 of the main emergency valve M and having a slot v^1 in one of its arms which receives a pin v^2 on the valve rod m^1 while its other arm is connected by a rod v^5 with the actuating arm v of the register V. The slot v^1 is so formed that during the first part of the upward movement of the rod m^1 the elbow lever will be turned sufficiently to advance the register V one space and then the further movement of the rod on the register is ineffective. At the end of the return stroke of the valve rod m^1 the register arm v is again moved backwardly ready to begin its next forward stroke. An auxiliary registering mechanism is also provided which shows how often the engineer has deliberately cut-out the automatic brake applying and signaling mechanism. This auxiliary registering mechanism consists of a register or recorder V^2 of any suitable construction preferably mounted on the case of the cut out valve U and having an actuating arm or member v^3 which is connected with the handle v^4 whereby the plug of said valve is rotated, as shown in Figs. 1 and 16.

Every time the cut-out valve is closed the auxiliary register is advanced one space or point on its dial, the number indicated on the auxiliary register being deducted from the total registration on the main register V in order to determine the number of times the engineer has been negligent and run his train past a danger semaphore when the same was set against him.

The cautionary signaling mechanism which is operated by the cautionary trip arm when the latter is shifted by engagement with the projected cautionary trip bar is constructed as follows: W Figs. 1 and 10 represents a gong, bell or similar audible signal or alarm and W^1 a lamp or other visual signal or indicator which are arranged in any suitable place but preferably adjacent to each other in the cab of the locomotives. The bell is provided with an actuating lever or member w and the globe w^1 of the lamp is of green color and normally covered by a hood w^2 of non-transparent material such as iron. w^3, w^4 represent the cylinder and piston of a motor whereby the audible and visual signals W W^1 are operated. The lower working end of the cylinder w^3 is connected by pipes w^5 u^3 with the main air reservoir. w^6 is a piston rod connected at one end with the piston w^4 while its opposite end is connected with the hood w^2 and operatively engages the actuating lever w of the bell. The piston w^4 and rod w^6 are yieldingly held in a depressed position when the supply pipe w^5 is closed by a spring w^7 surrounding the rod w^6 between the piston and the upper head of the cylinder w^3. In this position of the parts the hood covers the green globe of the lamp and the bell is still. Upon opening the supply pipe w^5 and admitting air into the lower end of the cylinder w^3, the piston w^4 is raised, thereby operating the bell and uncovering the lamp globe and warning the engineer that the cautionary semaphore has been set against him on account of another train being sufficiently near ahead of him and requiring the exercise of caution in continuing the progress of his train.

X represents the cautionary valve in the supply pipe w^5 which is shifted by the cautionary trip-arm for operating the audible and visual signals W, W^1.

This valve may be variously constructed but preferably has a rotary plug X^1 upon the stem x of which the upper end of the cautionary trip arm C is loosely hung. The latter is free to swing forwardly on the stem x so that no harm is done when this arm strikes the cautionary trip bar E during the backward movement of the train but when this arm strikes said bar during the forward movement of the train and is deflected upwardly the plug of the cautionary valve x is compelled to turn with said arm by a stop x^1 secured to the valve stem x in position to be engaged by said arm, thereby opening the cautionary valve and its supply pipe and causing the audible and visual signals W W^1 to be operated.

For the purpose of closing the cautionary valve and restoring its trip arm to its normal position after these parts have been shifted by the trip bar the following means are provided:—Y represents a restoring cylinder having its operative end connected by a pipe y and other pipes with the air reservoir, y^1 a piston arranged on the cylinder and provided with a piston rod y^2, and y^3 a rock arm connected at one end with the plug X^1 of the cautionary valve while its opposite end is loosely connected with the piston rod y^2, as shown in Figs. 1 and 10. y^4 is a restoring valve which is arranged in the pipe y and which is constructed like the restoring valve o shown in Fig. 11, so that air may be conducted from the reservoir to the cylinder y for moving its piston in the direction to close the cautionary valve or the passage of air from this reservoir to said cylinder may be cut off and the latter connected with the atmosphere so as to reduce the resistance which is offered this piston when the same is shifted by the cautionary trip arm in opening the cautionary valve.

If it is desired to cut out the cautionary signal mechanism and also the whistle u^4 this can be done by closing a hand valve y^5 arranged in the supply pipe u^3 between these devices and the main air reservoir, as shown in Figs. 1 and 10.

