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W. C. JAEGLER
VALVE ORGANIZATION

2,530,433

Filed March 24, 1945

2 Sheets-Sheet 1

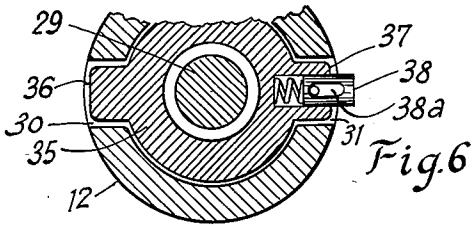


Fig. 6

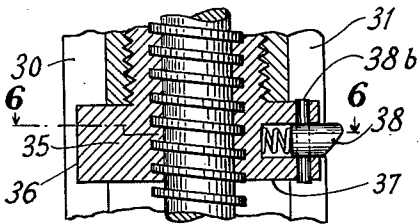


Fig. 5

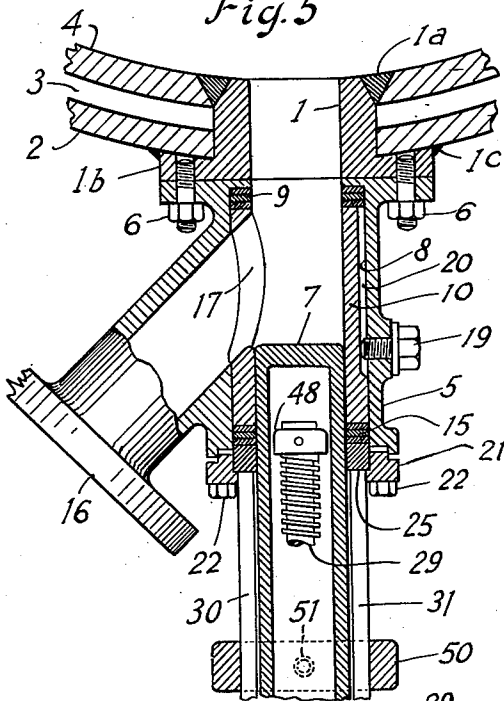


Fig. 1

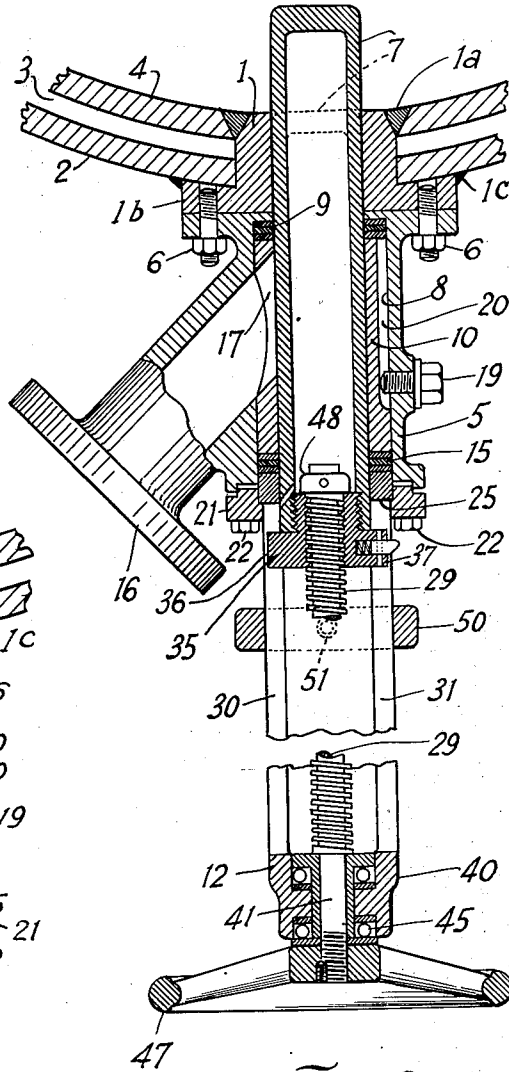


Fig. 2

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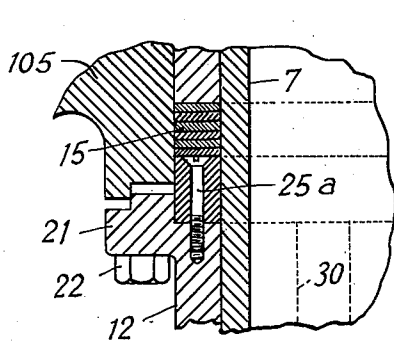


