137 -13

SUBSTITUTED FOR MISSING COPY

SEARCH ROOM

G. W. REMSEN.

CONVEYANCE OF LIQUIDS.

2013
2015
X2731
X2769
X2783

No. 190,902. Patented May 15, 1877.

Fig 1

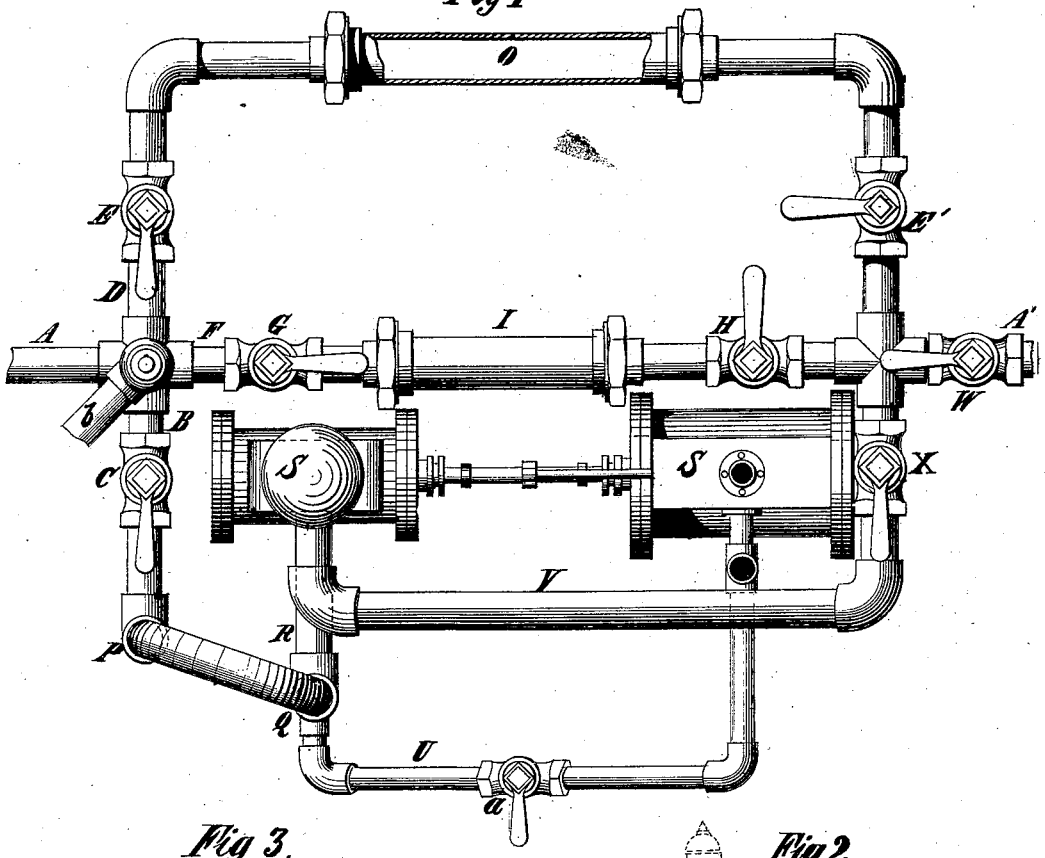


Fig 3.

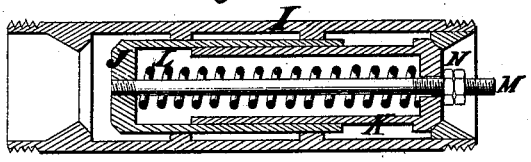
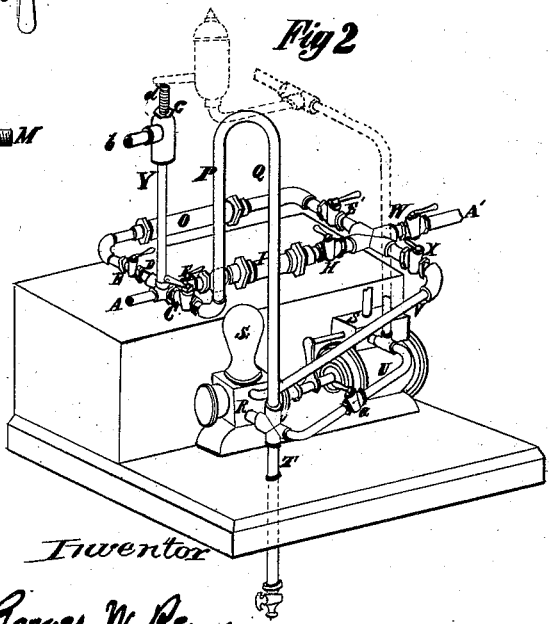


Fig 2



Witnesses.
Chandler Hall.
Thomas. E. Birch.

