Dec. 26, 1950 H. E. TEMPLE 2,535,820

TRAIN FUSEE DISCHARGER

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Fig. 1

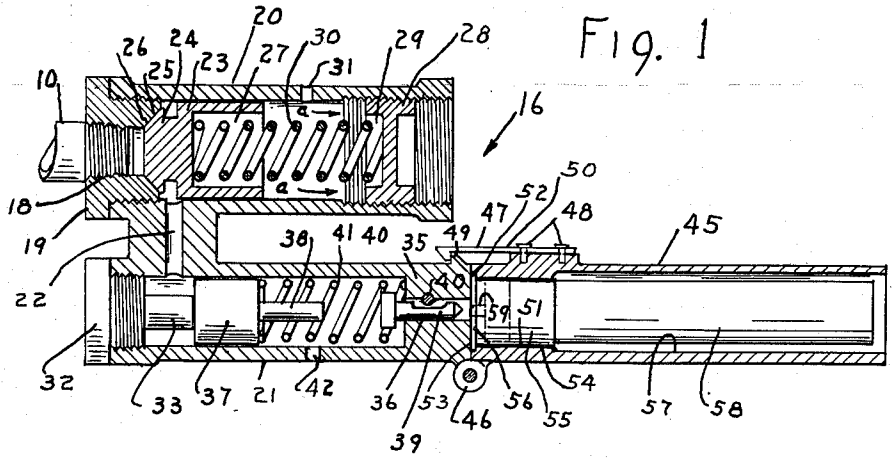


Fig. 2

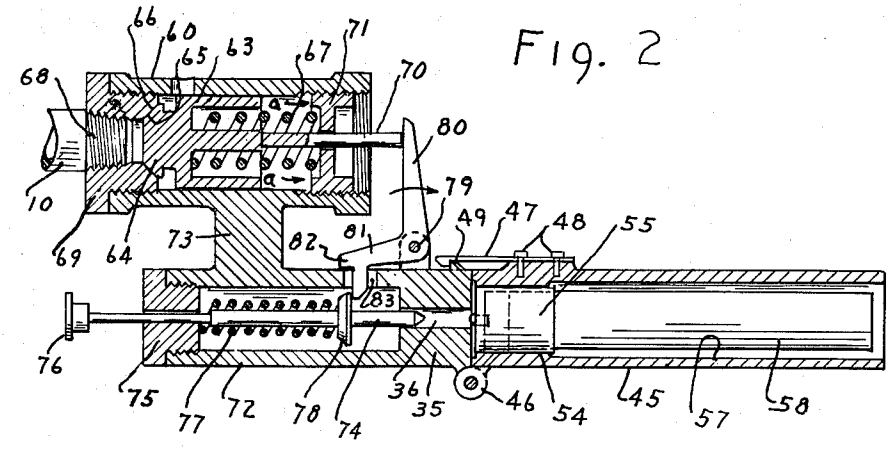
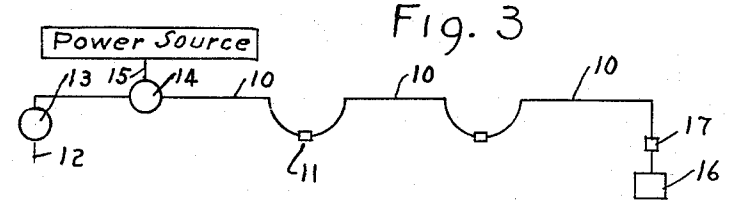


Fig. 3



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TRAIN FUSEE DISCHARGER

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5 Claims. (Cl. 246—215)

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This invention relates to railway signal devices, and particularly pertains to a train fusee discharger.

