No. 749,282. PATENTED JAN. 12, 1904.

P. ENGLUND.

RESERVOIR FOR STORING PETROLEUM.

APPLICATION FILED JULY 28, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

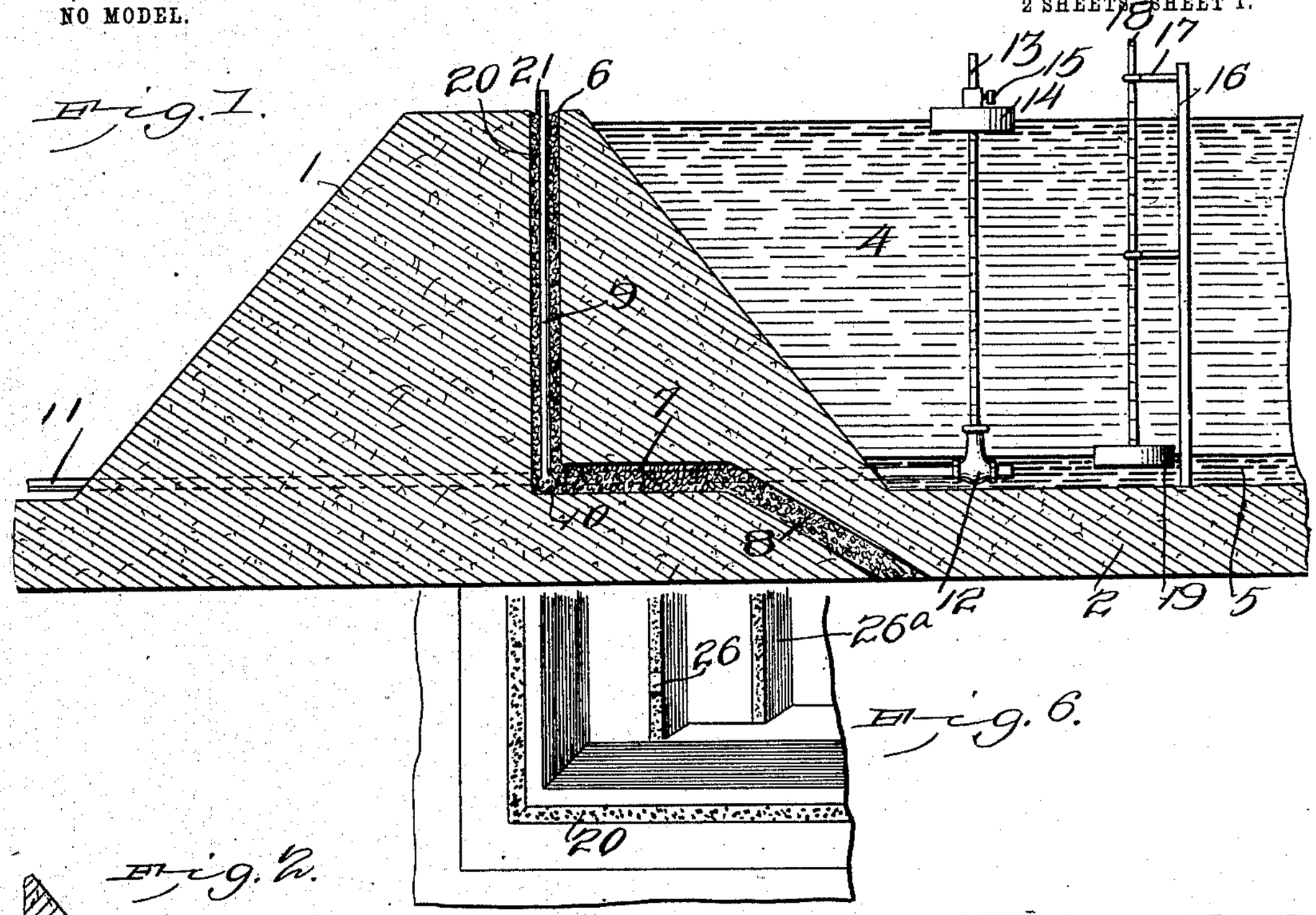



Fig. 6.




