

Dec. 1, 1959

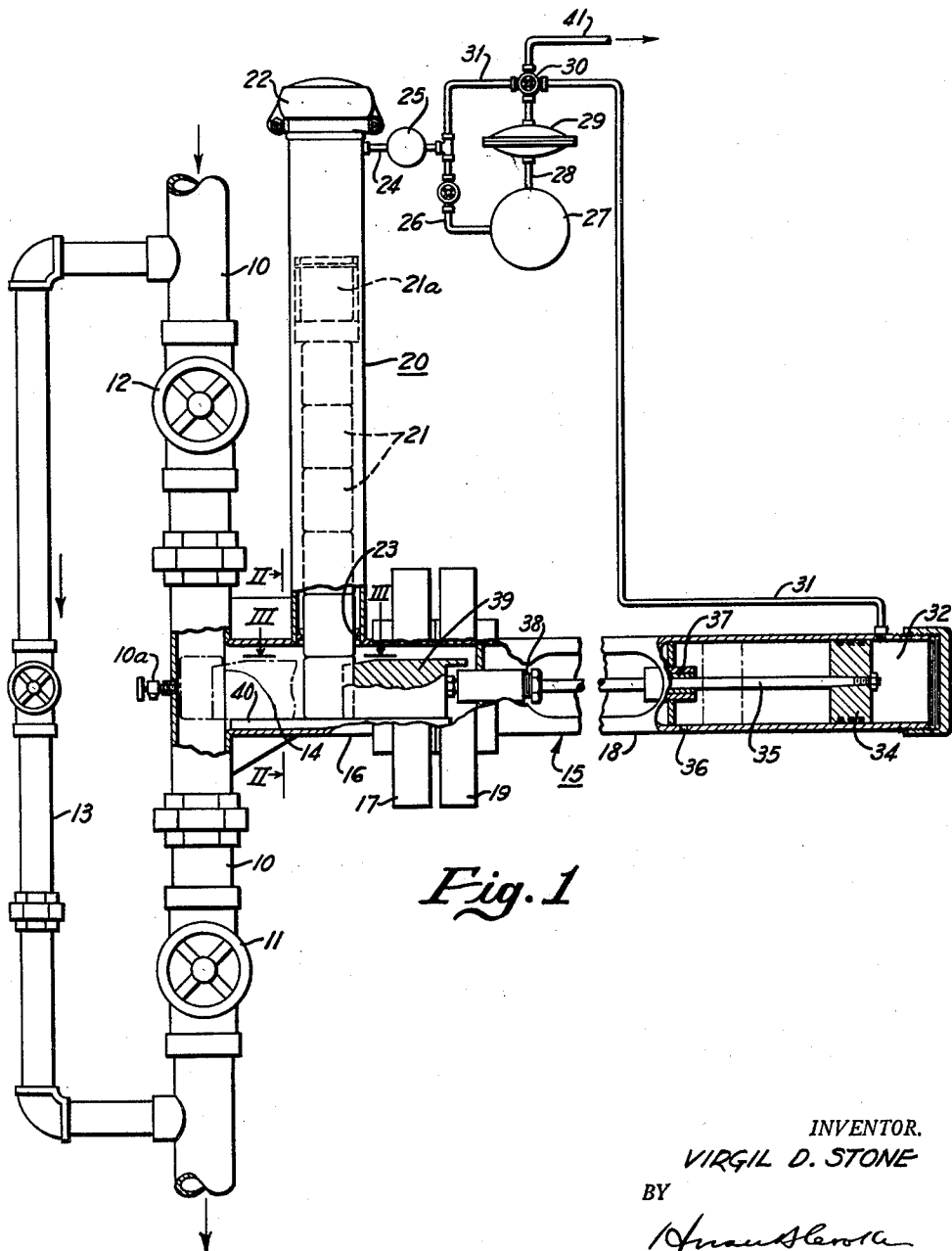
V. D. STONE

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AUTOMATIC PLUG INJECTOR AND METHOD OF CLEANING PIPELINES

Filed Sept. 8, 1954

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

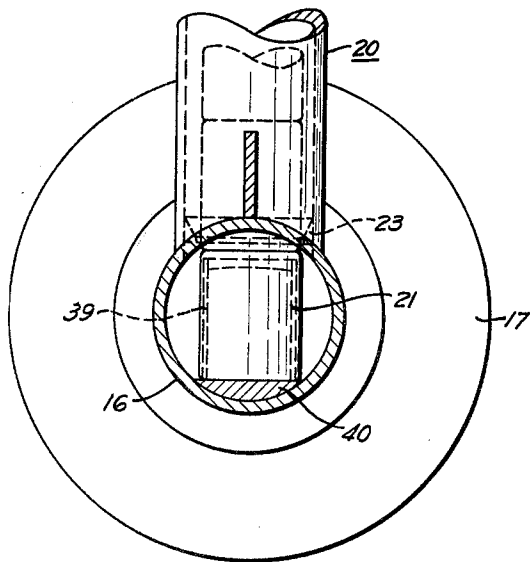


Fig. 2

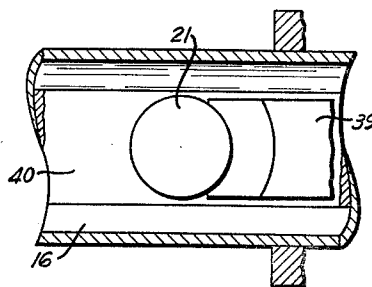


Fig. 3

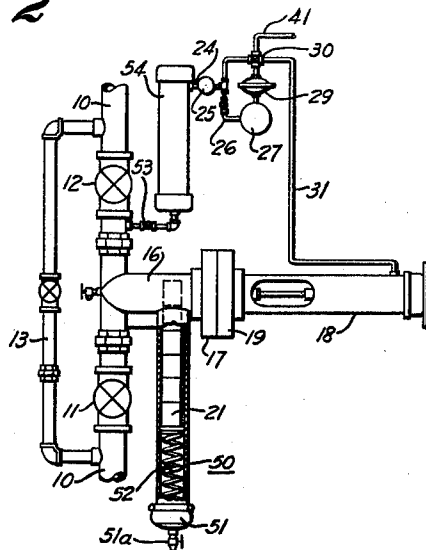


Fig. 4

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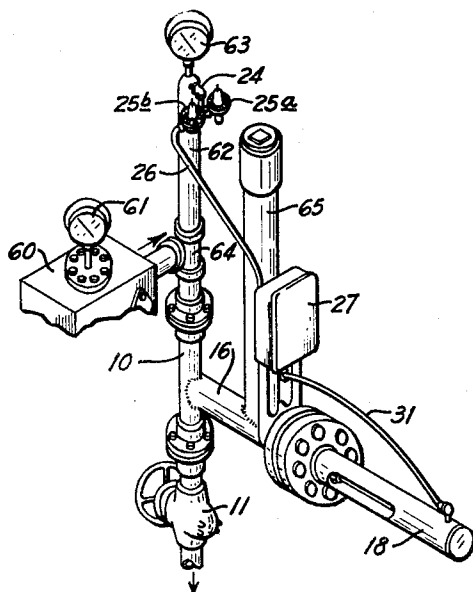


Fig. 5

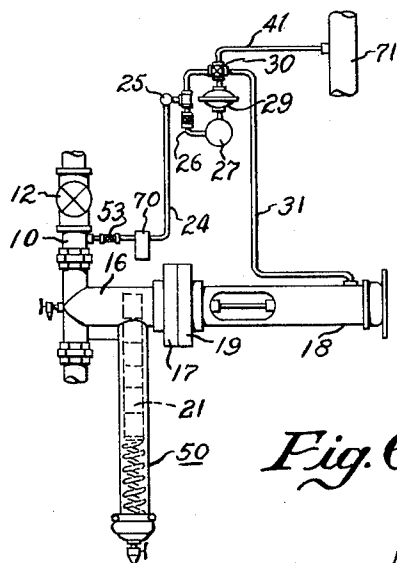


Fig. 6

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AUTOMATIC PLUG INJECTOR AND METHOD OF CLEANING PIPELINES

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Application September 8, 1954, Serial No. 454,730

10 Claims. (Cl. 134—8)

This invention relates to method and means for removing deposits in fluid conduits by forcing solid plugs through the conduits under pressure exerted by the flow of fluid in the conduit, and has reference more particularly to automatic apparatus for the introduction of such cleaner plugs into the conduits or lines.