Fig. 7

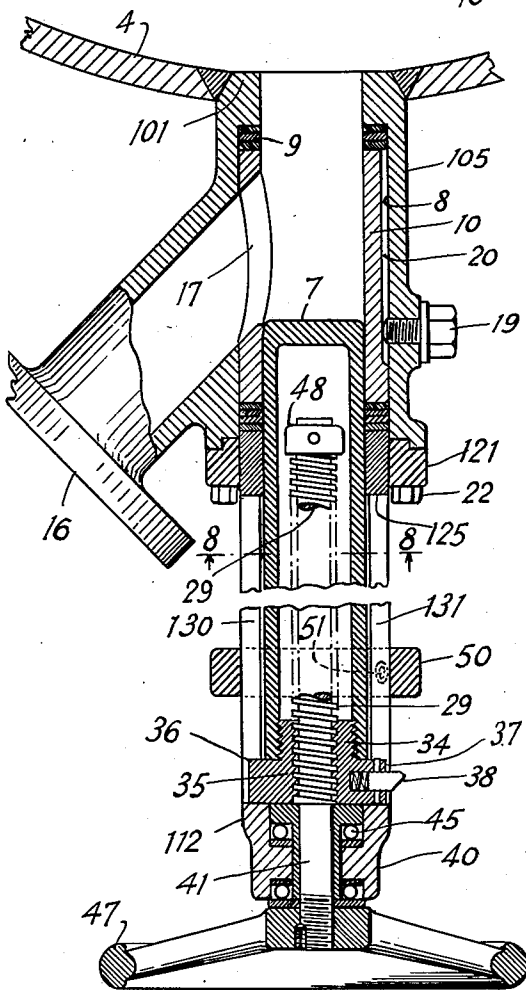


Fig. 3

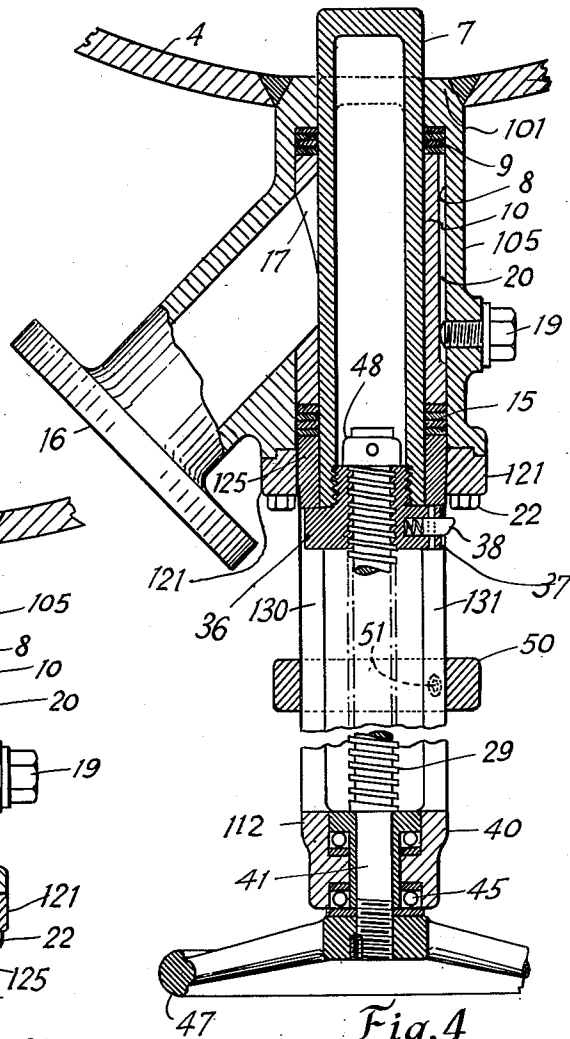


Fig. 4

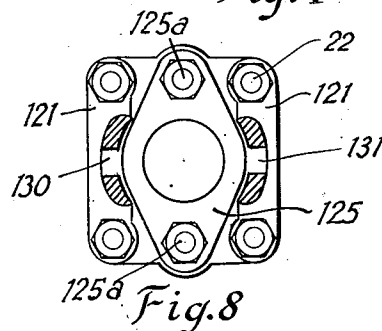


Fig. 8

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VALVE ORGANIZATION

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4 Claims. (Cl. 137—21)

