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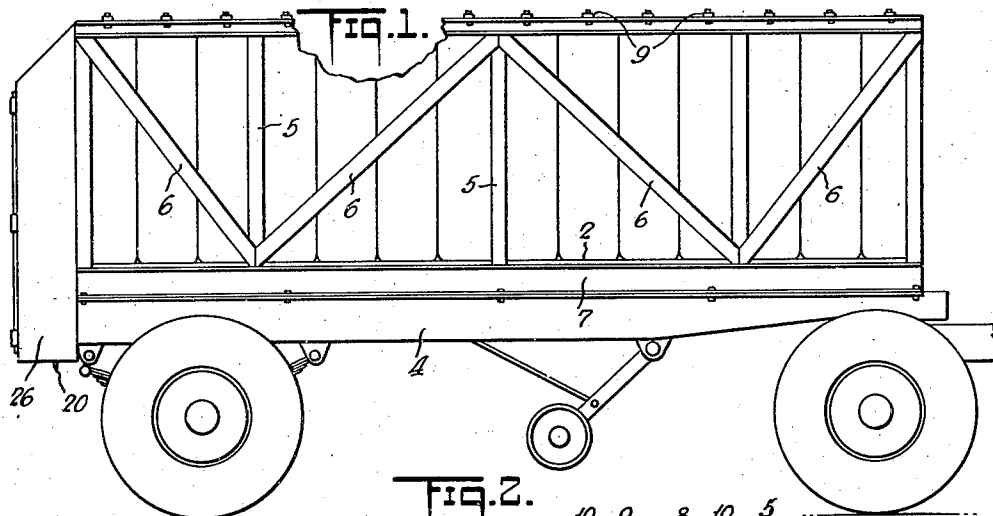
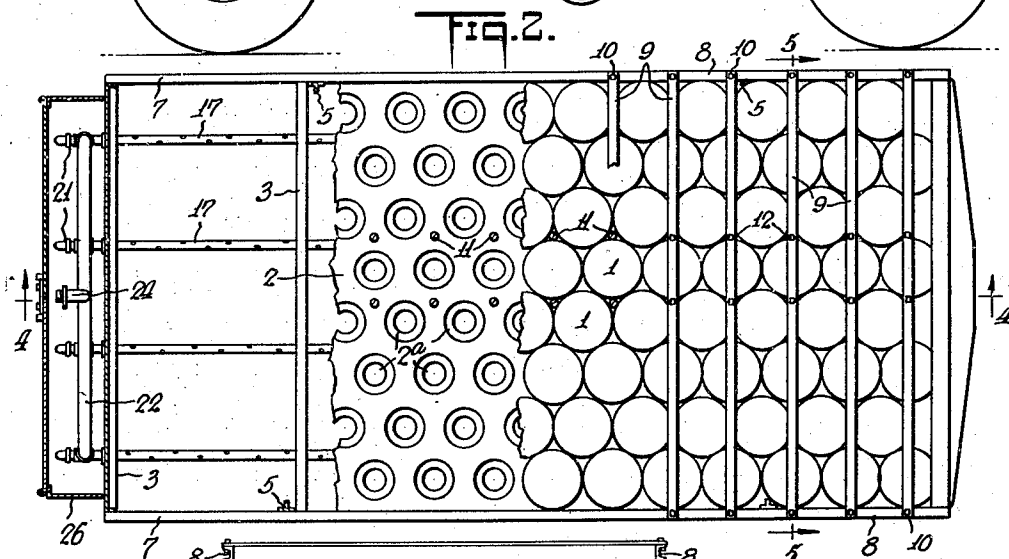
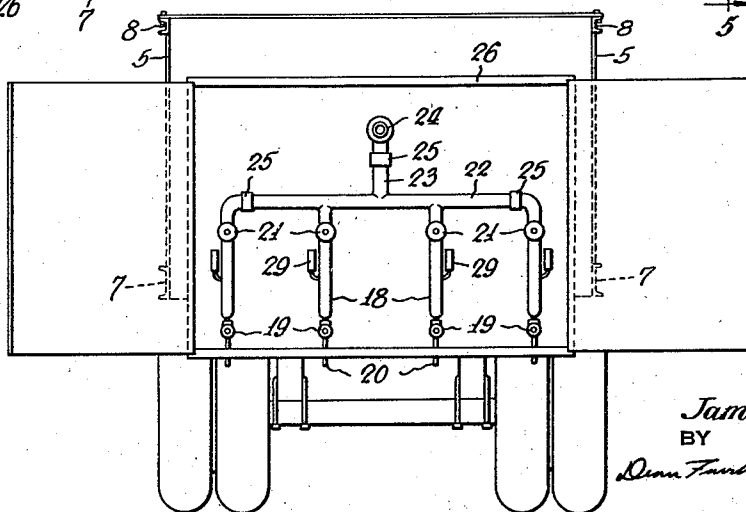
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2,102,686