Inventor
James W. Remsen,
by his atty.
Edwin H. Brown

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

SUBSTITUTED FOR MISSING COPY SEARCH ROOM

UNITED STATES PATENT OFFICE.

GARNET W. REMSEN, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN CONVEYANCE OF LIQUIDS.

Specification forming part of Letters Patent No. **190,902**, dated May 15, 1877; application filed March 7, 1877.

To all whom it may concern:

Be it known that I, GARNET W. REMSEN, of Brooklyn, Kings county, and State of New York, have invented certain new and useful Improvements in the Conveyance of Liquids, of which the following is a description:

These improvements are admirably adapted to pipe-lines through which petroleum is conveyed from place to place, as they provide for conveying it great distances without tanking or retanking, and consequently without rendering it liable to evaporation from exposure to the atmosphere, or the great danger of loss incident to conflagration from lightning. These improvements consist in effecting the conveyance of liquid through the pipes or conduits by imparting to it at intervals additional impulse in its transit; also, in insuring a continuous flow by compensating for irregularities therein; also, in establishing opposing currents, whereby the air and gases accompanying the liquid in its transit are concentrated or compacted so that the liquid will more nearly, if not completely, fill the pipe or conduit, and enable the motor or motors employed to impel it to act effectively, thereby enabling a larger volume of liquid to be impelled through a smaller pipe than is used in other processes of conveying liquids, and at a greater speed; also, in combinations of parts for use in the conveyance of liquid, whereby great economy and efficiency are obtained, and provision is afforded for yielding under excessive pressures.

The accompanying drawing illustrates one mechanical arrangement of parts embodying my improvements.

Figure 1 is a plan thereof. Fig. 2 is a perspective view of the same, and Fig. 3 is a detail view of a cushion or compensating pulsometer embodied therein.

Similar letters of reference designate corresponding parts in all the figures.

A A′ designate the main line of pipe or conduit for the conveyance of liquid, and into which the liquid may be conducted from a tank or tanks where it is collected, or from any other suitable source. The parts which I shall now describe may be combined with the main line near the source of the liquid, for impelling it along the same, and at intervals throughout the length thereof, to impart additional impulse to it, or they may be employed with any other apparatus, if desirable, for any reason.

B designates a branch pipe or conduit, provided with a cock, C, and an upright portion, P, and extending from the main line to a steam-pump, S, which is shown as the motor for impelling the liquid, and through which the liquid is intended to pass in order to derive its impulse. D is a branch pipe or conduit, provided with cocks E and E′, and shown as provided with a section, O, of large diameter, and extending from the main line, and preferably, for reasons hereafter to be described, from opposite to the branch pipe or conduit B. This branch pipe or conduit D constitutes a switch and relay, having several important functions. Extending from opposite the supply end A of the main line is a pipe or conduit, F, provided with cocks G and H, between which, in a cylinder or section, I, is a device, J K, forming an elastic cushion, adapted to yield and relieve the main pipe or conduit when the liquid therein acquires so great a pressure that it might occasion the bursting thereof, were no relief provided for. This device J K also serves as a compensating pulsometer, and, as represented, consists of two cylinders, which are free to move within the cylinder or pipe section I, fit one within the other, may be forced apart by a spring, L, or equivalent force, and are limited in their movement away from one another by a rod, M, preferably having an adjustable connection with one of the two parts, which may consist of a nut or nuts, N, capable of being shifted along the screw-threaded portion of the rod M, to afford a greater or cause a less movement of the parts, or to regulate the compression of the spring or its equivalent, and its potency. This device J K and cylinder I may be reversed when worn or injured at one end.