A frequent cause of the interference of flow of fluids in pipe lines is the deposition of solid materials on the inner surfaces of the lines. These materials are usually either derived from the fluid or carried along with it to the point of deposition. Lines conveying petroleum hydrocarbons are often plugged or the flow therethrough severely restricted by deposition of such solids as, for example, paraffins or petroleum hydrates. When lines conducting crude oil from wells to separators and tank batteries become coated internally with the deposited material, it is the usual practice to steam out such lines; this procedure requires expensive equipment and in certain cases is ineffective. Those lines which are exceptionally long (2000 to 8000 feet) and are under cold water such as in a marsh area, or offshore, many times can not be steam cleaned due to condensation of steam and consequent loss of heat through the long cold line. In such a case the well must be closed and the line removed from, for example, the ocean floor for cleaning. This causes lost production and excessive repair expense. Recently it has been found that lines can be kept clean by the use of cleaner plugs. A solid plug having a diameter only slightly smaller than the inside diameter of the line can be injected into the line upstream from the section of the line in which deposition has occurred and flow of fluid therethrough will force the plug to pass through the line and scrape deposits from its wall. If the plugs are of a material insoluble in the fluid in the pipe line they can be removed from traps deposited in the lines some distance from the point of introduction of the plug. Soluble plugs, or so-called soluble plugs, of such material for example, as naphthalene and other normally solid hydrocarbons, are used to clean pipe lines which conduct hydrocarbon fluids especially crude oil. These plugs are usually broken up during their passage through flow lines and the resulting pieces very slowly dissolve in the oil in traps, catch basins, or separators.

Cleaner plugs have heretofore been inserted manually into the lines. This manual introduction of plugs requires a great deal of attention since, for the plugs to be effective, they must be introduced into the lines before any heavy deposition has accumulated; otherwise it is impossible for the fluid traveling through the line to drive the cleaner plug and scraped material ahead of it. Plugs must be inserted at regular intervals and more or less frequently, depending upon variations in the potential solids content of the fluid, the temperature of the fluid, and the temperature of the surrounding atmosphere, in order to make this method at all operable. Where frequent manual insertion of plugs is necessary, and involves excessive man hours, as in the operation of flow lines from widely separated oil wells, the use of cleaner

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plugs has not been found sufficiently practicable to supplant the steaming operation. The problem is increased if the wells are situated in remote or inaccessible places such as swamps, and the regular manual injection of the plugs is even more infeasible in the case of offshore wells, which often cannot be reached during stormy weather. This can result in plugged lines, which cannot even be steamed out and, thus, to clean out the line, it is necessary to raise the line, break the connection, ream out the pipe sections and then replace the line and its coating. It becomes, therefore, especially important that such deposition be prevented in flow lines by the frequent regular insertion of cleaner plugs.

Briefly stated, the present invention comprises automatic apparatus for the timed intermittent delivery of a solid plug through a port, sealed by the apparatus, into a pipe line, and consists essentially of driving means for delivering the plug through the port into the line, a container for a plurality of the plugs arranged to deliver intermittently a plug to the driving means, and control means for effecting intermittent operation of the driving means according to a predetermined timed interval, the power source for operating the said driving means being the pressure of a fluid in the said line, which fluid is preferably a gas dissolved in and liberated by liquid or fluids in the line.

The reciprocal driving means is preferably a piston with a coacting plunger. The container for the plugs is preferably a vertically disposed cylinder from which plugs drop individually into position before the plunger; the container can also constitute the separator wherein gas that has been dissolved in the fluid is released and made available to drive the piston. This is a particularly useful feature of the apparatus since many installations will be in remote places where the delivery of electrical power or the maintenance of a battery power at the installation would be either extremely difficult or relatively expensive. The timer control is most conveniently a spring wound timer or intermitter which operates a valve that intermittently releases separated gas to the piston means and releases the gas from the piston. The timer control can also be a gas clock operated by the separated gas, so that the apparatus can thereby be rendered substantially entirely automatic. The necessity to renew the supply of cleaner plugs will of course require occasional visits to the apparatus and consequently a clock-wound timer is, as aforementioned, believed to be the most convenient and reliable form of control apparatus.