APPARATUS FOR THE TRANSPORTATION OF COMPRESSED OR LIQUEFIED GASES

Filed Jan. 6, 1936

2 Sheets-Sheet 1



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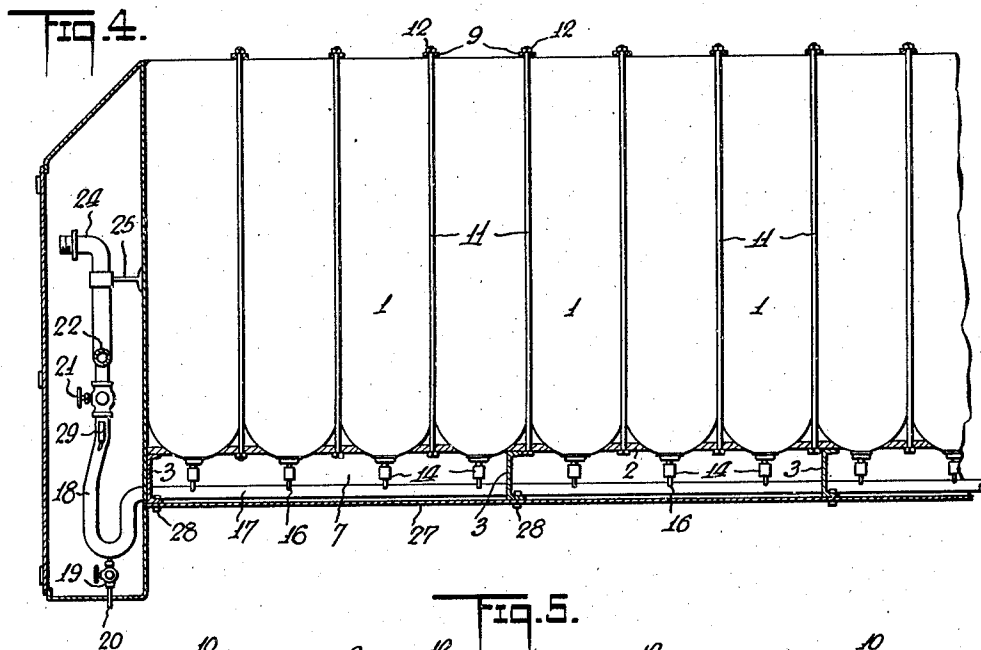
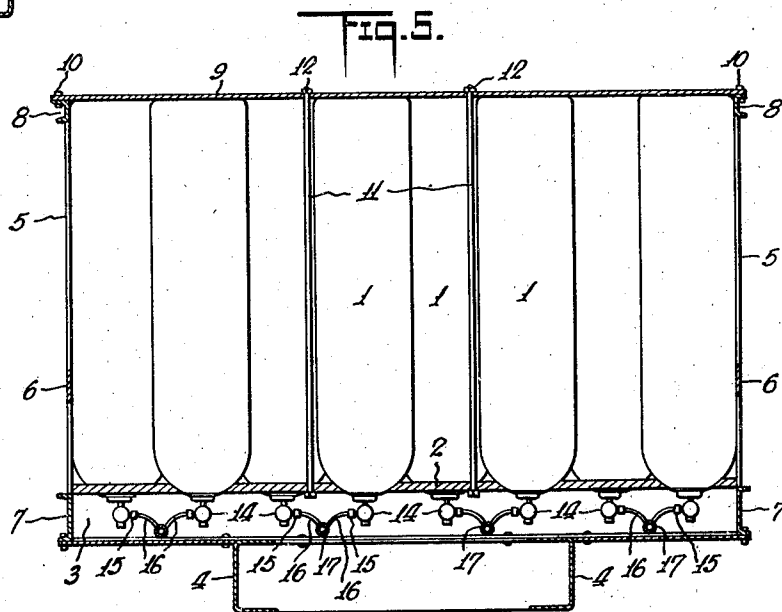
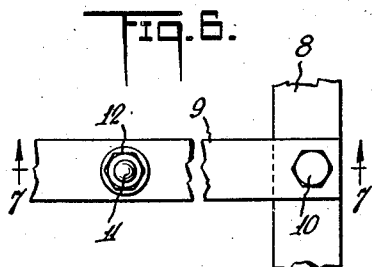
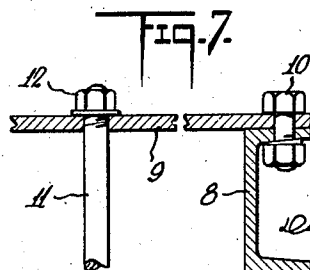
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APPARATUS FOR THE TRANSPORTATION OF COMPRESSED OR LIQUEFIED GASES