Numerous railway accidents have been caused due to the fact that a train is unexpectedly stopped on a right-of-way and there is not sufficient time for the brakeman to move to a point along the railroad track a desirable distance from the stopped train to satisfactorily signal another oncoming train. It is common practice under such conditions, and particularly at night, for the train brakeman to walk to the rear of the train a prescribed distance and then to ignite a flare or fusee which will give a danger signal to oncoming trains. Various attempts have been made to provide means which will mechanically ignite and drop a fusee along the railroad track as the train advances or is being brought to rest. These structures have not been complicated but they have been for the most part permanently installed on a railway coach so that care must be taken to use a coach with this installation at the end of the train or to go to the expense of having one of the structures mounted on each coach of the train. It has also been difficult to provide means to actuate the discharging device since this operation should be initiated from the engine cabin from which point of vantage the emergency condition may be anticipated. Heretofore structures of the type with which the present invention is concerned have necessitated that the operating means should be coupled at adjoining ends of coaches, thus making the expense of the device prohibitive and the use of the structure impractical. It is desirable to provide a train fusee discharge device which may be mounted detachably at the rear end of the last coach of the train and which may be operated from the engine cabin without the use of expensive special equipment. It is the principal object of the present invention, therefore, to provide a fusee discharge device which may be connected with air brake lines of the train whereby a superior pneumatic force may be applied to the brake line to operate a fusee discharging device as controlled from the engine cabin through an air line normally extending the length of the train.

This application is a continuation in part of my prior application Serial No. 694,107, filed August 30, 1946, and allowed as Patent No. 2,462,922 June 3, 1948. In that application the present generic inventive concept is disclosed as providing a pneumatically actuated ejector by which a controlled superior pressure applied to the brake

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line is utilized as the discharging force to eject the fusee from the discharging device. Obviously the invention is not limited to the specific ejecting means therein disclosed. The application of superior pressure may function to initiate the release of a fusee by various other means. In the present application such other means is illustrated as being a percussion shell or cartridge arranged to be detonated by the application of the superior pressure to the brake line.

It is another object of this invention to provide a device employing an explosive for performing the simultaneous function of discharging the fusee from a train and igniting said fusee.

The present invention is directed broadly to the use of an applied superimposed superior pressure for the control of fusee discharging means, and in one embodiment shows a percussive device for such discharging means.

The invention is illustrated by way of example in the accompanying drawings in which:

Figure 1 is an enlarged view in central vertical section through one form of percussion fusee discharge apparatus made in accordance with the present invention.

Fig. 2 is a view in central vertical section showing another form of discharge mechanism.

Fig. 3 is a view indicating a schematic arrangement of the fusee discharging device and the pneumatic line controlling the same.

Referring particularly to the diagram shown in Fig. 3 of the drawing, 10 indicates the signal line with which trains are normally equipped. This signal line is a conduit of relatively small diameter and carries air under a pressure of approximately forty-five pounds per square inch. Each car of a train is fitted with such a line which is connected by couplings 11. Air under pressure is delivered to the line from a suitable source in the engine by a pipe 12 which connects with a feed valve 13. Disposed in the engine cabin is a three-way valve 14 which connects the line 10 with a source of air under pressure through a pipe 15. The air under pressure in the pipe 15 is greater than the normal pressure in the line. This superimposes a pressure upon the normal air pressure in the line and actuates the flare discharging mechanism 16 which is attached to the end of the line 10 on the last car or coach. This attachment may be made by a coupling 17. Under normal conditions the signal line 10 is filled with air under a definite pressure and is available throughout the length of the train. When the engineer actuates the valve 14 to introduce air under higher pressure into the line

10 the pressure of the air within the line will actuate the flare discharging structure 16.