Fig. 2.

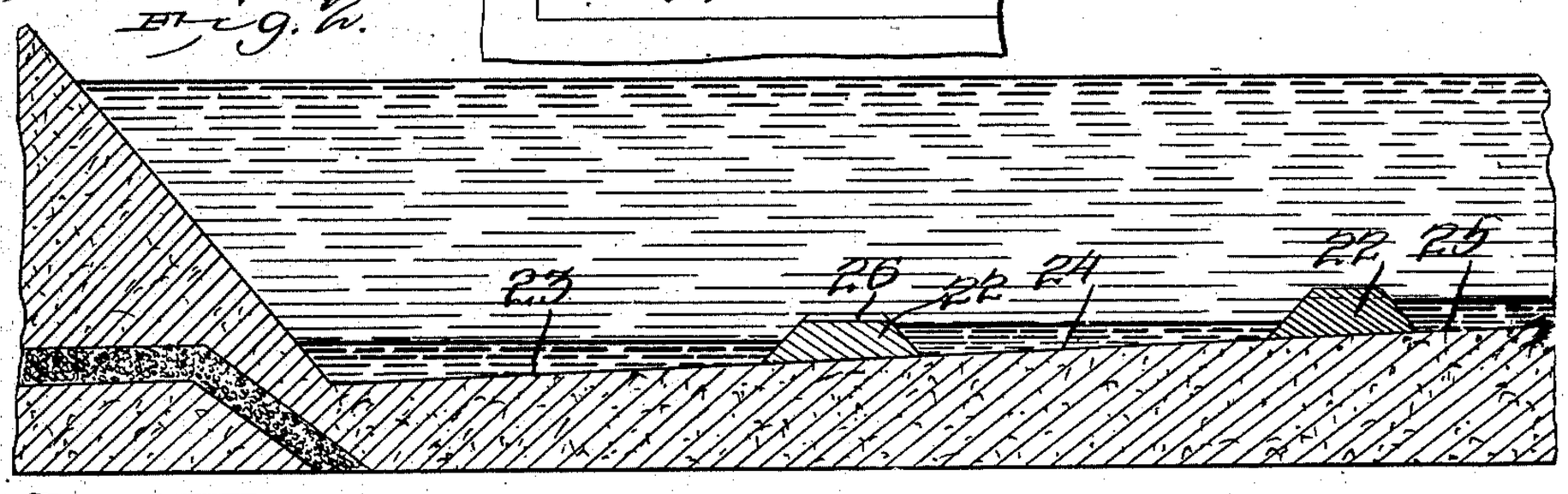
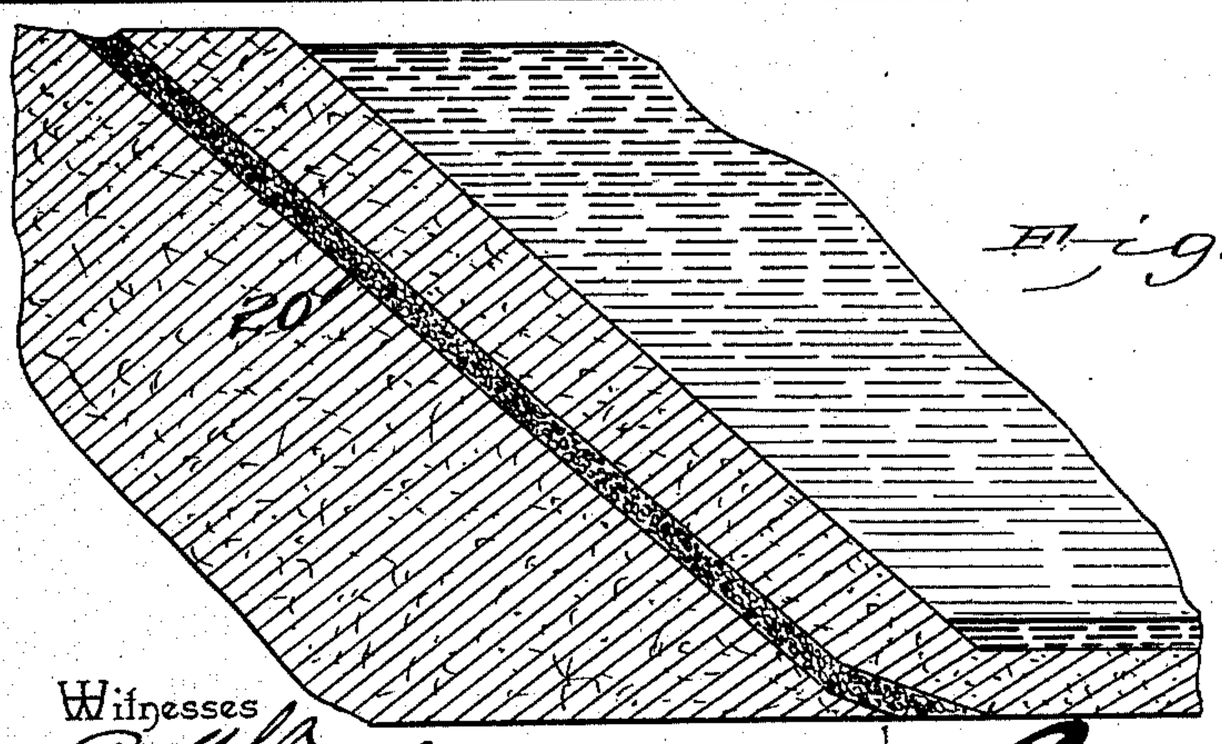