My invention further comprehends an improved method for cleaning pipe lines with cleaner plugs, in which method the energy employed in introducing the cleaner plugs into the pipe line is derived from the pressure of a fluid flowing in the pipe line. This method comprises the steps of maintaining a source of cleaner plugs adjacent to the pipe line, withdrawing fluid from the pipe line, and delivering the fluid under pressure at automatically timed intervals and through suitable means against a cleaner plug to drive the plug through an opening into the pipe line. More specifically my method includes withdrawing a liquid from the pipe line and separating, under a pressure that is less than pipe line pressure, a gas from the said liquid and thereafter employing the pressure of the gas to force a cleaner plug into the line.

In the accompanying drawings which are supplied solely for the purpose of illustrating the invention,

Fig. 1 is an elevational view, partly in cross-section and with parts broken away, of a preferred embodiment of my automatic plug injector,

Fig. 2 is a section taken through line II—II of Fig. 1 and showing the feeder outlet of the device,

Fig. 3 is a section of Fig. 1 taken along line III—III

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showing a plan view of a cleaner plug in my apparatus and the manner in which it is introduced by the apparatus,

Fig. 4 is an elevational view of another arrangement of the plug injector,

Fig. 5 is an isometric projection of still another arrangement of the plug injector, and

Fig. 6 is an elevational view, with parts broken away of another embodiment of the plug injector.

Like characters of reference refer to the same parts in each of the views of the drawings.

Referring now specifically to Fig. 1, line 10 is a flow line conveying crude oil from the well and the Christmas tree or well head piping. Disposed in the flow line 10 are valves 11 and 12. These valves can be closed and the product of the well can be, for example, by-passed through line 13. A port 14 is provided in the flow line 10 through which cleaner plugs are introduced into the flow line by the injector apparatus 15; this apparatus is attached to the flow line and around the port 14 in such manner as to seal the opening. Plunger chamber 16, fitted around the said port 14 in the flow line 10, extends preferably at right angles to the longitudinal axis of the flow line. The chamber 16 is fitted at its other end with a pipe flange 17 to which in turn is connected a cylinder 18 by means of pipe flange 19. Attached to an opening of the chamber 16 and extending preferably at right angles to the longitudinal axis of the chamber is a plug container and separating means 20. Plug container 20 consists essentially of a vertically extending pipe connected to and feeding into the chamber 16 and having at its other end a pipe cap 22. Pipe cap 22 can be fully opened to permit the insertion into the plug container 20 of cleaner plugs 21 on top of which is placed a guide weight 21a. Valves 11 and 12 are closed before the pipe cap 22 is opened, and the chamber 16 and plug container 20 are then drained of oil through bleeder 10a. The plug container 20 is supplied with an inner guide ring 23 disposed concentrically around the entrance port for the plugs from the container into the chamber 16, whereby the cleaner plugs 21 are delivered uniformly and individually into position within the chamber 16 for their subsequent delivery into line 10. The guide ring 23 has an inside diameter less than the outside diameter of guide weight 21a, thus preventing the weight from falling into chamber 16.

The plug container and separator 20 is open to the flow of oil from line 10 through port 14. Oil thus flows into the container 20 until it is restrained by back pressure exerted therein.

Soluble gas released from the oil standing in the container 20 will accumulate in the upper part of the cylinder and will flow therefrom, as called for by subsequently described devices, through line 24, pressure reducer and regulator 25 (which can represent a plurality of regulators and reducing valves), and valved line 26 to a spring-wound time-cycle controller or intermitter 27. The controller 27 is of conventional design, is spring-wound, and contains a clock which should need winding no more frequently than once every thirty-one days. Controller 27 intermittently releases the pressure of gas in line 26 to line 28 and diaphragm 29 whereby three-way valve 30 in line 31 is caused to open so that gas from container 20 will flow from line 24 through the line 31 to the cylinder 18. The gas flowing from line 31 into chamber 32 of the cylinder 18 will force the piston 34 and rod 35 forward, in the meantime expelling air from the cylinder through escape port 36. Piston rod 35 extends through bushings 37 and stuffing box 38 into the chamber 16 and is positively connected therein to a plunger 39. This plunger rides on skid-stage 40 disposed horizontally in the chamber 16 and, as a piston rod 35 moves forward, pushes a cleaner plug through the port 14 into the line 10.

