(No Model.) 2 Sheets—Sheet 1.

A. A. KNUDSON.

Lightning Guards for Oil Tanks.

No. 234,484. Patented Nov. 16, 1880.

Fig. 1.

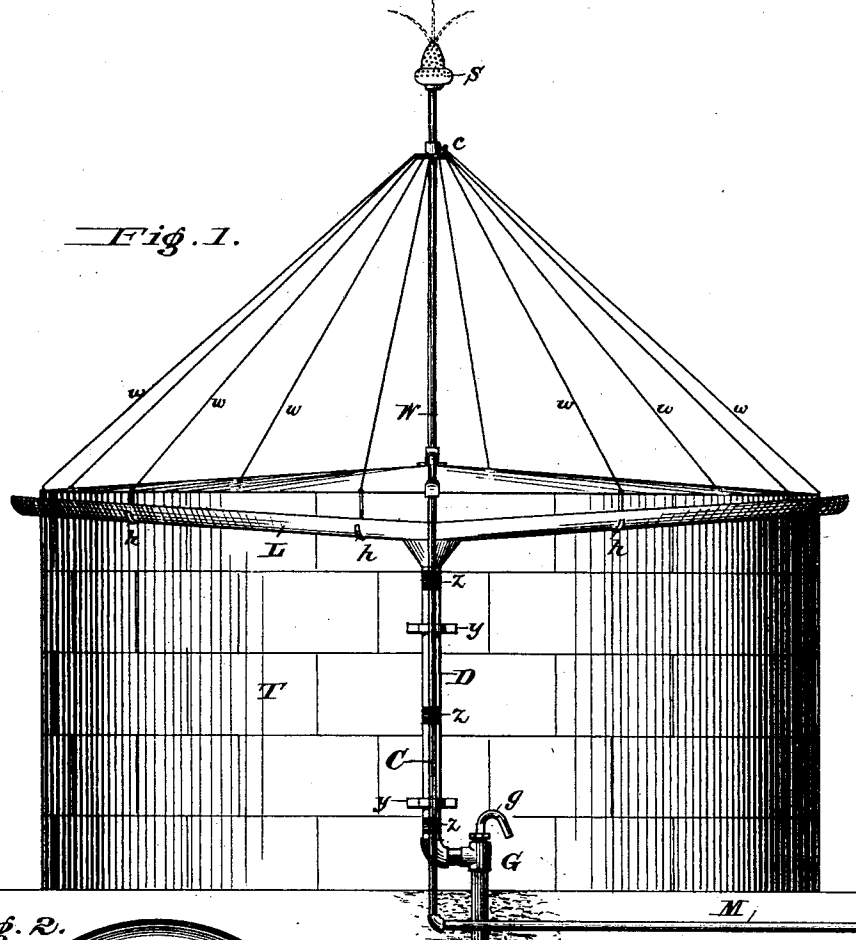


Fig. 2.

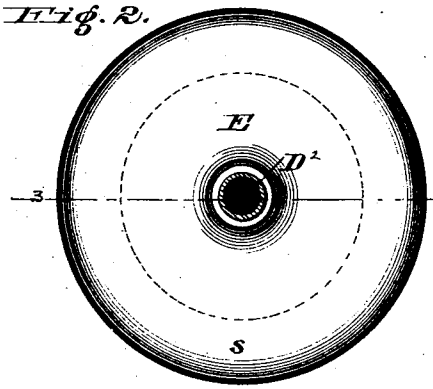


Fig. 3.

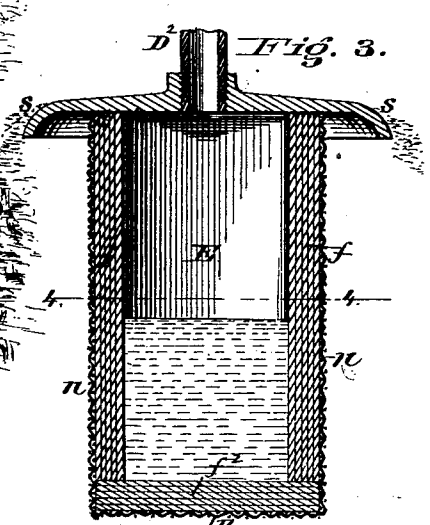
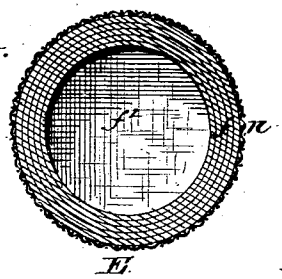


Fig. 4.