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,102,686

APPARATUS FOR THE TRANSPORTATION
OF COMPRESSED OR LIQUEFIED GASESJames W. Dunham, Evanston, Ill., assignor to
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Application January 6, 1936, Serial No. 57,803

2 Claims. (Cl. 221—73.5)

This invention relates to apparatus for the transportation of a compressed or liquefied gas by means of a battery of suitable containers mounted upon a vehicle.

5 In transporting gases by vehicle the ordinary practice has been to use portable steel cylinders which are loaded on the vehicle at the point of manufacture and unloaded at the point of use. This frequent loading and unloading of cylinders entails much labor as well as excessive wear and deterioration of the cylinders and valves. To ob-
10 viate the necessity of this handling, it has been proposed to provide the vehicle with a group of cylinders connected by one or more manifolds. One proposal was to use standard cylinders such as those used for compressed oxygen, and to hold them in vertical position on the vehicle, with the valves at the top and interconnected. Another suggestion was to use either standard or special
15 cylinders mounted in a horizontal position with the openings at the ends connected by one or more manifolds. Neither of these suggestions have proved to be entirely satisfactory as any moisture introduced into the cylinder with the gas and not carried off in the discharge of the gas either by absorption or entrainment, will accum-
20 ulate at the lowest point of each cylinder. After a large number of filling and discharging operations, this accumulated liquid reaches very objectionable proportions.

30 In the case of the standard portable cylinders which are moved on and off the vehicle, this accumulation of water or other liquid is not serious inasmuch as the cylinder can be inverted and the moisture drained at any time it becomes necessary. Furthermore, when cylinders are loaded on and off the vehicle they generally become mixed with all other cylinders in the gas filling plant and therefore they will be filled only as often as the average of all cylinders in the plant. Where
35 these cylinders are used in the general trade, each cylinder may remain at the filling or discharging stations for considerable periods of time, and there may be not more than twelve fillings per year. Therefore, the rate of accumulation of moisture in the cylinder, even if it is not dumped periodically, is comparatively slow. On the other hand, where cylinders are manifolded on a ve-
40 hicle it is common practice to fill the cylinders at least once per day. Therefore, the accumulation of moisture in the cylinder will take place much more rapidly than in the case of the port-
45 able cylinder.