In the actual installation of this signaling and propulsion controlling mechanism on a train it is preferable to place some parts on the locomotive and others on the tender and to permit of this the rigid pipe sections on the locomotive and tender are connected by flexible sections z, as shown in Fig. 1.

In Figs. 2 and 10 the connection between the restoring arms o^6, y^3 and the rods o^{14}, y^1 of the pistons o^7 y^1 which operate them is effected by passing the ends of these arms loosely through slots z^1 in said rods. If desired a gear segment z^2 may be employed in place of each of the arms o^6 y^3 and engaged with a gear rack z on each of the pistons o^7 y^1, as shown in Fig. 18.

In adapting my improved signaling and propulsion controlling mechanism to electrically propelled cars, trains or locomotives, as shown in Fig. 19, the yoke q^1 is connected with the movable member or contact z^4 of an electric switch z^5 which controls the motor of the train so that when the air is admitted into the cylinder Q the movable switch contact z^4 will be disengaged from the fixed contact z^6 thereby opening the switch and stopping the further supply of current to the motor.

I claim as my invention:

1. A safety mechanism for railway trains, comprising a trip arm arranged on the locomotive or connecting part, a horizontal trip bar arranged at right angles to the railway and movable transversely thereto into and out of the path of the trip arm, and a vertically swinging rock arm supporting said trip bar, substantially as set forth.

2. A safety mechanism for railway cars comprising a trip arm arranged on the locomotive or connecting part, a trip bar movable into and out of the path of said arm, a vertically rocking link supporting the front end of said bar, and an elbow lever supporting the front end of the same, substantially as set forth.

3. A safety mechanism for railway cars comprising a trip arm arranged on the locomotive or connecting part, a trip bar movable into and out of the path of said arm, a vertically rocking link supporting the front end of said bar, an elbow lever having one arm connected with said bar, a housing inclosing said bar, link and lever, a post rising from said housing, a semaphore mounted on said post, and a rod connecting said semaphore with other arm of said elbow lever, substantially as set forth.

4. A safety mechanism for railway trains comprising a trip arm arranged on the locomotive or connecting part, a housing arranged adjacent to the road bed and provided with an opening in its front end, a trip bar arranged on said housing and movable through said opening into and out of the path of said trip arm and a door operating to close said opening automatically, substantially as set forth.

5. A safety mechanism for railway trains comprising a trip arm arranged on the locomotive or connecting part, a trip bar arranged along the road bed and movable into and out of the path of the trip arm, and an electrical signal which is operated by an outward movement of said bar, substantially as set forth.

6. A safety mechanism for railway trains comprising a trip arm arranged on the locomotive or connecting part, a trip bar arranged along the road bed and movable into and out of the path of the trip arm, and an electrical signal which is operated by the inward movement of said bar, substantially as set forth.

7. A safety mechanism for railway trains comprising a trip arm arranged on the locomotive or connecting part, a trip bar arranged along the road bed and movable into and out of the path of the trip arm and two electrical signals one of which is operated by the outward and the other by the inward movement of said bar, substantially as set forth.

8. A safety mechanism for railway trains comprising a trip arm arranged on the locomotive or connecting part, a trip bar arranged along the road bed and movable into and out of the path of the trip arm, a rocking link connected with said bar, two electric signals arranged in separate circuits having switch contacts arranged on opposite sides of said link, and a switch bar arranged on said link and adapted to engage with the contacts on either side of the same for closing either of said circuits and operating the corresponding signal, substantially as set forth.

9. A safety mechanism for railway trains comprising two trip arms which are arranged on a locomotive or connecting part in different positions and one of which is operatively connected with the propulsion controlling devices while the other is connected with the signaling devices, and two trip bars arranged in different positions along the road bed and each adapted to be moved into and out of the path of one of said trip arms, substantially as set forth.

10. A safety mechanism for railway trains comprising two trip arms which are arranged in different positions transversely on a locomotive or connecting part and one of which is operatively connected with the propulsion controlling mechanism while the other is operatively connected with the signaling mechanism, the inner trip arm extending with its end beyond the end of the outer trip arm, and two trip bars arranged at different heights along the road bed, the upper bar being movable into and out of the path of the outer trip arm and the lower bar being movable beyond the upper bar into and out of the path of the inner trip arm, substantially as set forth.

11. A safety mechanism for railway trains comprising an air pipe forming part of the air brake mechanism, a valve arranged in said air pipe and having a movable con-

trolling member, and a trip arm coupled with said member so as to be free to move independent thereof in one direction but compels said member to move therewith in the opposite direction, substantially as set forth.