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(No Model.) 2 Sheets—Sheet 2.

A. A. KNUDSON.

Lightning Guards for Oil Tanks.

No. 234,484. **Patented Nov. 16, 1880.**

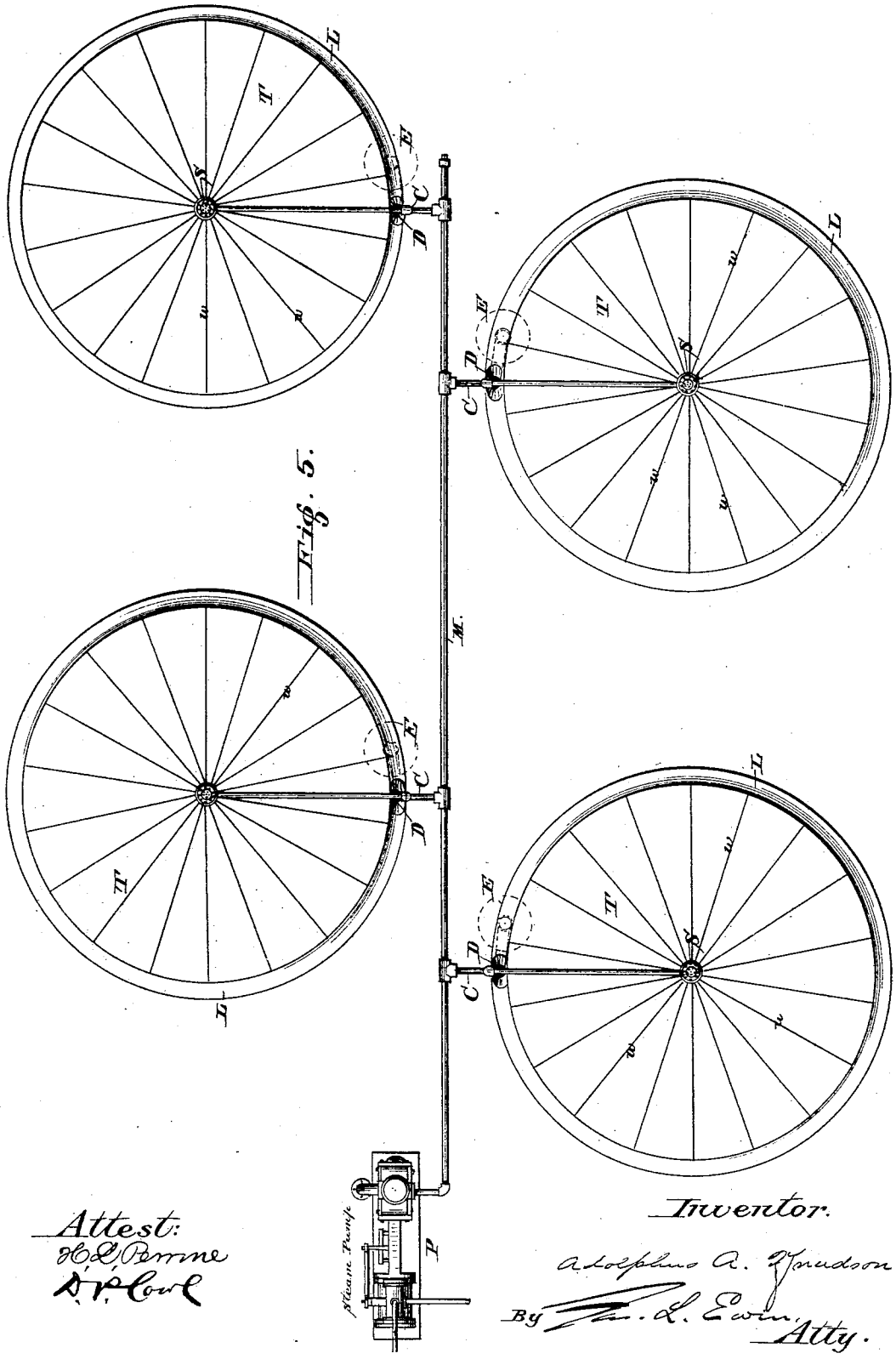


Fig. 5.