Fig. 5.

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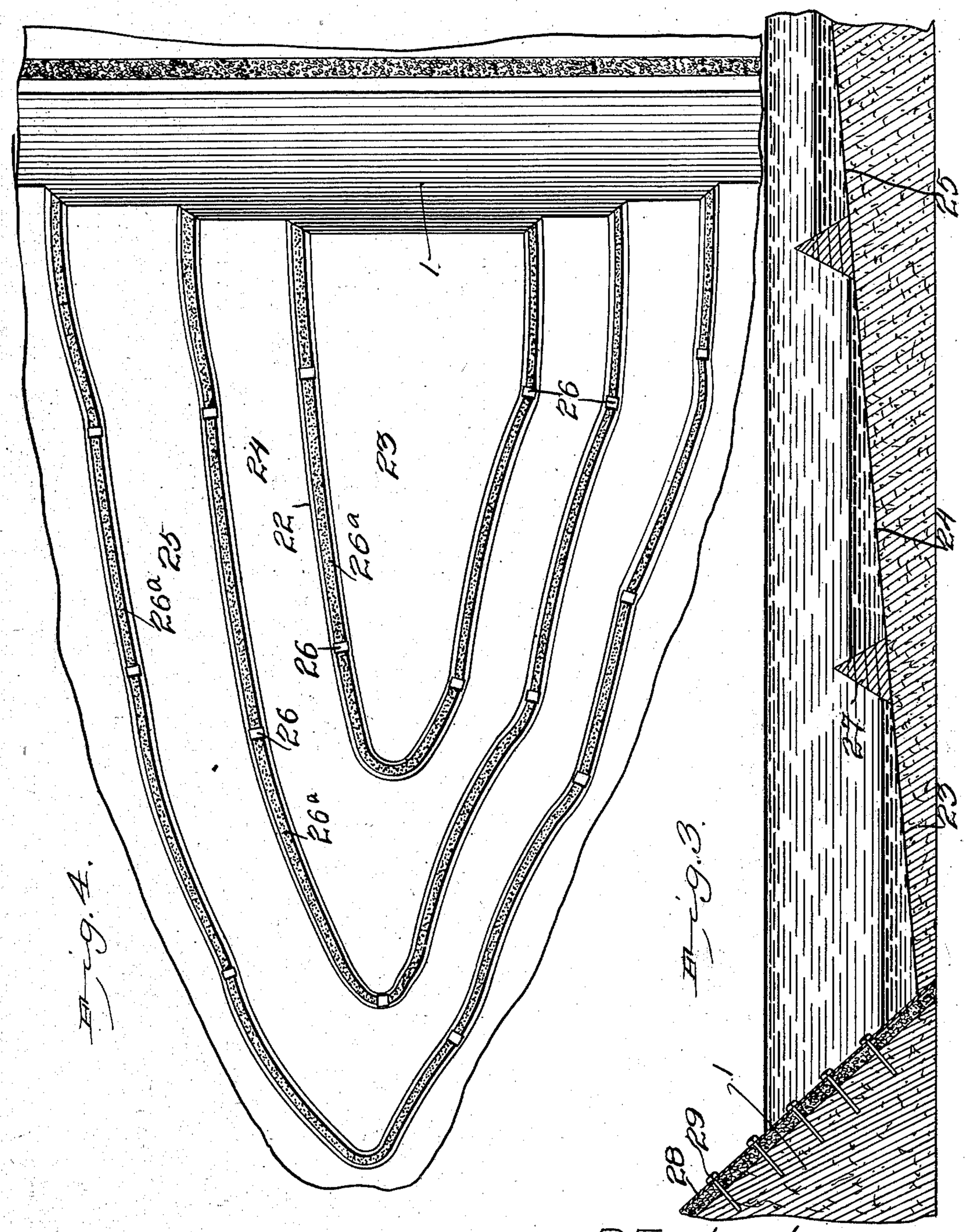


