March 1, 1949. H. E. TEMPLE 2,462,922

TRAIN FUSEE DISCHARGER

Filed Aug. 30, 1946 2 Sheets-Sheet 1

Fig. 1

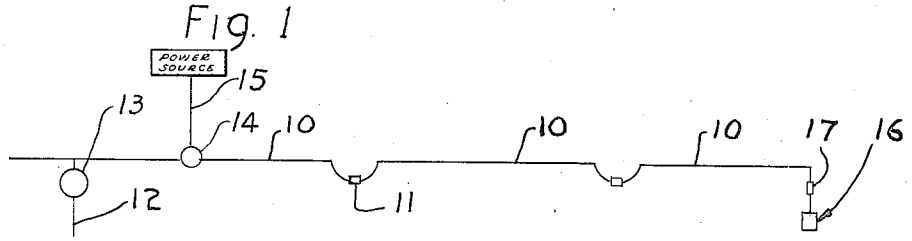


Fig. 2

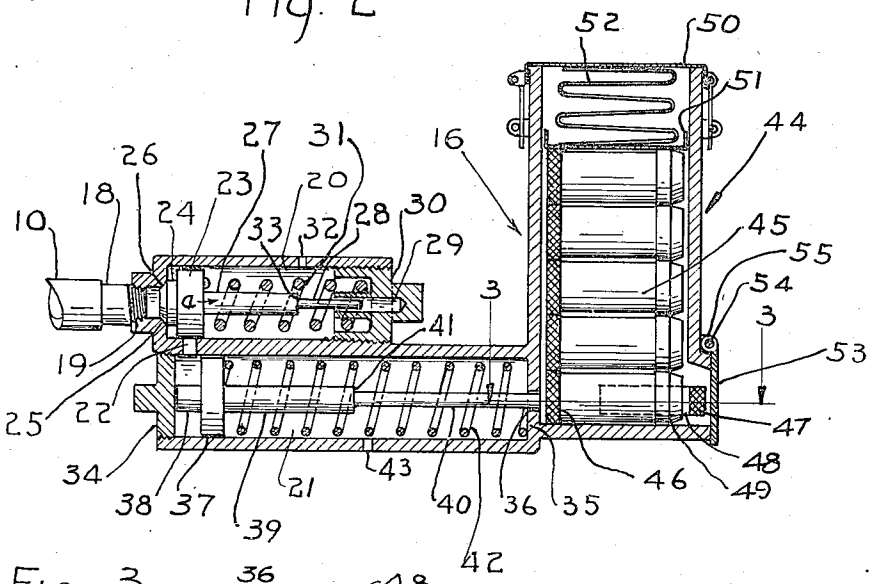
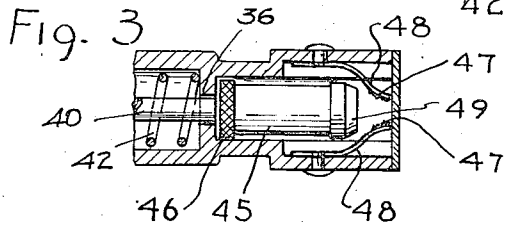


Fig. 3



INVENTOR.
HIRAM E. TEMPLE
BY James M. Abbett
ATTY.