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UNITED STATES PATENT OFFICE.

ADOLPHUS A. KNUDSON, OF BROOKLYN, NEW YORK.

LIGHTNING-GUARD FOR OIL-TANKS.

SPECIFICATION forming part of Letters Patent No. 234,484, dated November 16, 1880.

Application filed August 31, 1880. (No model,)

To all whom it may concern:

Be it known that I, ADOLPHUS A. KNUDSON, a citizen of the United States, residing at Brooklyn, in the county of Kings, New York, have invented a new and useful Improvement in Lightning-Guards for Oil-Tanks, of which the following is a specification.

This invention relates, as an improvement, to means or appliances in general for protecting storage-tanks at oil-wells and oil-distilleries or buildings of any kind against strokes of lightning. These tanks, it has been found, are peculiarly liable to be struck by lightning, owing to the light gases which rise from the oil under the heat of the sun's rays. Such gases, escaping and ascending to a height more or less great, form an electrical conductor materially better than the surrounding atmosphere, and thus constitute a line of least resistance leading directly to the tank from the paths of the storm-clouds.

Heretofore it has been proposed to surround a tank with metallic conductors extending vertically to a height where said gases are supposed to be so diluted as to form inferior conductors, and to unite said vertical metallic conductors by a net-work of wires to intercept any intermediate downward discharges of electricity. It has also been proposed to carry off said gases by means of a tubular lightning-conductor insulated from the oil-tank.

The object of the first part of my invention is to suppress or condense said gases and to prevent or lessen their generation to as great an extent as may be possible; and to this end it consists in providing an oil-tank or oil-tanks with vertical water-pipes extending upward above the tops of the tanks a sufficient distance, and having spray-nozzles at their upper extremities, said pipes being supplied with water under pressure from a force-pump, so as to saturate the air and gases above the tanks with moisture, causing the gases to sink, and at the same time to cool the tank, so as to arrest the generation of such gases, the same means serving to fill the earth-terminals with water.

The object of the second part of my invention is to utilize said spray-nozzles and water-pipes as lightning-conductors. To this end, adopting one nozzle per tank as sufficient, I employ therewith a central vertical pipe and connect the same, by a metallic collar and radial wires, with a metallic gutter or leader surrounding the tank and connected thereto. Said leader I cause to conduct the water which flows from the top of the tank into a metallic pipe, which extends down to and is connected with a hollow earth-terminal, and the water-pipe leading to said vertical pipe I also attach to said descending pipe, so that the whole is electrically connected with the earth.

The object of the third part of my invention is, first, to equalize and prolong the saturation of the earth with water at and below the earth-terminal, and at the same time expose a large amount of metallic surface to the earth; second, to provide for sounding the earth-terminals periodically and to prevent damage by frost; and, third, to guard the earth at said terminals against saturation with oil, so as to insure the efficiency of the earth-terminals. To this end I construct each earth-terminal with a hollow body of wire-netting lined with bagging or coarse felt, through which the water which enters the terminal from time to time filters out slowly, and keeps the earth moist around and below it for a relatively long time.

The descending pipe is provided with an elbow having a smaller neck, which admits a sounding-rod into the body of the terminal for ascertaining the depth of water therein, and also affords an overflow, which operates to keep the water below the frost-line. Said descending pipe is connected to said body by a metallic shield, which projects laterally beyond the walls of said body on all sides, so as to deflect away from the wire-netting any oil which may flow downward around said descending pipe. This part of my invention is not confined to oil-tanks, but is applicable wherever a lightning-conductor is desired.

In the accompanying drawings, which form a part of this specification, Figure 1 is an elevation of an oil-tank provided with a lightning-guard according to my invention, the earth-terminal being exposed in the foreground. Fig. 2 is a top view of the earth-terminal on a larger scale. Fig. 3 is a vertical longitudinal section of the same, illustrating its operation. Fig. 4 is a horizontal section of the same. Fig. 5 is a top view of a group of tanks on a smaller scale, illustrating their connection with the force-pump and the proposed arrangements of parts.

Like letters of reference indicate corresponding parts in the several figures.