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The plunger 39 is provided with a bevelled upper face extending from the forward face to the top of the head so that a cleaner plug resting on the one which is being pushed into the line 10 will ride up on the bevelled face and then on the top face of the plunger as it proceeds forward. To secure proper alignment of the cleaner plugs as they are injected into the line the plunger is shaped in a semi-cylindrical concave form so that the forward facing of the plunger will partly encircle the cleaner plug. The cleaner plugs must be of substantially the same height as the plunger to prevent jamming of the plunger or shearing of the plugs.

When the piston has proceeded forward a full stroke it will return, completing the cycle, by release to atmosphere of the gas pressure in the chamber 32 through lines 31 and 41 upon an automatic change of setting of the three-way valve 30. The difference in pressure between that exerted upon the piston head 34 when chamber 32 is thus vented to atmosphere and upon the piston rod 35 by the oil and gas in the chamber 16 will cause the retraction of the piston.

I have found, in operation of my plug injector, that the container and separator 20 will fill with gas down to the bottom cleaner plug 21 and that the oil will rise in the separator only when gas is withdrawn and for a few seconds thereafter. Oil-soluble plugs can be used with my apparatus because the slight contact which they have, in the device, with oil does not effect any substantial solution of the plugs. If, from having been coated with oil, the plugs tend to stick together, they can be kept separated by placing a disc of wax paper between each plug. Oil-soluble plugs, which are usually asphaltic in composition, are slow to dissolve until disintegrated during use in the flow line. If any plugs should ever show excessive solubility or sticking in the injector apparatus, they can be sprayed, before use, with a thin, friable oil-insoluble coating.

Alternatively, the piston can remain in forward position until such time as the controller 27 calls for the insertion of another cleaner plug at which time the pressure of gas in chamber 32 can be released, the piston cycle completed, and a new charge of gas be delivered into the chamber 32. The forward position of piston 34 and plunger head 39 are shown in dotted lines in Fig. 1.

Fig. 2 shows a cross-sectional view of the chamber 16 taken at lines II—II of Fig. 1 and shows in plan view the face of the plunger 39. The skid-stage 40 upon which the plunger rides is shown in cross-section. Two cleaner plugs and a portion of another are indicated by dotted lines which show the manner in which the cleaner plugs 21 are delivered into the chamber 16 being guided therein by the concentric guide 23.

Fig. 3 is a plan view of a feeder plug 21 resting in the chamber 16 on the stage 40 and shows the position of the cleaner plug with relation to the plunger 39, particularly illustrating the fact that the face of the plunger is concave in shape and fits around the cleaner plug in such a way as to guide it into the flow line.

Fig. 4 illustrates an alternative embodiment of the present invention in which similar parts are designated by the same reference characters. A flow line 10 contains valves 11 and 12 and a by-pass 13. Between the two valves in line 10 is attached chamber 16 having at its opposite end a pipe flange 17 which is connected to another flange 19 and cylinder 18. Disposed at right angles to the longitudinal axis of chamber 16 is a spring loaded storage container 50. Chamber 50 is supplied with a pipe cap 51 which can be easily opened in order to insert cleaner plugs 21 into the container. Pipe cap 51 contains a bleeder valve 51a which can be used to drain the chamber 50 and associated apparatus prior to removing the pipe cap. A spring 52 is then compressed into the container and the pipe cap is closed; the spring moves the cleaner plugs 21 upwardly into the chamber 16. A valved line 53 connects flow line 10 at a point

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between chamber 16 and valve 12 to a separator 54 where by oil from the line 10 flows into the separator. Soluble gas will separate from the oil and collect in the upper part of the separator 54. Thus gas is employed to operate piston 34 (not shown in Fig. 4) in the cylinder 18 in much the same manner as that described in Fig. 1. The clock wound controller 27 permits gas to flow at selected intervals through line 24, pressure regulator and reducer 25, and valved line 26 to the diaphragm 29 whereby it operates the three-way valve 30 and permits gas to flow through line 31 to the cylinder 18. In the present embodiment the automatic apparatus is set so that the plunger 39 (not shown in Fig. 4) will remain in a forward position after having delivered a cleaner plug into the line 10 until an additional cleaner plug is called for by the timer. At this time the plunger will be retracted and will permit an additional cleaner plug to be discharged into the chamber 16 for delivery by the plunger into the line 10.