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My invention relates to improvements in tank attachments, and has to do, more particularly with the provision of a drain device for liquid storage tanks and like vessels in which an accumulation of sludge or sediment is experienced and tends to interfere with drainage through conventional valve structures. In the case of vessels provided with agitating means for effecting mixture or suspension of their liquid and non-liquid contents, the drain device must not project within the vessel in such fashion as to interfere with the agitating instrumentalities. It is to the solution of these and related problems that my invention is directed.

It is a primary object of my invention to provide a drain device for storage tanks and the like wherein the drainage duct therethrough is provided with a valve which in normal closed position may be located accurately flush with the inner surface of the tank or other vessel, which in open position offers a minimum of restriction to discharge of liquids, with or without suspended solids, through the drainage duct; and which, in the event of the drainage duct being dammed by an accumulation of sludge or sediment in the tank itself, may be so actuated as to itself effect rupture of the sediment or sludge dam without the introduction of a "snake" or other instrumentality into the tank.

It is another object of my invention to provide such a device for tanks and the like which can serve successfully as a drainage cut-off valve even in instances where the liquid to be handled contains solids of a nature which would interfere with or impair the sealing surfaces of conventional valve structures.

It is also an object of my invention to provide such a device which may be produced in a relatively few standardized sizes suitable for installation upon a wide range of tank and vessel types.

It is a further object of my invention to provide such a device which is easy to operate, compact in installation, inherently sturdy and resistant, to injury and wear, and inexpensive to maintain.

Further objects and improvements relating to details of structure and economies of manufacture will more definitely appear from the following description.

In the claims and in the description, parts are identified by specific names for convenience; but such nomenclature is intended to be as generic as the state of the art will warrant. My invention is particularly defined in the appended claims; and the best form in which I have con-

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templated applying the invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a longitudinal sectional view through a drain device constituting a preferred embodiment of my invention as applied to a tank of double-walled structure, a portion through the operating stem of the device being "broken out" to reduce the length of the figure.

Fig. 2 is a similar view of the same device as that illustrated in Fig. 1, the parts, thereof, however, being shown in closed, sediment-clearing, position as distinguished from the open, drainage, position depicted in Fig. 1.

Fig. 3 is a view of a modified form of drainage device installed upon a single-walled tank, the position of the parts corresponding to the disclosure in Fig. 1.

Fig. 4 is a view of the structure shown in Fig. 3, the parts being, like those of Fig. 2, in sediment-clearing projected position.

Fig. 5 is a detail sectional view (on an enlarged scale) of the screw-carried nut of the plunger element common to the devices of Figs. 1 through 4.

Fig. 6 is a transverse sectional view (also on an enlarged scale) taken on the line 6—6 of Fig. 5.

Fig. 7 is a detail sectional view (drawn to an enlarged scale) showing in vertical section, the adjoining portions of the plunger and casing structure forming a part of the device illustrated in Figs. 1 and 2; and

Fig. 8 is a transverse sectional view taken on the line 8—8 of Fig. 3 and revealing the independently adjustable packing gland of that structure.

In the drawings, Figs. 1 through 8, similar parts are identified by similar reference numerals. The device of Figs. 3 and 4 is identical to that of Figs. 1 and 2 insofar as its plunger and plunger-operating mechanism is considered; differing therefrom otherwise solely in details of casing and bonnet structure and in the character of its attachment to the tank.