The cocks C, E, and G, and a cock, W, on the delivery end of the main line being open, and the cocks E′ and H being closed, liquid passing along the supply end A of the main line is apt to act directly on the device J K, owing to its position, whereupon the component parts of this device are compressed together

to an extent due to the impact of the liquid against it. If the flow of the liquid is constant and its pressure uniform the parts of the device J K remain in this condition; but, if, on the contrary, its flow is irregular and its pressure varies, owing to a wave-like motion, due to any cause, such as the intermittent action of a pump, the parts of the said device, upon every reduction of pressure, are forced apart, and at such times impel the liquid backward, concentrate, and compact any air or gases that may accompany it, so that the liquid more nearly, if not completely, fills the pipe, wherefore the said device forms a pulsometer, compensating for irregularitities in the flow.

It is obvious that the parts of this device J K will be compressed so as to yield sufficiently to afford immediate relief to the main line of the pipe or conduit upon any sudden increase in the pressure of the liquid. The liquid being turned back by the device J K is apt to turn into the branch pipe or conduit B leading to the steam-pump S or into the switch and relay D. If it enters the pipe or conduit B between the strokes of the pump any air or gas which may have previously accompanied it is compressed or compacted by the pulsations due to the weight of the column of liquid in the upright portion P, and is additionally compressed and compacted. If, on the contrary, it enters the switch and relay D the liquid with air and gases therein forming an elastic cushion acts upon it at every diminution of pressure, pulsates, compresses and compacts the air and gases accompanying the liquid additionally. Therefore, air and gases which may have accompanied the liquid thus far are caused to escape at the point of least resistance, and the liquid is enabled to enter the steam-pump S in a regular, or nearly regular, stream, more nearly, if not completely, filling the pipe, wherefore the pump acts upon it much more effectively, and a larger volume of liquid may be forced through a smaller pipe than is ordinarily used in pipe-lines, and may be impelled therein at a greater speed. This is of the utmost importance, as the quantity of liquid delivered at the terminus of the main line is enormously increased. Hitherto, in pipe-lines for liquids, the intermittent action of the pumps employed to impel the liquids has been always liable to create a wave-like flow of the liquid, which prevents the pipe from being properly filled. My improvements just described are designed to obviate this. The large section O of the switch and relay D is employed to accommodate a volume of liquid air and gases sufficiently great to make it serve as an elastic cushion. The same result might be attained by increasing the length of the switch and relay, and there are several reasons which would make this a very desirable modification.

To additionally insure the compacting or expulsion of air and gases accompanying the liquid before its entrance into the pump I prefer to combine with the upright portion P of the pipe B a downwardly-extending portion, Q, of such length that the two portions P Q will form a siphon and cause the downward flow of the liquid between the strokes of the pump. To accomplish this the pump will need to be arranged lower than the main line A A′. In some instances this feature will be rendered unnecessary by the natural formation of the land near the junction of the main line with the pump. I also prefer, at the junction of the branch pipe B with the suction-pipe R of the pump S, to arrange a well, T, into which, between the strokes of the pump, liquid will fall, so that at every stroke of the pump it will have two sources for supply—one from the branch pipe, another from the well.

In order to provide for working the valve of the liquid-cylinder of the pump, in case the ordinary means for working the same shall prove ineffectual, I preferably conduct steam through a suitable pipe, U, under control of a cock, *a*, where it may operate upon the valve to free it. This pipe may conduct the steam into the liquid-supply pipe of the pump, and then if the cock C is closed, so that the liquid cannot be forced back, it may be forced against the valve to free it. An advantage is gained by connecting a steam-pipe to the supply-pipe, as it serves as a heater, which, in pumping petroleum, has a tendency to so liquefy this article as to enable it to pass through the pump more freely.

V designates the delivery-pipe of the pump. It is preferably arranged at an incline, so that the liquid impelled by the pump will be compacted—*i. e.*, freed from the wave-like flow caused by the intermittent action of the pump during its ascent before reaching the delivery end A′ of the main line. This pipe is provided with a cock, X, which, of course, has to be opened during the operation of the pump.