In Fig. 5, an isometric view of an embodiment of my invention, another example of an injector having a liquid-gas separator, or gas supply chamber, that is separate and distinct from the plug container, is shown. Referring particularly to the drawings, a flow line 10 leads from a manifold 60 having a pressure gauge 61. The flow line 10 contains valve 11 and to the line is attached plunger chamber 16. Gas separator 62 having a pressure gauge 63 is connected to flow line 10 at T 64. Gas separates from oil standing in the separator 62 and accumulates in the upper part of the separator. The gas flows through line 24, pressure regulator 25a and reducing regulator 25b and through line 26 to time cycle controller 27 at intervals controlled by the latter. The controller 27 operates a three-way valve (not shown) to permit the flow of gas through line 31 to the cylinder 18 which operates a piston and in turn a plunger (not shown) to move cleaner plugs from the base of plug container 65 through a port (not shown) at the end of the plunger chamber 16 into the line 10. The controller 27 then releases the pressure of gas from the cylinder 18 and line 31 through a vent in the controller (not shown), and the piston and attached plunger retracts in the cylinder 18 and chamber 16 to the position for receiving and eventually charging another cleaner plug.

Other alternatives within the scope of my invention will be apparent upon reading the foregoing description of the preferred embodiment of my apparatus. For example the fluid in line 10 can be directly employed without separating the gaseous and liquid fluids by a modification, shown in Fig. 6, of the apparatus wherein flow of fluid from the said line is intermittently permitted by the time-cycle intermitter 27 to flow into the cylinder 18, operate piston 34, and thereafter discharge to waste or preferably to a flow line which is under a lower pressure. With reference to Fig. 6, intermitter 27 will set valve 30 to permit fluid to flow from the line 10 through valved line 53 and a line filter 70 of conventional design. The filtered fluid will then flow through line 24 pressure reducer and regulator 25, and valved line 26 to the spring-wound time-cycle controller or intermitter 27. Controller 27 will release the pressure of fluid in line 26 to diaphragm 29 so that three-way valve 30 in line 31 will be set so that fluid flowing from line 24 will flow through line 31 to the cylinder 18. Operation of the cylinder 18 will be substantially identical as that described for the operation of Fig. 1. When the intermitter 27 resets valve 30 fluid from line 31 will flow through line 41 into a line of lower pressure 71. The pressure of oil in the chamber 16 exerted against the piston rod 35 will cause the piston 34 to complete its cycle and place the plunger 39 in position to receive another cleaner plug, in substantially the same manner as that described with respect to the preferred embodiment.

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In an example of actual field operation employing the apparatus of my invention, cleaner plugs have been delivered into a flow line that connects a bayshore oil well to a tank battery, is about two thousand feet in length, and is buried beneath the ocean floor. The apparatus has been set to feed a cleaner plug once every 24 hours. The apparatus has been in operation over a period of about seven months and has kept the flow line in clean fully operating condition throughout that period in contrast to other flow lines in the same area, of similar length, which have required steaming or other cleaning at the rate of about forty lines per hundred flow lines per month.

Having described my invention, I claim:

1. An improved method of maintaining the interior of pipe lines free of depositions or other accumulations which interfere with the flow of fluids therethrough, which method comprises: maintaining a supply of solid cleaner plugs of slightly less than the inside diameter of the pipe line adjacent thereto; withdrawing fluid from the pipe line; automatically releasing the pressure of the withdrawn fluid at intervals of predetermined frequency and employing the so-released fluid pressure to introduce a cleaner plug into the pipe line at a predetermined frequency; and flowing the said cleaner plugs through the pipe line with the flow of fluid in the pipe line and thereby scraping deposits from the inner walls of the pipe line.

2. An improved method of removing paraffin and like deposits from the inner walls of pipe lines conveying petroleum hydrocarbons having dissolved therein compressed gases, the said method comprising: withdrawing petroleum hydrocarbons from the said lines; separating gases from the so-withdrawn hydrocarbons; releasing and expanding so-separated gas at automatically predetermined intervals into a zone of expansible volume; maintaining a supply of oil-soluble cleaner plugs, having a diameter slightly less than the inside diameter of the pipe line adjacent thereto and to said gas separating zone; introducing a cleaner plug into the said pipe line by the force exerted by said expansion of gas and thus at a predetermined frequency; and passing the so-introduced oil-soluble cleaner plug through the pipe line with and by the flow of petroleum hydrocarbons therethrough to scrape deposits of paraffin or like hydrocarbons from the inner walls of the pipe line.