Referring to Figs. 1 and 2 of the drawings, the device there illustrated is a drainage attachment embodying my invention installed upon a double-walled tank having an inner wall 4, and an outer wall 2 arranged to define, therebetween, a space 3 for a heat-exchange medium such as hot water, steam, brine or the like. A sput element 1 extends through aligned openings in the tank walls 2 and 4, is fillet welded flush to the inner surface of the inner wall 2 at 1a and is

formed with a flange 1b lap-welded at 1c to the outer surface of the outer tank wall 4.

To the flange 1b of the sput is secured, by means of a plurality of studs 6, a casing member 5 having a counterbore 8 therein coaxial with the sput 1, into which is snugly received a sleeve 10 provided with a sealing ring 9 of packing material. The casing 5 is formed with a flanged outlet 16 defining, with the counterbore 8, a Y, and the sleeve 10 is ported at 17 so as to aline with the outlet 16 and offer a minimum of resistance to flow therefrom. A set screw 19 engaged within a groove 20 in the sleeve 10 insures accurate registry of the port 17 with the outlet 16.

A plunger 7, having the form of a cylindrical cup of greater length than the combined length of the sput 1 and sleeve 10, is snugly slidably received in the sleeve 10 and projectable through the sput 1 as depicted in Fig. 2. Mechanism is provided for so projecting and retracting the plunger 7 to cause same to assume, selectively, either of the actual positions illustrated in Figs. 1 and 2, and also the position represented in dotted lines in Fig. 2, wherein the closed forward end of the plunger lies flush with the inner surface of the tank wall 4 and sput 1. This mechanism is supported upon the casing 5 by means of a bonnet 12 which, also, serves as a clamping member by which the inner sealing ring 9 aforementioned, and an outer sealing ring 15 backed by a gland 25, are compressed into leakage-preventing contact between the sleeve 10 and casing 5 as well as into peripheral sealing contact with the plunger 7, enabling the sliding plunger movements, above described, without seepage therepast. The bonnet 12 is assembled with the casing 5 by means of cap screws 22, which afford the means for applying appropriate packing pressure upon the sealing rings 9 and 15.

The bonnet 12, an intermediate portion of which is shown "broken out" to shorten the view, is slotted from its casing-attached base flange 21 up to its head 40, providing diametrically opposed guide slots 30, 31 within which the extended arms 36, 37 of a crosshead nut 35 slide captive against rotation for the length of the bonnet. The nut 35 is threadedly associated with a stem 29 having a reduced outer end 41 by which it is journaled in a double-row annular ball bearing 45 mounted in the bonnet head 40. A hand-wheel 47 is secured to the end 41 of the stem 29 and, by its manual rotation, the nut 35 may be caused to travel for the full length of the stem 29 between the stem collar 48 and the bonnet head 40.

The nut 35 is formed with a threaded plug portion 34 which is engaged within the otherwise open end of the plunger 7 and constitutes an integral portion thereof when so assembled therewith, closing the hollow plunger space against entry of foreign matter as well as enabling retention of lubricant desirably provided therein to insure free-running of the nut upon the threads of the stem.

The function of the plunger 7 as a valve element for closing the sleeve port 17 is obvious; the plunger 7 of my drain device is not a mere valve, for it serves to perform a special function which is of great importance in tank installations for the handling of liquids from which sediment or sludge tends to precipitate upon the tank wall in the vicinity of the drainage sput. Such precipitation, particularly in the case of tanks forming a part of digesters, evaporators and like plant equipment, frequently becomes so thick and re-

sistant to dislodgement as to impair or completely prevent drainage through the sput. Under these conditions, it is usually necessary to bail out or syphon off the tank contents and clear away the obstruction by means of a "snake" introduced through the drainage opening or by means of an implement operated from within the tank itself. When one considers the problem of the handling and removal of the freed deposits in the presence of residual liquid, solvent and flushing mediums, and the necessity of removing or working around such agitating mechanism as may and usually does form a part of the equipment within the tank, the difficulty of the operation will be manifest. Moreover, in heat-exchange equipment, particularly, the inner tank walls are desirably thin and may be of some soft metal for high thermal efficiency. The deposits to be removed may, on the contrary, be extremely hard and tenacious, so that the implements required for their dislodgement and breaking-up may, of necessity, be sharp, massive or otherwise risky to use.