Fig. 4.




Fig. 3.

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No. 749,282. Patented January 12, 1904.

# UNITED STATES PATENT OFFICE.

PHILLIP ENGLUND, OF CHICO, CALIFORNIA.

## RESERVOIR FOR STORING PETROLEUM.

SPECIFICATION forming part of Letters Patent No. 749,282, dated January 12, 1904.

Application filed July 28, 1902. Serial No. 117,360. (No model.)

*To all whom it may concern:*

Be it known that I, PHILLIP ENGLUND, a citizen of the United States, residing at Chico, in the county of Butte and State of California, have invented a new and useful Reservoir for Storing Petroleum, of which the following is a specification.

This invention relates to reservoirs for storing petroleum.

The object of the invention is in a ready, simple, thoroughly feasible, and practical manner to store petroleum in an earthen reservoir in such manner as positively to preclude loss by seepage or absorption of the oil through or by the surrounding material.

With these and other objects in view, as will appear as the nature of the invention is better understood, the same consists in the novel construction and combination of parts of a reservoir for storing petroleum, as will be hereinafter fully described and claimed.

In the accompanying drawings, forming a part of this specification, and in which like numerals of reference indicate corresponding parts, there are illustrated four forms of embodiment of the invention, each capable of carrying the same into practical operation, it being understood that the elements therein exhibited may be varied or changed as to shape, proportion, and exact manner of assemblage without departing from the spirit thereof.

In the drawings, Figure 1 is a view in sectional elevation of an oil-reservoir constructed in accordance with the present invention. Fig. 2 is a similar view of another form. Fig. 3 is a similar view of still another form. Fig. 4 is a view in plan of a reservoir constructed in accordance with the arrangement shown in Fig. 2, certain of the parts being omitted. Fig. 5 is a view in sectional elevation of still another form of reservoir. Fig. 6 is a view in plan, showing certain parts omitted in Fig. 4.

The law govering the flow of liquids, on which is based the operation of the present invention, is that oil or other fluids of the same or less specific gravity than water cannot leak from a receptacle no matter how porous may be the substance of which it is composed if the said receptacle be immersed in water up to the level of the oil or other lighter fluid contained in the receptacle. The liquid under such conditions—say oil—instead of leaking out through the walls of the receptacle will be kept inside by the water surrounding it, and the water will leak into the receptacle.