When these combinations of parts, or the most important of them, are used to impart additional impulse to liquid previously impelled by another pump, it may happen that, owing to the first pump being worked faster than the second, it will supply the liquid faster than required. In this case the cock E′ is opened partially or wholly, and the surplus liquid flows through it and into the delivery end A′ of the main line. Thus, where a number of pumps are used, switches and relays, of the character of the one herein described, will afford provison for obtaining the maximum amount of work from each, and enable each to assist the others.

When, owing to any accident which may have befallen the pump, or because it is desirable to leave it, its operation is desired to be suspended, the cock C controlling its suction-pipe, and the cock X controlling its delivery-pipe, are closed, and the cock E′ controlling communicating between the switch and relay D and the delivery end A′ of the main line is opened, whereupon the liquid

may flow on around the switch and relay, and through the main line, under the impulse which it may have previously acquired.

The cock H is intended to be opened in case of accident. When open, the liquid, acting on the device J K backwardly, may cushion upon it, and be afforded such relief as to save (in the reverse direction to that formerly referred to) the pipe from injury. The device J K forms therefore an adjustable, reversible, double-acting elastic cushion and compensating pulsometer.

To afford additional security against the bursting of the main line or pipe, I prefer to combine with it a relief device, which may consist of an upright pipe, Y, provided with a valve capable of opening under excessive pressure, to allow of the escape through an outlet, *b*, of some of the liquid. This valve may with advantage be so constructed, for instance, by combining with it a spring and a nut, *c*, and a screw-thread on the valve-spindle *d*, as to provide for regulating the pressure under which it will open. Its spindle may, with advantage, be so combined with an audible alarm, a steam-whistle, or other device, that it will give warning of the accumulation of pressure, and it may be so regulated as to give warning whenever the pressure becomes so great as to make it desirable to allow some liquid to flow through the switch and relay.

This relief device may be opened at any time to ascertain whether the liquid is flowing under the impulse derived from a previous motor.

By my invention I obviate the necessity for tanking and retanking liquid in transportation, which, in the case of petroleum, occasions serious losses through evaporation, and oftentimes, through conflagrations, of immense quantities from a stroke of lightning, or other accident. I provide for conveying economically greater quantities at greater speed; and I provide for relieving the apparatus employed from danger of bursting.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The method of conveying liquids along pipes or conduits by successively imparting to it at intervals additional impulse without tanking and retanking, or exposure to the atmosphere.

2. The method, in the conveyance of liquids through pipes or conduits, of causing it to fill the said pipes or conduits by establishing opposing currents therein at intervals in its transit.

3. The combination, with a pipe or conduit for the conveyance of liquids, of a series of motors, for successively imparting fresh impulse thereto at intervals, without exposing it to the atmosphere or introducing additional liquid into the said pipe or conduit.

4. The combination, with a pipe or conduit for the conveyance of liquids, of a series of pumps, communicating therewith at intervals, to successively take in the liquid, and force it out again under fresh impulse without exposure to the atmosphere, tanking or retanking it, substantially as set forth.

5. The combination, with a pipe or conduit for the conveyance of liquids, and a pump for imparting impulse to liquid therein, of a device forming spring-cushion for receiving the impact of the flowing liquid, yielding to obviate the undue straining of the pipe or conduit, and reacting on the liquid previous to its entrance into the pump, substantially as and for the purpose set forth.

6. The combination, with a pipe or conduit for the conveyance of liquids and a pump or motor for imparting impulse to liquid therein, of an adjustable spring-cushion, adapted to be adjusted and set to yield only at a certain pressure.

7. The combination, with a pipe or conduit for the conveyance of liquids, of a pump or motor for imparting impulse to liquid therein, and a spring-compensator receiving the impact of the liquid in its flow and correcting irregularities therein.

8. The combination, with a pipe or conduit for the conveyance of liquid, and a pump or motor for imparting impulse to liquid therein, of a spring-compensator, receiving the impact of the liquid in its flow, and capable of adjustment so as to correct irregularities however slight or great.

9. The combination, with a pipe or conduit for the conveyance of liquid, and a pump or motor for giving impulse to liquid therein, of a reversible compensator for correcting irregularities in the flow.