12. A safety mechanism for railway trains comprising an air pipe forming part of the air brake mechanism, a valve arranged in said air pipe and having a rotary plug, a trip arm pivoted loosely on said plug, and a stop secured to said plug in position to be engaged by said arm and compel the plug to turn with the arm upon rotating the latter in one direction but permitting said arm to rotate in the opposite direction independent of said plug, substantially as set forth.

13. A safety mechanism for railway trains comprising an air pipe forming part of the air brake mechanism, a valve arranged in said air pipe, a trip arm connected with the controlling member of said valve and having its free end beveled and a trip bar arranged along the road bed and adapted to engage with the beveled part of said arm, substantially as set forth.

14. A safety mechanism for railway trains comprising an air pipe forming part of the air brake mechanism, a valve arranged in said air pipe and having a rotary plug, a trip arm connected with said plug, a brake disk connected with said plug, and a brake band applied to said disk, substantially as set forth.

15. A safety mechanism for railway trains comprising an air pipe forming part of the air brake mechanism, a valve arranged in said air pipe and having a rotary plug, a trip arm connected with said plug, a brake disk connected with said plug, a brake band applied to said disk, and means for tightening said band on said disk, substantially as set forth.

16. A safety mechanism for railway trains comprising an air pipe forming part of the air brake mechanism, a valve arranged in said air pipe and having a rotary plug, a trip arm connected with said plug, a brake disk connected with said plug, a brake band applied to said disk, and means for tightening said band on said disk comprising a power cylinder, and a piston arranged on said cylinder and connected with said brake band, substantially as set forth.

17. A safety mechanism for railway trains comprising an air pipe forming part of the air brake mechanism, a valve arranged on said air pipe and having a rotary plug, a trip arm connected with said plug, a brake disk connected with said plug, a brake band applied to said disk and having one end secured to a fixed support, a lever having one of its arms secured to the other end of said band, a piston connected with the other arm of said lever, a cylinder containing said piston, and a pressure medium supply connected with the working end of said cylinder, substantially as set forth.

18. A safety mechanism for railway trains comprising an air pipe forming part of the air brake mechanism, a valve arranged in said pipe and having a movable closure member, a cam operatively connected with said member, and a trip arm connected with said cam, substantially as set forth.

19. A safety mechanism for railway trains comprising an air pipe forming part of the air brake mechanism, a valve arranged in said pipe, and having a movable closure member, a rock shaft, a trip arm connected with said shaft, a cam turning with said shaft and operatively connected with said member, and a power cylinder and piston operatively connected with said shaft, substantially as set forth.

20. A safety mechanism for railway trains comprising an air pipe forming part of the air brake mechanism, a valve arranged in said pipe and having a sliding closure member, a shifting rod connected with said member, a rocking cam operatively connected with said rod, a rock shaft supporting said cam, a trip arm mounted on said shaft, a restoring arm connected with said shaft, a piston having a rod which is connected with said restoring arm and a power cylinder containing said piston, substantially as set forth.

21. A safety mechanism for railway trains comprising an air pipe forming part of the air brake mechanism, a valve arranged in said pipe and having a sliding closure member, a shifting rod connected with said member, a rocking cam operatively connected with said rod, a rock shaft supporting said cam, a trip arm mounted on said shaft, a restoring arm connected with said shaft, a piston having a rod which is connected with said restoring arm, a power cylinder containing said piston, a compressed air supply reservoir connected with said cylinder by a supply pipe, and a valve arranged in said supply pipe and constructed to connect the reservoir with said cylinder in one position of the valve, and to connect the cylinder with the atmosphere in another position of the valve, substantially as set forth.

22. A safety mechanism for railway trains comprising an air pipe forming part of the air brake mechanism, a valve arranged in said pipe and having a movable member a shifting device for said valve, and a register connected with said movable member substantially as set forth.

23. A safety mechanism for railway trains comprising an air pipe forming part of the air brake mechanism, a valve arranged in said pipe and having a sliding closure member, a rod connected with said member, a shifting mechanism connected with said rod, a register provided with an actuating arm, and an elbow lever having one of its arms connected by a rod with said actuating arm while its other arm is provided with a slot which receives a pin on said rod, substantially as set forth.

24. A safety mechanism for railway trains comprising a brake mechanism, a track sander having a hopper provided with an outlet, a valve for closing said outlet, a crank shaft having its crank connected with said valve and having a rock arm, a whistle having supply pipe, a valve arranged in said supply pipe and having a rotary plug provided with an arm, a rock shaft, a rock arm on said rock shaft connected with the rock arm of said crank shaft, a rock lever having one of its arms connected with the arm of said whistle valve arm, a power piston having its rod connected with the other arm of said rock lever, and a power cylinder containing said piston, substantially as set forth.