T represents an ordinary oil-tank of any construction; S, a large spray-nozzle of copper or brass; and W, an iron water-pipe of, say, one inch diameter, and about twenty feet long, provided with said nozzle and erected at the center of the top of the tank, said pipe being also provided with a metallic collar, *c*, near its upper end.

L represents a gutter or leader of sheet metal surrounding said tank at the top of its walls and connected therewith by metallic hangers *h*, from which metallic wires or ropes *w*, preferably of galvanized iron, extend to the collar *c*.

D represents a descending pipe of the same metal as the leader L, preferably galvanized iron, about four inches in diameter and one-half inch thick, extending downward from said leader to a point eight or ten feet below the surface of the ground.

G represents an elbow forming a part of the pipe D, and provided with a bent piece of smaller pipe, forming an escape-neck, *g*, which allows the water from the pipe D to overflow when the earth-terminal is filled, so as to prevent bursting by frost, and through which a rod may be inserted for ascertaining the depth of water in the earth-terminal.

E represents a hollow earth-terminal, about four feet long and one and one-half foot in diameter, attached to the bottom of the said pipe D.

P, Fig. 5, represents a steam-pump; M, a main leading therefrom; and C a connecting-pipe laid from said main to the pipe W, and attached to the descending pipe D by lashings *z*, of copper wire or equivalent connections. All the joints between the parts above named down to the earth-terminal should be carefully made so as to be good conductors of electricity, and said earth-terminal should be laid in porous earth, the pit being refilled and tightly rammed.

The construction of the earth-terminal E is illustrated by Figs. 2, 4.

n represents galvanized-iron wire-netting; ff^2, felt or bagging in several layers, forming linings for the walls and bottom, and *s* a galvanized-iron casting, termed the "shield," which is constructed with a collar on its upper surface to receive the lower end of the descending pipe D, and has the netting *n* securely attached to its under side, its margin being beyond the walls on all sides, for the object hereinbefore stated. Good and ample contacts will be made between D and *s*, and between *s* and *n*, to avoid material resistance at these points.

The pipe D may be provided with a collar fitting over that of the casting *s*, if this form of attachment be preferred.

The presence of natural moisture being unessential in this system, the earth-terminal pit can usually be sunk close to the wall of the tank and enlarged beneath it slightly, so as to locate the earth-terminal in line with the descending pipe D, with the latter laid against the side of the tank, as indicated in Fig. 1, and by dotted circles in Fig. 5. Where this is not practicable, owing to previous saturation of the ground with oil or the presence of rocks, the terminal can be located as far away as may be necessary, and the descending pipe extended thereto.

A steam-pump available for the purposes of this invention will usually be found adjacent to the oil-tanks, as illustrated by Fig. 5. The tanks may be one or more in number. When no pump is available the tank may be fitted up in precisely the same way as regards the parts attached thereto; or a plain rod may be substituted for the pipe W, and an ordinary-air terminal for the nozzle S, as indicated by dotted lines in Fig. 1. The rain-fall will, in this case, supply the earth-terminal with water through the leader L and descending pipe D.

The particular metals herein named are simply preferred, and are not considered absolutely essential, and parts described simply as metallic may be made of any preferred metals.

The following is claimed as new and of my invention, namely:

1. As improved means for protecting oil-tanks from lightning, the combination, substantially as herein described, of a spray-nozzle supported at a sufficient height above the tank by a vertical pipe, and a force-pump supplying water to said pipe under pressure for suppressing or condensing the gases which arise from said tanks and preventing or lessening the generation of said gases, in the manner set forth.

2. The combination, substantially as herein described, of the spray-nozzle S, water-pipe W, leader L, descending pipe D, connecting-pipe C, and a porous hollow earth-terminal connected with each other, and with an oil-tank, T, substantially as herein described, as an improved lightning-conductor system for such tanks.

3. An earth-terminal for lightning-conductors having a hollow body of wire-netting and provided with linings of felt, or its equivalent, substantially as herein described, for equalizing and prolonging the supply of moisture to the surrounding earth, in the manner set forth.

4. The elbow G, in combination with the earth-terminal E, whereby the earth-terminal E may be sounded, &c., as herein specified.

5. A porous hollow earth-terminal having a shield projecting beyond the porous walls on all sides to deflect oil away therefrom, as herein specified.

ADOLPHUS A. KNUDSON.

Witnesses:

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JOHN BUCKLEY.