Referring to the drawings, and to Fig. 1 thereof, there is illustrated the lower end of the dam of the reservoir constructed in accordance with the present invention. The dam 1, which is exhibited diagrammatically as an ordinary earthen structure, is for purposes of strength truncated pyramidal in cross-section and is provided with an approximately level bottom 2. The oil-reservoir, formed by the dam-wall, may be of any preferred configuration in plan, rectangular or otherwise, contains a body of oil 4 and a subjacent stratum 5 of water that presents a seal to prevent the oil from seeping through or being absorbed by the bottom of the reservoir.

The water seal for the sides and ends of the reservoir is formed by constructing a vertical trench 6 in the dam-walls, the lower end of which terminates at a point slightly above the top of the water seal, thence extends laterally at 7 in an approximately horizontal plane, and thence inclines downward at 8 and terminates a short distance beneath the bottom water seal, and this trench or chamber is filled with gravel or other material, which will not pack so closely as to present an obstacle to the free circulation of water throughout the entire section formed by the gravel. Within the vertical member of the section is disposed a pipe 9, having a strainer 10 at its lower end extending downward into the member 7 of the gravel-section and to a point approximately on line with the bottom of the reservoir, and projecting through the dam and into the reservoir at the bottom seal thereof is a drainage-pipe 11, that portion of the pipe disposed within the bottom seal being provided with a valve 12, to the stem of which is connected the lower end of a graded bar 13, the upper end of which carries a float 14, adjustable thereon. The valve may be of any preferred construction, preferably a gate-valve, and the float is held associated with the bar by a set-screw 15, thus to permit adjustment as requisite.

Located at any preferred point within the reservoir is a post or upright 16, carrying guides 17, in which works a graded bar 18, carrying at its lower end a float 19, which is of less specific gravity than water and of greater specific gravity than oil, so that it will sink to the bottom of the oil and float on the surface of the water or be suspended between the water and the oil.

Water from any suitable source being supplied to the gravel-section 20 gradually percolates to the bottom of the reservoir and mingles with the bottom seal, and thus causes the oil gradually to rise. To prevent overflow of the oil, the float 14 is provided, which when the oil passes a predetermined level is lifted, thereby opening the valve of the drain-pipe 10 and allowing the surplus water to escape until the oil has reached the proper level, whereupon the valve will automatically close, and thus preclude further escape of water at the time. In practice the upper end of the section 20 is guttered to facilitate distribution of the water.

In use the reservoir will not always be filled with oil, and the lowering of the level of the oil below a certain point will cause the float 14 to become inoperative for maintaining the water at the desired level, and without the provision of means for obviating this it would be necessary to adjust the float to each new level of the oil. To prevent this and to enable the operator at a glance to determine the level of the water in the bottom seal, the bar 18 and float 19 are provided, and it will be seen that by noting the level of the oil on the bar 18 the depth of water in the bottom seal can be determined, and if insufficient to bring the oil into operative relation with the float 14 water may be supplied to the section 20 until the desired level is attained. The post 16 and guides 17 are designed to keep the float 19 steady and in place, at the same time permitting perfect freedom of movement, the top guide serving as an indicator of the rise and fall of the water-level. If the water in the section 20 were allowed to sink out of sight, there would be no means of ascertaining at what level it stood at the bottom seal, and it might sink below the level of the oil, and thus cause leakage. To obviate this and to enable the operator at all times to ascertain the level of the water when it is maintained at a lower level than the visible level of the gutter 21, the pipe 9 is provided, in which the water will rise to a level corresponding to that on its exterior in the section 20, thus providing a ready means for plumbing the depth of the water in said section, the strainer at the bottom of the pipe operating to prevent it from becoming clogged and thus inoperative.

In Fig. 5 the section 20 instead of being disposed vertically for a portion of its length, as in Fig. 1, is on an incline approximating that of the incline of the inner face of the dam-wall; but in operation it performs the same function as that above described. In the structure shown in Fig. 5 the floats and their adjunctive mechanism, as well as the pipe 9, are omitted; but it is to be understood that the same parts are employed in connection with this latter structure, and as this will be readily understood detailed illustration is omitted.