Referring particularly to Fig. 1 of the drawing, it will be seen that in this form of the fusee discharging device the signal line 10 is threaded into a threaded bore 18 of an end cap 19 of an air cylinder 20. The air cylinder 20 is formed as a part of the housing structure of the flare discharging unit generally indicated at 16. The cylinder 20 is designated as a pilot cylinder and it is disposed with its longitudinal axis parallel to a firing cylinder 21. The cylinder 21 and the pilot cylinder 20 are joined by an intermediate web, a port 22 establishing communication through the web between the cylinders 20 and 21 at their inner ends. Reciprocably mounted within the pilot cylinder 20 is a pilot piston 23. This piston is of a diameter to provide a suitable sliding fit within the cylinder 20. Formed at the inner end of the piston 23 and centrally thereof is a projecting valve head 24 having a conical valve face 25. The valve face 25 is adapted normally to rest against a tapered valve seat 26 which circumscribes the threaded bore 18 of the end cap 19. Formed centrally of and extending inwardly from the opposite side of the piston 23 from the head 24 is a counterbore 27. The forward end of the cylinder 20 is closed by a forward cylinder head 28 which is threaded into the forward end of the cylinder 20 and closes the same. Interposed between the cylinder head 28 and the opposing end face of the piston 23 is a helical spring 30 seated within the counterbore 27 and a corresponding recess 29 of the head 28. Spring 30 tends to urge the piston 23 toward its valve closing position as shown. A vent opening 31 is formed through the wall of the cylinder 20 to permit air to be discharged from the cylinder 20 in the space between the cylinder head 28 and the piston 23. It is to be understood that the helical spring 30 is of a predetermined strength sufficient to resist normal signal pressure in the air signal line and the equipment associated therewith, so that said line may function under the normal air pressure in the line but the spring 30 is not of sufficient strength to resist the added pressure established in the line 10 when the three-way control valve 14 is opened.

The firing cylinder 21 is formed with a removable cylinder head 32 which is threaded into the inner end of the cylinder adjacent to the port 22. The cylinder head 32 is formed with inwardly extending spaced stop fingers 33 which while permitting air flow from the port 22 to the cylinder 21 will act as stop means to preclude movement of the detonating piston (hereafter referred to) to a position obstructing said port. The opposite end of the cylinder 21 is closed by an integral breech block 35 having a central firing pin passage opening 36 therethrough. Mounted to reciprocate within the cylinder is a detonating piston 37. A firing pin 39 is loosely mounted in the firing pin passage 36 of the block 35, being secured therein for limited free motion by a transverse retainer 40. Projecting from the forward face of the piston opposite the cylinder head 32 is a hammer bar 38. A helical spring 41 is interposed between the block 35 and the detonating piston 37. This spring is sufficient to move the piston 37 to its normal inactive position when an operating cycle of the flare dropping unit has been completed. Disposed at a point in the length of the cylinder wall 21 is a vent port 42. This port is spaced from the end of the cylinder wall 35 a desired distance to insure that the piston 37 will pass across the port as it reaches the end of its operating stroke. This will cause the air to be exhausted from the cylinder in the space between the piston 37 and the cylinder head 32 after a flare has been ejected, and will thus allow the spring to return the piston to its retracted position.

Disposed at the forward end of the actuating cylinder 21 is a flare gun comprising a hingedly mounted barrel 45 secured by a hinge structure 46 to the forward or outer end of the cylinder 21. A latch 47 is mounted as at 48 upon the barrel 45 to extend from the inner end of the barrel to engage a catch 49, thus securing the barrel in its normal closed position coaxial with the cylinder 21. Means such as the leaf spring 50 releasably retains the barrel in the position indicated.

The barrel 45 is formed in the manner of a shot-gun or signal pistol barrel with a shell flange rabbet 51 at its breech face 52 for securing a shell flange between the barrel and the outer face 53 of the breech block 35. Adjacent to the rabbet 51 the bore 54 of the barrel is formed as a shell chamber to snugly engage a discharging shell or cartridge indicated at 55, the flange of which, indicated at 56, seats within the rabbet 51. Forwardly or outwardly of the bore 54 the barrel is of enlarged internal diameter, as shown at 57, so as to loosely receive a flare body 58. Preferably the flare body 58 is formed as the projectile of the shell or cartridge 55, but if desired the cartridge and flare may be formed separately and loaded into the barrel individually. By virtue of the enlarged diameter 57 of the barrel it will be seen that upon explosion of the cartridge propelling gases will escape around the flare to minimize the propelling effect of the detonation, so that the flare will be lightly tossed from the barrel.