55 One object of this invention is to provide a means for the transportation of compressed or

liquefied gas in containers manifolded into bat-
teries and arranged in such a manner as to pre-
vent the accumulation of moisture upon repeated
refilling of the battery. A further object is to
construct the battery with as few threaded joints
5 as possible, to guard against the possibility of leaks developing at the connections.

A further object is to so mount and secure the cylinders that they are rigidly held by simple, in-
expensive means, but whereby any cylinder may
10 be removed without disturbing the other.

In one embodiment of this invention, standard cylinders are used which have necks at one end only, and they are secured on a suitable vehicle
body in a vertical position with their openings at
15 the neck ends directed downwardly. The open-
ings are interconnected by means of piping into one or more groups, each group constituting a storage and transportation battery.

The interconnecting piping is so arranged as to
20 be pitched downward toward the discharge end. A trap is inserted at the lowest point at which the moisture accumulates, and this trap is equipped with a blow-off valve to permit discharge of the
moisture from the system. Each battery is
25 equipped with a control valve to shut off the en-
tire group of cylinders.

A storage battery of the above described type is ordinarily subjected to vibration while en-
route, which tends to loosen the pipe and fitting
30 joints and cause leaks to develop. In my im-
proved apparatus, the cylinders are so held as to reduce to a minimum relative movement result-
ing from vibration, and all screwed fittings or
other types of mechanical joints are eliminated
35 wherever possible and are replaced by welded,
soldered or brazed connections. In a preferred
embodiment, screw connections are used only for the connecting piece which is screwed into the
cylinder, and for the end of the pigtail which is
40 screwed to said connecting piece. The other end
of the pigtail is silver soldered and bends are used in the manifold instead of screwed fittings. Those
screwed fittings which must be used are soft
45 soldered together at the threads as a further pre-
caution against leaks developing due to vibration.

One form of the above described embodiment of this invention is shown in the drawings which
form a part hereof.

In the said drawings:—

Fig. 1 is a side elevation of the complete ap-
paratus,

Fig. 2 is a top plan view, portions being broken
away in different planes,

50

55

Fig. 3 is a rear elevation of the same apparatus with the doors open to show the controls.

Fig. 4 is a partial vertical longitudinal section taken along the line 4—4 of Fig. 2, and on a slightly larger scale.

Fig. 5 is a vertical transverse section taken along the line 5—5 of Fig. 2, and

Figs. 6 and 7 are enlarged details of cylinder retaining means.

In the form shown, the gas containers or standard cylinders 1 are mounted in closely juxtaposed and staggered arrangement on the vehicle in a vertical position, with their necks extending downwardly through a perforated plate 2 having openings 2a of a size slightly less than the diameter of the cylinders but larger than the necks. The cylinders are each preferably substantially hemispherical at the lower end and the edges of the openings are beveled so as to center the cylinders and aid in preventing lateral movement. The perforated plate 2 is supported by cross beams 3 which in turn are supported by the longitudinal members 4.

The cylinders are braced against horizontal movement and the vehicle body is strengthened by the vertical side members 5, diagonal side members 6 and top longitudinal members 8. The body of the vehicle is further braced by the bottom longitudinal rails 7 to which the cross beams 3 are attached. Across the top of the framework are a plurality of retaining members 9 which are secured to the top side members 8 by means of nuts and bolts 10. These retaining members 9 bear on the tops of the cylinders 1 and serve to hold them against vertically upward displacement out of the seats formed by the plate 2. To further insure that the retaining members 9 bear on all cylinders 1, vertical retaining rods 11 are attached at their lower ends to the perforated plate 2 and at their upper ends are inserted through holes in the retaining members 9 and nuts 12 are screwed on the retaining rods 11 thus forcing the retaining member 9 tightly against the cylinders 1. As the retaining members 9 are bolted to top side members 8 and rods 11, they can be easily removed, thus permitting any cylinder 1 to be taken out of the group for repairs or testing.