3. Apparatus for connection to a pipeline and operable by the pressure of a fluid in the pipeline for the periodic introduction of solid plugs into the pipeline comprising storage means for the solid plugs adapted to communicate with the pipeline through a port in the pipeline for introduction of the solid plugs into the pipeline, fluid pressure responsive reciprocal driving means adapted to engage a solid plug positioned adjacent thereto by the storage means and move it through the port into the pipeline, the reciprocal driving means being constructed and arranged to allow substantially uninterrupted flow through the pipeline, said storage and reciprocal driving means being constructed and arranged to prevent leakage from the pipeline through the port and out of the apparatus, a conduit for communication with the pipeline and the reciprocal driving means for conveying fluid under pressure from the pipeline to the reciprocal driving means, three-way valve means disposed in said conduit, and a timer control connected to the valve means and operative to effect an alternating delivery of the fluid pressure to the reciprocal driving means and release of the fluid pressure in the reciprocal driving means.

4. Apparatus for connection to a pipeline and operable by the pressure of a fluid in the pipeline for the periodic introduction of solid plugs into the pipeline comprising a chamber adapted to be operationally mounted on the pipeline and open thereto through a port, storage means communicating with the chamber and adapted to position a solid plug in the chamber for introduction into the

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pipeline, fluid pressure responsive reciprocal driving means movable in the chamber from a position remote from the port to a position adjacent the port to move the solid plug therein through the port into the pipeline, the reciprocal driving means being more remote from the port than the plug whereby the part of the reciprocal driving means nearest the port engages the side of the plug remote from the port and the reciprocal driving means allows substantially uninterrupted flow through the pipeline, a conduit for communication with the pipeline and the reciprocal driving means to supply fluid under pressure to actuate the reciprocal driving means, valve means disposed in the conduit adapted to deliver fluid under pressure to the reciprocal driving means and to release fluid pressure from the reciprocal driving means, and a timer control connected to the valve means to effect an intermittent change in the fluid pressure in the reciprocal driving means.

5. Apparatus for connection to a pipeline and operable by the pressure of a fluid in the pipeline for the periodic introduction of solid plugs into the pipeline, said fluid containing gaseous and liquid components, the apparatus comprising a chamber adapted to be operationally mounted on the pipeline and open therinto through a port, storage means communicating with the chamber and adapted to position a solid plug in the chamber for introduction into the pipeline, fluid pressure responsive reciprocal driving means movable in the chamber to engage the solid plug in the chamber and move it through the port into the pipeline, the reciprocal driving means being constructed and arranged to allow substantially uninterrupted flow through the pipeline, a separator adapted to be connected to the pipeline adapted to collect gas in its upper end from the fluid in the pipeline, a conduit extending from the upper end of the separator to the reciprocal driving means to supply gas under pressure to actuate the reciprocal driving means, valve means disposed in the conduit constructed and arranged to deliver gas under pressure to the reciprocal driving means and to release gas pressure from the reciprocal driving means, and a timer control connected to the valve means to effect an intermittent change in the fluid pressure in the reciprocal driving means.

6. Apparatus for connection to a pipeline and operable by the pressure of a fluid in the pipeline for the periodic introduction of solid plugs into the pipeline, said fluid containing gaseous and liquid components, the apparatus comprising a chamber adapted to be operationally mounted on the pipeline and open therinto through a port, a plug storage container extending upwardly from the chamber whereby gas from the fluid in the pipeline is collected in the upper end of the container, said plug storage container being adapted to position solid plugs in the chamber for introduction in the pipeline, fluid pressure responsive reciprocal driving means movable in the chamber to engage a solid plug in the chamber and move it through the port into the pipeline, the reciprocal driving means being constructed and arranged to allow substantially uninterrupted flow through the pipeline, a conduit extending from the upper end of the storage container to the reciprocal driving means to supply gas under pressure to actuate the reciprocal driving means, valve means disposed in the conduit arranged to deliver gas under pressure to the reciprocal driving means and to release gas pressure from the reciprocal driving means, and a timer control connected to the valve means to effect an intermittent change in the fluid pressure in the reciprocal driving means.