The bottoms of the oil-reservoirs of the above-described types would not be level, but would be more or less concave, sloping from the foot of the dam upward to the upper end of the reservoir, and upward from the center to either side. If, with this arrangement, it be attempted to cover the entire bottom of such reservoir with water, it would have the effect of nearly filling it, it being necessary that the water be very deep at the foot of the dam in order to have it cover the upper end thereof, and this would materially lessen the capacity of the reservoir. To remedy this, it is proposed to terrace the sloping bottom of the reservoir and to maintain the subjacent stratum of water at different levels up to the edges of the reservoir. In Fig. 4 there is exhibited the lower portion of a reservoir, showing the terraced bottom, and in this figure only the lower end of the dam is shown, as in Fig. 1. The bottom is provided with low earthen ridges 22, of which there may be any desired number, a series of three of which is shown in Fig. 4 and as arranged substantially concentric with each other and as being built out from the lower wall 1, thus dividing the bottom of the reservoir into three terraces 23, 24, and 25. To maintain the level of water back of each ridge 22 on a plane slightly below its top, the ridges are cut at intervals by wooden water-gates 26, Figs. 3 and 6, which allow the water to run over into the next adjacent terrace before it could overflow the ridges elsewhere and thus damage them. By the employment of these ridges and water-gates the entire bottom of the reservoir can be covered by water with a loss of but a small part of its available capacity. As shown in Fig. 2, the ridges 22 are composed of earth; but, if preferred and as shown in Figs. 4 and 6, the apex of the ridges may be trenched and filled with gravel, as at $26^a$, thus to impart added strength thereto. Under either arrangement the water from the section 20 will easily percolate into the bottom of the water seal.

In the form of embodiment of the invention shown in Fig. 3 the ridges 27 are constructed of boards, and the dam-wall is faced with boards 28, held in place by posts 29, and back of the board-facing the gravel-section will be packed. If desired, it is to be understood that the gravel-backed board-facing may be employed in connection with the structure shown in Fig. 1, and as this will be readily understood detailed illustration is omitted.

It is to be understood that the invention is not to be limited to the exact forms of reservoirs herein shown, as many of the features will have to be modified or changed according to the location of the reservoir and the materials available. Also the invention is not to be limited to the storing of petroleum alone, as other liquids besides oil can be conserved, and other liquids besides water may be employed for presenting a seal. The underlying features, however, are generic to each of the forms shown and will be thoroughly effective for the purpose designed.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A structure of the character specified, comprising a reservoir having bottom and lateral liquid seals, and means for maintaining the liquid in the bottom seal at a predetermined level.

2. A structure of the character specified, having bottom and lateral liquid seals, and means operating automatically to lower the level of the bottom seal when the same rises above a predetermined level.

3. A structure of the character specified, having a bottom liquid seal maintained at different levels.

4. A structure of the character specified, having a bottom liquid seal maintained at different levels, and means for permitting the liquid to pass from one level to another.

5. A structure of the character specified, having a bottom liquid seal, a waste-pipe in communication therewith and provided with a valve, a float, and means for connecting the float and the valve.

6. A structure of the character specified, having a bottom liquid seal, a float of less specific gravity than the seal and resting thereon, and indicating means connected with the float and projecting above the superposed liquid on the seal.

7. A structure of the character specified, having a bottom liquid seal, a float of less specific gravity than the seal and resting thereon, and a graded bar connecting with the float and projecting above the superposed liquid on the seal.

8. A structure of the character specified, having a bottom and lateral liquid seals, and means associated with the lateral seal to determine the depth of the liquid contained therein when it shall have dropped below the upper face of the seal-containing section.

9. A structure of the character specified, having its dam-walls provided with a section pervious, without packing, to the passage of water.

10. A structure of the character specified, having its dam-walls provided with a section pervious, without packing, to the passage of water, and means within the section for determining the depth of the water therein.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

PHILLIP ENGLUND.

Witnesses:
J. W. ROPER,
J. W. SAWYERS.