10. The combination, with a pipe or conduit for the conveyance of liquids, and a pump or motor for imparting impulse to liquid therein, of a double-acting pulsometer for correcting irregularities in the flow of the liquid.

11. The combination, with a pipe line or conduit for the conveyance of liquids, and a series of pumps or motors for successively imparting fresh impulse thereto, of switches or relays arranged to connect the sections of the pipe line or conduit intercepted by the pumps or motors, substantially as described, whereby any one pump or motor may be stopped at pleasure without necessarily stopping the transit of the liquid, and the greatest amount of work may be obtained from each pump or motor.

12. The combination, with a pipe line or conduit for the conveyance of liquids, and a switch and relay, of means, substantially as described, capable of being manipulated for establishing or severing communication between the same and the main line or conduit, to impart the action of the pump or motor to the liquid, or remove it therefrom.

13. The combination, with a pipe line or conduit for the conveyance of liquid, of a switch and relay and means, substantially as described, for enabling the same to serve as an elastic cushion for yielding, to relieve the

main line, whereby it can contain a larger volume of liquid and accompanying air and gases, and the latter, through their elasticity, are enabled to form an elastic cushion and compensator.

14. The combination, with a pipe line or conduit for the conveyance of liquids, of a switch and relay embodying a section or portion of a larger diametrical capacity than the main line or conduit.

15. The combination, with a pipe line or conduit for the conveyance of liquid, of a switch and relay, and means, substantially as described, for providing for closing the latter at a considerable distance from the outlet, whereby air and gases may be made to serve as a compensator for correcting irregularities in the flow of the liquid through the main line.

16. The combination, with a pipe line or conduit for the conveyance of liquids, of an upright or elevated section leading from a regulating pulsometer to the motor employed, to give impulse to liquid in said pipe line or conduit.

17. The combination, with a pipe line or conduit for the conveyance of liquid, of a siphon leading from the main line to a pump or motor for giving impulse to liquid in said main line or conduit.

18. The combination, with a pipe line or conduit for the conveyance of liquid, of a well between the same and a pump or other motor for giving impulse to liquid therein, whereby greater continuity and uniformity in the transit of the liquid is insured.

19. The combination, with a pipe line or conduit for the conveyance of liquid, of a combined siphon and well between the pipe line or conduit, and the pump or motor for giving impulse to liquid therein, whereby great continuity and uniformity, with increased velocity in the transit of the liquid, is insured.

20. The combination, with a pump for effecting the transit of liquids, of a siphon leading to the inlet of said pump.

21. The combination, with a pump or motor for effecting the transit of liquids and an inlet thereto, of a well for equalizing and rendering uniform the supply to the pump or motor.

22. The combination, with a pump or motor for effecting the transit of liquids, of a combined siphon and well for equalizing and rendering uniform the supply to the pump or motor.

23. The combination, with a pipe line or conduit, and a pump or motor for giving impulse to liquid therein, of means, substantially as described, for yielding from, and reacting upon, the liquid in opposite directions, whereby all irregularities in the transit of the liquid are corrected and the same rendered uniform and continuous.

24. The combination, with a pipe line or conduit, of a compensator, a compensating switch and relay, and a siphon establishing communication between the main line or conduit and a pump or motor for giving impulse to liquid therein.

25. The combination, with a pipe line or conduit, and a pump or motor for giving impulse to liquid therein, of an elevated or upwardly-inclined outlet section, forming a well for assisting in maintaining a regular and uniform transit of the liquid.

26. The combination, with the valve-chest of a pumping-cylinder, of a conduit for steam or other motive agent thereto, whereby provision is afforded for moving the valve in case the ordinary means for working the same shall prove ineffectual.

27. The combination, with the valve-chest of a pumping-cylinder and inlet thereto, of a conduit for the steam or other motive agent, whereby provision is afforded for moving the valve through the medium of the liquid when the ordinary means, substantially as described, for working it may be ineffectual.

28. The combination, with the inlet of a pump or other motor for oils, of means for transmitting from the steam supply-pipe of the motor to the inlet-pipe sufficient heat to liquefy the oils before their entrance into the pump, substantially as set forth.

GARNET W. REMSEN.

Witnesses:
CHANDLER HALL,
THOMAS E. BIRCH.