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Fig. 5

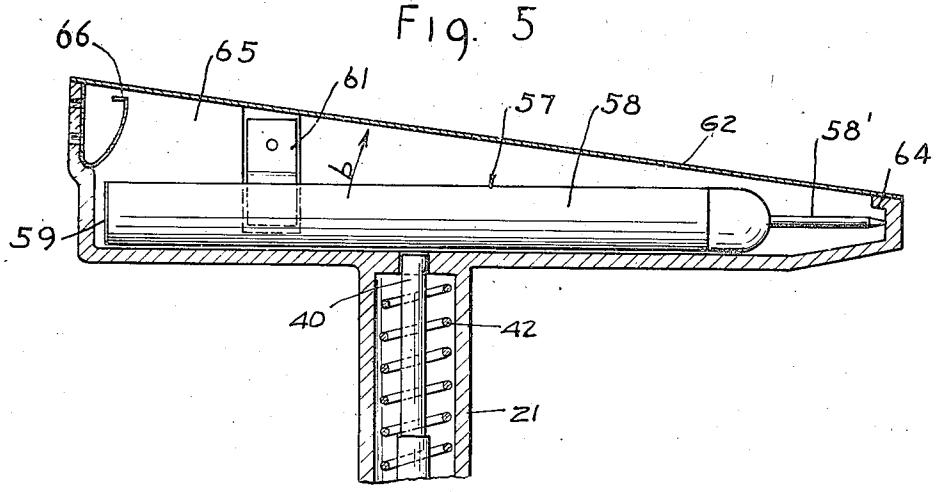
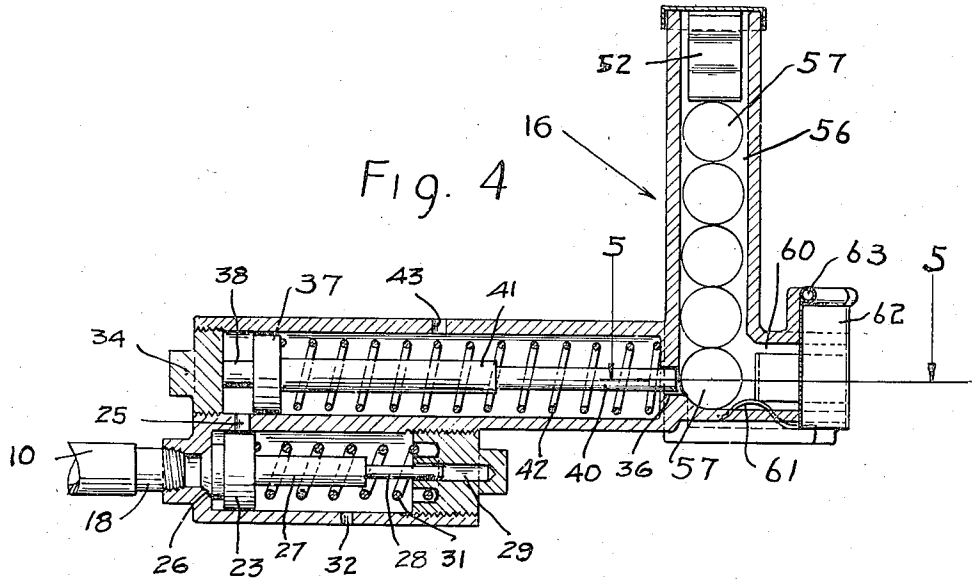


Fig. 4



INVENTOR.
HIRAM E. TEMPLE
BY
James M. Abbett
ATTY.

Patented Mar. 1, 1949

2,462,922

UNITED STATES PATENT OFFICE

2,462,922

TRAIN FUSEE DISCHARGER

Hiram E. Temple, Los Angeles, Calif.

Application August 30, 1946, Serial No. 694,107

4 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 only 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 portable fusee discharge device which may be instantly mounted upon or removed from the end of the rear coach of a train, and which structure may be connected with air brake lines of the train whereby a pneumatic force may be applied to the fusee discharging device as controlled from the engine cabin through an air line normally extending the length of the train.

The present invention contemplates the provision of a portable fusee discharger adapted to be detachably secured upon a railway coach, and which discharging device includes a fusee magazine and a pneumatically actuated ejector connected with a conduit carrying air under pressure

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and whereby the repeated application of air pressure will successively operate the ejector and discharge a fusee along the railway right-of-way.

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

Figure 1 is a view indicating a schematic arrangement of the fusee discharging device and the pneumatic line controlling the same.

Fig. 2 is an enlarged view in central vertical section through the fusee discharge apparatus showing the magazine and ejecting means.

Fig. 3 is a view in longitudinal section, as seen on the line 3—3 of Fig. 2, and shows the manner in which the fusees are ignited as they are discharged from the device.

Fig. 4 is a view in central vertical section showing another form of the discharge mechanism adapted for use with stake-type flares.

Fig. 5 is a view in horizontal section as seen on the line 5—5 of Fig. 4 and shows the manner in which the flares are held and the mechanism for ejecting them.

Referring particularly to the diagram shown in Fig. 1 of the drawings, 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 a flare dropping 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. Thus, under normal conditions the signal line 10 is filled with air under a definite pressure and is available throughout the length of the train. However, 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 dropping structure generally indicated at 16 in Fig. 1 of the drawings and shown in detail in the other figures of the drawings.