As has been indicated in the introductory portion of this specification, the present invention is directed to the elimination of the problem of clogging or damming of the drainage orifice of a tank or the like with such accumulations, and this object is attained by my device without the need for prolonged shut-down of the tank equipment nor the use of tools which may prove deleterious in unskilled hands.

Reference to Fig. 2 of the drawing will reveal that by means of the threaded stem 29, the end of the plunger 7 may be projected so far beyond the internal surface of the tank wall 4 and sput 1 as to pierce or break loose any amount of sediment, sludge, calcareous scale or the like which might deposit across the sput passage and interfere with drainage therethrough. Because of the great amplification of force which is developed by an Acme-threaded stem (such is commonly employed in bench vises, screw jacks, etc.) only a slight manual effort (applied to rotation of the handwheel 47) will suffice to clear the most obstinate obstruction across the sput opening; and the stresses incident to such removal are inherently borne, almost exclusively, by the massive sput 1 and the drainage device carried thereby.

Reference has been made, earlier in this specification, to the fact that agitating equipment is commonly employed within tanks and the like of the type to which the present invention is of utility. Such agitating equipment frequently has the form of a bladed rotated hub coaxial with the tank wall through which the drainage sput extends and the blade elements often have extremely small clearance from such walls serving, in some instances, as wall scrapers to keep the wall as free as possible of scale or sludge which always interferes with heat-exchange.

To insure against inadvertent interference with, or injury of, such rotated blades, means are provided for normally positively limiting the projection of the end of the plunger 7 to a position, for example, flush with the inner face of the sput 1, as indicated by dotted lines in Fig. 2. In the device illustrated, this means consists of a collar 50 snugly disposed around the bonnet 12 and locked thereon by a set screw 51. One of the arms (37) of the nut 35 (see Figs. 5 and 6) is provided with a bore within which a spring-urged bolt 38 extends radially-outwardly a distance sufficient to abut the outboard face of the

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collar 50 and thus limit projected travel of the nut 35, with its assembled plunger 7, upon the stem 29 to the dotted-line position indicated in Fig. 2.

To effect clearing of the sput 1 of deposits which may interfere with free drainage through the device in its Fig. 1 or "open" position, plunger projection to the full-line position shown in Fig. 2 is undertaken as a preliminary operation. In the case of the bolt-equipped device just set forth as a preferred form for the embodiment of my invention, projection of the plunger 7 to the full-line position shown in Fig. 2 is effected simply by appropriately rotating the handwheel 47 while manually depressing the bolt 38 against its spring 39 so that the nose of the bolt may pass within the confines of the collar 50. Once having passed the collar 50, the bolt-equipped nut, and its assembled plunger, are unimpeded by the collar 50 and are free to move until the stem collar 48 is engaged by the nut 35. It will be noted that the bolt 38 is provided with a slot 38a there-through and a pin 38b which passes through this slot and insures retention of the bolt in the nut arm 37. Moreover, it will be self-evident that, by reason of the inclined nose of the plunger 33, the need for its depression to enable retraction of the plunger by handwheel operation is obviated, the plunger being automatically cammed radially inwardly against the resistance of its spring 39 upon engagement with the inboard face of the collar 50.

The detail view, Fig. 7, shows the structure of the joint between the bonnet 12 and the casing 5 of the device, as well as the screws 25a by which the annular gland provided for engagement with the sealing ring 15 is assembled with the bonnet 12.

It is to be noted that the device of Figs. 1 and 2 is applicable to sputs of various lengths, and therefore to tanks of a considerable range of wall thickness. The projection allowed the plunger 7, when unlimited by the stop-bolt 38, is adequate to extend through a sput of even greater length than shown and still suffice to dislodge or pierce a sediment or sludge formation of considerable thickness. In order to insure the operation of the bolt 38 so that the plunger will, in the absence of bolt depression, lie flush with the inner tank wall surface, the collar 50 may be secured to the bonnet 12 at the desired position along its length by the set screw 51. Under some conditions of use, atmospheric moisture may tend to collect within the plunger 7. To insure against interference with plunger movement due to such moisture a vent 52 is provided in the plunger.