7. Apparatus for connection to a pipeline and operable by the pressure of a fluid in the pipeline for the periodic introduction of solid plugs into the pipeline, said fluid containing gaseous and liquid components, the apparatus comprising a chamber adapted to be operationally mounted on the pipeline and open therinto through a port, storage means extending from and opening into the

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chamber, resilient means within the storage means adapted to urge plugs from the storage means towards the chamber, fluid pressure responsive reciprocal driving means movable in the chamber to engage a solid plug in the chamber and move it through the port into the pipeline, the reciprocal driving means being constructed and arranged to allow substantially uninterrupted flow through the pipeline, a liquid-gas separator adapted to be connected to the pipeline and collect in its upper end gas from the fluid in the pipeline, a conduit extending from the upper end of the separator to the reciprocal driving means to supply gas under pressure to actuate the reciprocal driving means, valve means disposed in the conduit arranged to deliver gas under pressure to the reciprocal driving means and to release gas pressure from the reciprocal driving means, and a timer control connected to the valve means to effect an intermittent change in the fluid pressure in the reciprocal driving means.

8. Apparatus for connection to a pipeline and operable by the pressure of a fluid in the pipeline for the periodic introduction of solid plugs into the pipeline, said apparatus comprising a chamber adapted to be operationally mounted on the pipeline open therinto through a port, storage means extending from the chamber and adapted to position plugs therein for introduction through the port into the pipeline, fluid pressure responsive reciprocal driving means movable in the chamber to engage a plug in the chamber and move it through the port into the pipeline, the reciprocal driving means being constructed and arranged to allow substantially uninterrupted flow through the pipeline, a conduit adapted to be connected at one end to the pipeline and at the other end to the reciprocal driving means to supply fluid under pressure for actuating the reciprocal driving means, valve means disposed in the conduit constructed and arranged to deliver gas under pressure to the reciprocal driving means and to release gas pressure from the reciprocal driving means, and a timer control connected to the valve means to effect an intermittent change in the fluid pressure in the reciprocal driving means.

9. Apparatus for connection to a pipeline and operable by the pressure of a fluid in the pipeline for the periodic introduction of solid plugs into the pipeline comprising a chamber adapted to be operationally mounted on the pipeline and open therinto through a port, storage means for the plugs extending upwardly from the chamber and adapted to position plugs in the chamber for movement into the pipeline, a plunger movable in the chamber from a position below the storage means allowing a plug to drop into the chamber to a position adjacent the port for introduction of a plug through the port into the pipeline, said plunger normally occupying the position adjacent the port, driving means comprising a cylinder, a piston movable in the cylinder, and a piston rod connected to the piston, said piston rod extending into the chamber and being connected therein to the plunger, a conduit for communication with the pipeline and the cylinder to supply fluid under pressure to move the piston therein, valve means disposed in the conduit constructed and arranged to deliver fluid under pressure to the cylinder and to release fluid pressure from the cylinder to cause movement of the piston, and a timer control connected to the valve means to effect an intermittent change in the fluid pressure in the cylinder, said timer control controlling the valve means to maintain normally a high pressure on the cylinder to hold the plunger in a position adjacent the port and periodically release the pressure on the cylinder whereby the plunger moves from a position adjacent the port to a position allowing a plug to move from the storage means for introduction into the pipeline.

10. Apparatus for periodically injecting solid plugs into a pipeline comprising a tubular section adapted to be connected in and form a part of the pipeline, a chamber extending laterally from the tubular section, said tubular section having a port therein opening into the chamber

through which plugs are injected into the tubular section, a storage reservoir for the solid plugs opening from the chamber and adapted to position plugs in the chamber for movement into the tubular section, fluid pressure responsive driving means movable in the chamber from a position adjacent the opening from the storage reservoir to the chamber to a position adjacent the port in the tubular section to move solid plugs from the storage reservoir into the tubular section whereby the driving means allow uninterrupted flow through the pipeline, conduit means for communication with the pipeline and the driving means to supply fluid pressure to actuate the driving means, valve means in the conduit means constructed and arranged to control the fluid pressure in the driving means to operate the driving means, and a timer control connected to the

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valve means to effect a periodic change in the fluid pressure in the driving means.

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