Referring particularly to Fig. 2 of the drawings, it will be seen that the signal line 10 is fitted with a connection 18 which is threaded into a threaded bore 19 of an air cylinder 20. The air cylinder

20 is formed as a part of the housing structure of the flare dropping unit generally indicated at 16. The cylinder 20 is designated as a pilot cylinder and it is disposed with its longitudinal axis parallel to an actuating cylinder 21. The actuating cylinder and the pilot cylinder have an intermediate wall in common. A port 22 establishes communication between the cylinders 20 and 21 at their outer ends. Reciprocably mounted within the pilot cylinder 20 is a pilot piston valve 23. This valve is of a diameter to provide a suitable sliding fit within the cylinder 20 and of a width sufficient to cover and close the port 22 when in register therewith. Formed at the outer end of the piston 23 and centrally thereof is a projecting portion 24 having a valve face 25 at its end. The valve face 25 is adapted normally to rest against a tapered valve seat 26 which circumscribes an extension of the threaded bore 19. The length of the extension 24 is such as to insure that when the tapered face 25 is on the seat 26 the piston 23 will be in a position to close the port 22. Formed centrally of and extending from the opposite side of the piston 23 from its portion 24 is a piston rod 27. This piston rod has a reduced end portion 28 which extends into a guide bore 29. The guide bore 29 is formed centrally of a cylinder head 30 which is threaded into the inner end of the pilot cylinder 20 and closes the same. The guide bore 29 is closed at its outer end to prevent leakage of fluid therethrough. Interposed between the cylinder head 30 and the opposing end face of the piston 23 is a helical spring 31 which tends to urge the piston 23 toward its closed position. A vent opening 32 is formed through the wall of the cylinder 20 at a point adjacent the cylinder head to permit air to be discharged from the cylinder 20 in the space between the cylinder head and the piston 23. It will also be noted that due to the fact that the piston rod 27 is formed with the reduced end portion 28 a shoulder 33 will occur at the end of the large diameter of the piston, which shoulder will abut against the end face of the cylinder head 30 and limit the movement of the piston 23 as it is actuated by air under pressure delivered through the conduit 10. It is to be understood that the helical spring 31 is of a predetermined strength sufficient to allow the air signal line and the equipment associated therewith to function under the normal air pressure in the line but is not sufficient to resist the added pressure established in the line 10 when the three-way control valve 14 is opened.

The actuating cylinder 21 is formed with a removable cylinder head 34 which is threaded into the end of the cylinder adjacent to the port 22. The opposite end of the cylinder is closed by a wall 35 having a central opening 36 therethrough. Mounted to reciprocate within the cylinder is a piston 37. Projecting from the face of the piston which opposes the cylinder head 34 is an extension 38. This extension abuts against the end face of the cylinder head 34 when the piston 37 is in its normal inactive position. The length of the extension 38 is such as to insure that the piston 37 cannot cover the port 22 at any point in the stroke of the piston. Projecting from the opposite side of the piston 37 from the extension 38 is a piston rod 39. This rod extends axially from the cylinder 21 and is formed at its outer end with a reduced portion 40. The diameter of the reduced portion 40 agrees substantially with the bore 36 through the end of the cylinder wall 35. It is obvious, however, that a shoulder 41

which occurs at the end of the reduced portion 40 of the piston rod will engage the inner end face of the wall 35 when the piston 37 is actuated and will thus limit the stroke of the piston. A helical spring 42 is interposed between the end wall 35 of the cylinder 21 and the actuating 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 43. This port is spaced from the end of the cylinder wall 35 a desired distance to insure that the actuating 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 34 after a flare has been ejected, and will thus allow the spring to return the piston 23 to its retracted position.

Disposed at the forward end of the actuating cylinder 21 is a magazine 44 within which a series of flares 45 may be placed. These flares are here shown as being cylindrical and being formed at their rear ends with an ignition shoulder 46 which encounters the abraded faces 47 of spring fingers 48. As shown in Fig. 3 of the drawing the spring fingers are attached to the opposite vertical side walls of the magazine 44 and their abraded ends are disposed in the path of movement of the lowermost flare 45. The forward ends of the flares are tapered, as indicated at 49, so that the flare may force its way between the abraded surfaces 47 of the fingers as the flare is discharged. The upper end of the magazine 44 is fitted with a suitable cover 50 and within the top of the magazine is a follower plate 51 which rests upon the uppermost flare in the magazine and is urged downwardly by a spring 52. The outer end wall of the magazine 44 at its lower end is fitted with a trap door 53 which is mounted upon a horizontally pivoted hinge 54. A suitable spring 55 tends to urge the trap door 53 to its closed position.