The numeral 59 indicates the center fire cap portion of the shell or cartridge 55 which will be struck by the firing pin 39 when the hammer bar 38 of the piston 37 is moved to actuate the firing pin to detonate the shell and thus expel the fusee 58 from the barrel 45.

The fusee 58 may be a standard fusee of the type used on railroads and naturally has the fuze end extended into the cartridge 55. When the powder in this cartridge is ignited by the detonation of the cap thereof, the resulting explosion not only expels the fusee 58 from the barrel 45 but ignites the fuze end.

In the operation of this form of the invention it will be seen that with the device loaded as shown in Fig. 1 normal line pressure will be precluded from cylinders 20 and 21 by the valve-like action of cylinder 23. However, when a superior pressure is applied the cylinder 23 will be moved to admit pressure to the cylinder 21, which pressure will drive the piston 37 and its hammer bar 38 will strike the firing pin and detonate the shell.

Referring to Fig. 2 of the drawings it will be seen that the structure is similar to that of Fig. 1 in that a pipe line 10 engages a threaded bore 68 of a cylinder head 69 of a primary or pilot cylinder 60 within which a piston 63 with its valve head 64 is mounted for reciprocation against the tension of a spring 67. The cooperating surface 65 of the valve head 64 of piston 63 and surface 66 of the cylinder head 69 act in the manner of surfaces of the elements 25 and 26 of Fig. 1 to normally preclude line pressure from the cylinder 60.

In contrast to the structure shown in Fig. 1 the device of Fig. 2 utilizes spring pressure for actuating the firing pin while the applied superior line pressure actuates a trigger for releasing the spring pressure.

In the device of Fig. 2 the piston 63 carries a forwardly projecting actuator bar 70 which is mounted through a forward cylinder head 71 and is guided thereby. The lower cylinder is indicated by the numeral 72 and it united with the upper pilot cylinder 60 by a web 73. There is however no air passage between the cylinders 60 and 72. At the forward end of the lower cylinder 72 a barrel, hinge and catch mechanism identical with that of Fig. 1 is provided, similar numerals being applied to represent similar parts. Within the cylinder 72 there is mounted a firing pin 74. The firing pin 74 extends inwardly through the inner threaded cylinder head or end member 75 and is provided with a cocking knob 76 by which the firing pin may be retracted to cocked position. Within the cylinder 72 a spring 77 is provided encircling the pin and bearing against a centrally disposed abutment plate and firing pin latch 78. The forward end of the firing pin is mounted in the firing pin bore 36 of the breech block 35.

The trigger mechanism is in the form of a bell crank pivotally mounted upon the forward end of the cylinder 72, as indicated at 79. The trigger includes a vertical bell crank arm 80 arranged in the path of movement of the bar 70 of the piston 63. The trigger also includes an integrally formed pin release arm 81 disposed substantially parallel to the cylinder 72 and including a release catch 82 which is adapted to extend through an aperture 83 in the cylinder 72 to engage the plate latch 78, when the firing pin is retracted or cocked against the tension of the spring 77.

From consideration of the foregoing construction, it will be seen that with the device of Fig. 2 loaded and with the firing pin 74 retracted against the tension of its firing spring 77, as indicated, the trigger will retain the firing pin in cocked position. Normal fluctuations of pressure within the line 10 will not unseat the valve formed by surfaces 65 and 66 nor move the piston 63. Upon the application of superior pressure however the piston will move forwardly, rocking the trigger in clockwise direction to release the firing pin and discharge the cartridge.

In operation of the two forms of the invention it will be understood that the usual train signal line 10 will be employed and that associated with it is the three-way valve 14 and a conduit connected with a source of air under pressure greater than that normally carried in the signal line. The springs 30 and 67 normally hold the pilot pistons 23 and 63 in the position shown. The flare discharging units 16 may be connected to the end of the signal line 10 and may be removed when the train comes in off its run. When the flare dropping unit 16 is connected to the train and the train is in operation the usual functioning of the signal device may be accomplished through the train line 10 without actuation of the devices 16. If, however, an emergency arises so that it is desirable to drop one of the flares the engineer may manipulate the three-way valve 14 so that additional air pressure will be built up in the line 10 from the source connected by the conduit 15. When this additional air pressure is built up within the line 10 the air will act against the piston. This will force the piston in the direction of the arrow *a* and will remove

the tapered valve face from its seat, and the piston will move forwardly to admit pressure for actuating the piston 37 and firing pin 39 of Fig. 1 or to actuate the trigger of Fig. 2.