25. A safety mechanism for railway trains comprising a throttle valve which controls the steam to the engine, a hand lever connected with said valve, a spring pressed locking bolt mounted on said hand lever, a releasing lever pivoted on said hand lever and having one arm connected with said bolt, a yoke having a slot which receives said hand lever and the other arm of said releasing lever, a piston connected with said yoke, and a power cylinder containing said piston, substantially as set forth.

26. A safety mechanism for railway trains comprising a propulsion controlling device, an air motor connected with said propulsion controlling device, a compressed air supply pipe for said motor, and means for controlling the flow of air from said supply pipe to said air motor consisting of a chamber connected at its front end with the air supply pipe, an outlet port arranged in the rear end of said chamber and connected with said air motor, an auxiliary reservoir connected with the rear part of said chamber, a valve arranged in the rear part of said chamber and controlling said outlet port, and a piston having a leakage groove or passage arranged in the front part of said chamber and connected with said valve, substantially as set forth.

27. A safety mechanism for railway trains comprising a propulsion controlling device and air motor connected with said propulsion controlling and signaling device, a compressed air supply pipe for said motor, and means for controlling the flow of air from said supply pipe to said air motor consisting of a chamber connected at its front end with the air supply pipe, an outlet port arranged in the rear end of said chamber and connected with said air motor, an auxiliary reservoir connected with the rear part of said chamber, a valve arranged in the rear part of said chamber and controlling said outlet port, and a piston having a leakage groove or passage arranged in the front part of said chamber and connected with said valve, substantially as set forth.

28. A safety mechanism for railway trains comprising a main air pipe, a propulsion controlling device, a branch pipe connecting the main pipe with said propulsion controlling device, and a cut-out valve arranged in said branch pipe, substantially as set forth.

29. A safety mechanism for railway trains comprising a main air pipe, a propulsion controlling device, a branch pipe connecting the main pipe with said propulsion controlling device, a cut-out valve arranged in said branch pipe, and a register operatively connected with said cut-out valve, substantially as set forth.

30. A safety mechanism for railway trains comprising a main air pipe, a propulsion controlling device, a branch pipe connecting the main pipe with said propulsion controlling device, a cut-out valve arranged in said branch pipe, and a signal which is operated by the cut-out valve when the same is opened, substantially as set forth.

31. A safety mechanism for railway trains comprising a main air pipe, a propulsion controlling device, a branch pipe connecting the main pipe with said propulsion controlling device, a whistle having a supply pipe, and a cut-out valve having its rotary plug provided with ports adapted to open and close said branch pipe and said whistle supply pipe alternately, substantially as set forth.

32. A safety mechanism for railway trains comprising a main air pipe, a propulsion controlling mechanism, a branch pipe connecting the main air pipe with said propulsion controlling mechanism, an automatic valve arranged in said branch pipe, a register operatively connected with said automatic valve, a manual cut-out valve arranged in said branch pipe, and a register operatively connected with said cut-out valve, substantially as set forth.

33. A safety mechanism for railway trains comprising a main air pipe, a propulsion controlling mechanism, a branch pipe connecting the main air pipe with said propulsion controlling mechanism an automatic valve arranged in said branch pipe, and a manual regulating valve arranged in said branch pipe, substantially as set forth.

34. A safety mechanism for railway trains comprising an air pipe, a valve arranged in said pipe, a trip arm connected with said valve, an air motor connected with said pipe, a lamp and a movable hood for inclosing said lamp operatively connected with said motor, substantially as set forth.

35. A safety mechanism for railway trains comprising an air pipe, a valve arranged in said pipe, a trip arm connected with said valve, a cylinder connected with said pipe, a piston arranged in said cylinder and having a rod, a lamp, a hood inclosing said lamp and connected with said rod, and a bell having an actuating arm which is operatively engaged by said rod, substantially as set forth.

36. A safety mechanism for railway trains comprising an air pipe, an automatic valve arranged in said pipe and having a rotary plug, an arm connected with said plug, a restoring cylinder, and a piston arranged in said cylinder and having a rod which is connected with said arm, substantially as set forth.

Witness my hand this 17th day of May, 1906.

JAMES DOYLE.

Witnesses:
THEO. L. POPP,
RUTH TABBELL.