In Figs. 2 and 3 a device is shown for dropping the ordinary cylindrical flare or fusee. In Figs. 4 and 5 a modification of the structure is shown for dropping the stake type of flare which is provided with a pointed end which may be driven into the ground. The pilot and the actuating cylinders, as shown in Fig. 4, are substantially the same as those shown in Fig. 2, however in Fig. 4 the pilot cylinder is disposed beneath the actuating cylinder. Mounted at the end of the actuating cylinder, as shown in Fig. 4, is a magazine 56. This magazine is designed to receive a plurality of flares 57 which lie horizontally in stacked relation one upon the other. As shown in Fig. 5 the flares have a long cylindrical body 58 and a pointed member 58' at one end thereof. The opposite end of the body 58 is formed with a section 59 which is made of material designed to ignite by friction. In the form of the invention shown in Fig. 2 the flares 45 are disposed with their longitudinal axes in the same plane as the longitudinal axis of the actuating cylinder 21. In the form of the invention shown in Figs. 4 and 5 the flares 57 are disposed with their longitudinal axes in a plane at right angles to the longitudinal center of the actuating cylinder 21. In this latter case the flares are intended to roll out and to fall along the right-of-way. The magazine 56 is fitted at its lower end with a horizontal throat 60 which is properly aligned to receive the lowermost flare 57. A spring 61 is disposed in the path of the lowermost flare and yieldably holds this

flare in position until it is ejected by movement of the actuating piston 37. The outer end of the throat is covered by a trap door 62 mounted on a horizontal hinge 63 disposed at the upper edge of the door. By reference to Fig. 5 of the drawing it will be seen that the throat 60 is so formed as to dispose the door 62 at an angle to the longitudinal axis of the flare 57. At one end of the throat 60 a lip 64 is provided. This lip overhangs the pointed ends 58' of the flares when they are in their lowermost position. The bottom of the throat 60 is defined by a floor 65 which is of greater width at the end opposite to that of the lip 64. Mounted on the side wall of the throat at its large end is a spring finger 66 having an abrading surface along which the ignition surface 59 of the flare 57 will be forced as the flare is ejected.

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 a 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 spring 31 normally holds the pilot valve piston 23 in the position shown in Figs. 2 and 4 of the drawing, and spring 42 normally holds the actuating piston 37 in its retracted position. The flare dropping unit 16 may be connected to the end of the signal line 10 by the coupling 17 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. If, however, an emergency arises so that it is desirable to ignite and drop one or more 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 end face of the extension 24 of the valve piston 23. This will force the piston 23 in the direction of the arrow *a* and will remove the tapered valve face 25 from the seat 26. The exposed area of the piston 23 will thus be increased so that the piston will move forwardly at an accelerated speed and will uncover the port 22. This movement will take place until the shoulder 33 on the piston rod 27 encounters the end face on the cylinder head 30. So long as the valve 14 remains open the valve piston 23 will be held in its open position. During this time the port 22 will be uncovered and air will pass into the actuating cylinder 21. This air will act against the end of the actuating piston 27 and force the piston longitudinally of the actuating cylinder 21 against the compression of spring 42. This movement will continue until the shoulder 41 of the piston rod 39 encounters the end face of the cylinder wall 35. When this takes place the piston 37 cannot move any further and air delivered to the cylinder will be vented through the port 43 in the cylinder wall.

When the piston 37 moved the length of its stroke as limited by the shoulder 41 the piston rod section 40 was moved through the opening 36 in the end wall of the cylinder and in the structure of Fig. 2 encountered the end of the flare 45. This flare was then moved horizontally and forced between the spring fingers 48. The forward end 49 of the flare encountered the trap door 53 and lifted it. As the ejecting operation continued the portion 56 of the flare encountered the abraded surfaces 47 on the fingers 48. This ignited the flare at the conclusion of the ejection stroke so

that the flare would fall from the discharge opening at the bottom of the magazine 44 immediately after it had been ignited. In the form of the invention shown in Figs. 4 and 5 the flare 57 is engaged by the end portion 40 of the piston rod, at which time the flare is moved outwardly. However, the pointed end 58' will encounter the lip 64 so that the flare will swing in the direction of the arrow *b*, as indicated in Fig. 5. As it swings the ignition surface 59 will be forced along the abraded face of the spring 66 so that the flare will be ignited as it forces the trap door 62 open and falls to the ground.