The device illustrated in Figs. 3 and 4 is, in its functional aspects, identical to that shown in Figs. 1 and 2. For an understanding of its fundamental mode of operation, accordingly, reference may be had to the description given of the Fig. 1 device. In Fig. 3, however, the drain device is so formed as to be directly attached to the tank, as by welding. In a sense, the casing 105 thereof may be said to carry its own sput portion 101 which is permanently, or otherwise, secured to the tank wall. Such a structure is especially suited for installation upon single walled tanks, although neither the Fig. 1 nor the Fig. 3 device is necessarily limited to use with any particular form of tank.

The bonnet 112 of the device illustrated in Figs. 3 and 4 is, as shown in Fig. 8, of bifurcate form, the base flange being constituted by two feet 121

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which are spaced from each other. The bonnet feet 121 are fastened down tight upon the casing 105 by the studs 22 and do not serve the packing-compressing function of the bonnet flange 21 in the Fig. 1 device. The packing gland 125 of the Fig. 3 device is flanged to overlie the bonnet-adjacent end of the casing 105 and is urged to bear upon the packing 15 (and indirectly upon the packing 9) by means of its own adjusting studs 125a. This independent gland-tightening arrangement is of especial advantage over the design depicted in Figs. 1, 2 and 7 in installations where the bonnet is of considerable length and lateral pull upon the handwheel 47 may be of such magnitude as to tend to throw the bonnet out of alinement with the casing of the bonnet if the bonnet mounting be even slightly yieldable in character.

I am aware that my invention is capable of embodiment in many forms and of materials other than those herein specified or conventionally employed in valve manufacture. I therefore claim my invention broadly, as indicated by the appended claims.

Having described the preferred embodiment of my invention, what I claim is:

1. In a drainage device, a container, a valve casing adapted to be attached to said container, a tubular guideway within said casing, a plunger longitudinally movable within said guideway, a stem mounted for rotation within said guideway and held against longitudinal movement, means for rotating said stem, a screw-threaded engagement between said stem and said plunger whereby said plunger may be reciprocated, a detent on said plunger, an abutment on said valve casing adapted to coact with said detent to position said plunger flush with the inner surface of said container and means whereby said detent may be released from coaction with said abutment to permit projection of said plunger beyond the inner surface of said container.

2. A valve organization comprising: a casing having an end portion adapted to be secured in a wall of a tank so as to form a portion of the tank wall, there being a conduit within the casing communicating with the tank and an outlet from the conduit, a plunger forming an imperforate septum for the conduit, means for reciprocating said plunger either to open said outlet, close said outlet, position the plunger flush with the casing end portion or project the plunger beyond the casing end portion, a detent on said plunger, an abutment on said casing adapted to coact with said detent to position said plunger flush with the casing end portion, and means whereby the detent may be released from coaction with the abutment to permit projection of the plunger beyond the casing end portion.

3. A valve organization comprising: a casing having an end portion adapted to be secured in a wall of a tank so as to form a portion of the tank wall, there being a conduit within the casing communicating with the tank and an outlet from the conduit, a plunger forming an imperforate septum for the conduit, means for reciprocating said plunger either to open said outlet, close said outlet, position the plunger flush with the casing end portion or project the plunger beyond the casing end portion, one of said parts having a detent adapted to coact with a portion of the other part so as to position the plunger flush with the casing end portion, and means for displacing the detent to inoperative position whereby the

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plunger may be projected beyond the casing end portion.

4. A valve organization comprising: a casing having an end portion adapted to be secured in a wall of a tank so as to form a portion of the tank wall, there being a conduit within the casing communicating with the tank and an outlet from the conduit, a plunger forming an imperforate septum for the conduit, means for reciprocating said plunger either to open said outlet, close said outlet, position the plunger flush with the casing end portion or project the plunger beyond the casing end portion, and a member moved forward with the plunger and so coacting with a portion of the casing as to normally limit movement of the plunger to a position flush with the casing end portion, said member being readily shiftable to inoperative position whereby the plunger may

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be projected beyond the casing end portion when desired.

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