Attention is directed to the fact that while the valve is on its seat a relatively small surface area is presented to the air under pressure delivered through the line 10. As soon as the head 24 or 64 leaves its seat the larger diameter of the end face of the piston will be subjected to the pressure of the air in line 10. Due to this arrangement the valve cannot re-seat until the line pressure is normal or slightly less than normal. Thus it is not necessary for the engineer to be careful in the manner in which he handles the air or to watch any gauges, since the structure will act automatically in the manner of the usual pop valve. It is to be understood that the pistons 23 and 63 are positioned within their cylinders with a loose fit so that as the cylinders are returned to their normal positions under the action of their springs the entrapped air at the ends of the cylinders may bypass the pistons. The same result could be obtained by forming a small vent hole through each of the pistons.

While the present invention is here described as being attached to a train signal line and the members dropped are described as being flares or fusees, it is obvious that it would be within the spirit of the present invention to connect the fuse dropping device with any other pneumatic line and to drop any other type of visible signal element.

It will thus be seen that in the structures here disclosed the flare discharging device is simple and compact in construction, so that it may be conveniently carried from place to place and may be easily connected to the ordinary train signal line by which it is actuated. It will be recognized that under usual emergency conditions the engineer makes an effort to bring the train to a stop. During this time the brakeman or other member of the train crew begins to move the length of the train so that he can take the flag and the flare-box and walk down the railway track in order to signal an oncoming train. With the present arrangement the engineer may discharge a flare at the time he anticipates making a stop. Thus, the flare will be placed along the right-of-way at a point which will be far removed from the train when it comes to a stop and which could not be quickly reached by the brakeman according to routine procedure.

It will be understood that while the present application has shown specifically the provision of mechanism for discharging the fusee by explosives or the like, that the invention is more particulary concerned with fluid responsive release means, which release means may be of any desired type depending upon explosives, mechanical, or electrical structures for discharging the fusee.

While I have shown the preferred form of my invention as now known to me, it will be understood that various changes may be made in combination, construction and arrangement of parts by those skilled in the art, without departing from the spirit of the invention as claimed.

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

1. In combination with an air signal line of a train subject to pressure fluctuations incident to normal signaling, means for imposing a superior pressure on said line greater than that imposed incident to normal signaling, and means

responsive to the application of said superior pressure for explosively firing a flare.

2. In combination with an air signal line of a train subject to pressure fluctuations incident to normal signaling, a flare discharging unit attached to said line, including a flare firing chamber means for imposing a superior pressure on said line greater than that imposed incident to normal signaling, and means responsive to the application of said superior pressure for explosively discharging a flare from said firing chamber and igniting said flare.

3. A device as set forth in claim 2 in which said unit includes a firing pin actuated in response to the application of said superior pressure to explosively fire a percussive flare-propelling element.

4. A flare discharging unit for railway trains or the like comprising a pressure responsive piston and cylinder combination, a flare gun including a firing chamber and a restrained, spring biased firing pin, and means operable by actuation of said piston for releasing said firing pin

for movement to detonate a cartridge mounted within said firing chamber.

5. A unit for discharging flares including a pilot cylinder and piston, an actuating cylinder parallel thereto, a flare gun including a shell chamber and barrel mounted on said actuating cylinder, a firing pin carried by said actuating cylinder, a spring biasing said pin, a trigger for restraining said firing pin against movement by said spring, and a trigger actuator carried by the pilot piston for releasing said trigger upon the application of predetermined pressure to said pilot cylinder.

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