Attention is directed to the fact that while the valve 26 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 member 26 leaves its seat the larger diameter of the end face of the piston 23 will be subjected to the pressure of the air in line 10. Due to this arrangement the valve 26 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 37 are positioned within their cylinders with a loose fit so that as the cylinders are returned to their normal positions under the action of the springs 31 and 42 the entrapped air at the ends of the cylinders may by-pass 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 simple and effective means are provided for accommodating a large number of flares and for selectively and consecutively ejecting the flares as they are ignited. It is to be noted further that the flare dropping 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 begin dropping flares at the time he anticipates making a stop. Thus, the flares will be ignited and placed along the right-of-way at points 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.

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 the air signal line of a

train including a source of air under pressure by which the line is normally maintained at a predetermined working pressure, a source of air for said line under superior pressure, valve means for introducing said air under superior pressure to the signal line, a flare dropping unit constantly connected with said line, fluid pressure responsive means for ejecting a flare from said unit, and means interposed between said signal line and said fluid pressure responsive means normally closing the line to the fluid pressure responsive means and acting under the superior air pressure only to open the line to said fluid pressure responsive means whereby an ejecting operation will take place.

2. A flare dropping device adapted to be connected to a train signal line, which line is characterized as carrying air at a constant normal pressure and provided with manually controlled means for introducing air at a higher pressure, said flare dropping device comprising a magazine within which a plurality of ignitable flares are stored, the magazine having a discharge opening at its lower end and carrying an igniter with which the flare contacts as it is discharged, an air cylinder contiguous to the discharge position of the flares, a piston reciprocable within said cylinder, a piston rod connected therewith and moving with the piston to engage a fusee and discharge it from the magazine, an air port through which air may flow into the cylinder and against the end of the piston to move the same on its discharge stroke, a pilot cylinder communicating with said air port, said pilot cylinder having an air inlet opening in constant communication with the train signal line, a piston reciprocable within said pilot cylinder and adapted to simultaneously close the air inlet opening and the communicating port between the two cylinders, a spring urging the piston toward its closed position with a force greater than the normal pressure of air within the train signal line and less than the force exerted by the higher pressure air introduced to the train signal line, and a spring within the first named cylinder acting against the piston therein tending to urge the piston within said cylinder toward its retracted position, said spring exerting a force less than the force of the higher air pressure introduced into the train signal line whereby when air under higher pressure than the air under constant pressure within the signal line is introduced into said line the piston in the pilot cylinder will move to an open position, thereby establishing communication between the train signal line and the first named cylinder, after which said pressure will act to move the piston in the first named cylinder to cause the rod associated therewith to eject a fusee.

3. In combination with an air pressure line normally extending the length of a train and having a constant pressure source of air therefor and a controlled source of air under a higher pressure at the forward end thereof, a flare dropping unit attached to the opposite end of said line, a magazine forming a part of said unit and adapted to receive a plurality of flares, fluid pressure responsive means connected with said air line and said magazine and being unresponsive to the constant air pressure and adapted to operate under pressure of said higher pressure air in the line to eject a flare from said magazine, and a pilot valve structure interposed between said fluid responsive means and the line whereby only one flare will be ejected from the magazine at each application of air under pressure from the line.

4. In combination with the air signal line of a train including a source of air under pressure by which the line is normally maintained at a predetermined working pressure, a source of air for said line under superior pressure, remote valve means for introducing said air under superior pressure to the signal line, a flare dropping unit connected with said line, said unit containing two cylinders, one of which is in communication with said signal line and has a valve therein normally closing communication between said signal line and said cylinder, said valve moving only upon introduction of air under superior pressure into said signal line from said valve means, a flare compartment having a flare therein in alignment with the other cylinder, means establishing communication between the cylinders, and means in said other cylinder actuated by the movement of said valve in the first mentioned cylinder to eject the flare from the compartment.

HIRAM E. TEMPLE.

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