In the bottom of each cylinder is an opening threaded to receive a connecting piece 14, the outlet of which is secured by a nut 15 to a pigtail 16. The other ends of the pigtails 16 are silver soldered into longitudinal headers or manifolds 17 beneath the supports 2.

The manifolds 17 are pitched slightly downward towards their discharge ends and at the lowest point of each, a U-bend is made in the manifold, forming a trap 18. The lowest point of each of these traps 18 is equipped with a drain valve 19 having a discharge pipe 20. A control valve 21 is inserted in each manifold line and at the upper discharge ends beyond these valves 21, the manifolds are connected to a header pipe 22. From this header pipe a single outlet pipe 23 leads to the main outlet connection 24. Each manifold 17 is provided with a safety valve 29, preferably located as shown, immediately ahead of the control valve 21. All piping is suitably braced by means of brackets 25. The rear end of the vehicle is equipped with a box 26 for the protection of the piping, the valves 19 and 21 and the main outlet connection 24. The cylinder connections and underside piping are protected from road dirt and flying stones by a bottom plate 27 detachably secured to the members 3 and 7 by means of bolts 28. By removing this plate 27, ac-

cess may be had to the cylinder connections and piping.

For the transportation of gas between a point of supply and a point of consumption, one method that may be employed is as follows:

With the apparatus at the point of supply the main outlet pipe 23 is attached by means of the main outlet connection 24 to a source of gas (not shown), the drain valves 19 and the manifold control valves 21 having been closed at the end of the previous cycle, as will be described later. When gas is to be supplied to the main outlet pipe 23, the control valves 21 are opened and the gas then flows into the cylinders 1. This continues until the proper pressure has been reached, when the manifold control valves 21 are closed and the main outlet connection 24 disconnected. The drain valves 19 are now opened slightly to allow any moisture that has accumulated in the traps 18 to be forced out by the pressure in the entire system, after which the valves 19 are closed.

The vehicle is now transported to the point of consumption. Before connecting the battery to the consuming apparatus, each of the manifold control valves 21 is opened slightly to blow a little gas through the main outlet 23, in order to blow out any air or other foreign gas which may have come into the main outlet pipe 23 or the cross manifold 22 inasmuch as these two pipes are open to the atmosphere as far as the manifold control valves 21.

After purging the piping as described, the main outlet 23 is connected up to the pipe line to the consuming point by means of the main outlet connection 24. One or more of the valves 21 are then opened and gas is discharged from the cylinders through the connecting pieces 14, pigtails 16, manifolds 17, trap 18, manifold control valves 21, cross manifold 22 and main outlet 23, to the consuming pipe line. If it is desired to discharge only one battery of gas, only one of the manifold control valves 21 is opened. By opening any number of control valves 21 a similar number of batteries of gas will be discharged.

The final pressure in the cylinders 1 can only be as low as the pressure required in the consuming pipe line. When this pressure is reached, the control valves 21 are closed and the connection 24 disconnected. The drain valves 19 are then opened slightly to again drain out any moisture, after which the valves 19 are closed. The vehicle is now returned to the point of gas supply. Before repeating the cycle, the control valves 21 are each opened slightly to purge the piping, in the same manner as previously described for the purging prior to discharging the battery. The battery is now ready to be connected to the gas source and the cycle repeated.

It will be understood that the invention may be embodied in other forms and numerous alternate methods of supporting, bracing and connecting the cylinders may be used without departing from the invention as described in the following claims. For instance, separate drains and separate excess pressure devices may be employed for each cylinder, and the moisture drain opening may be separate from the gas outlet.

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

1. A vehicular compressed gas cylinder battery having a plurality of vertically disposed cylinders each having a convex lower end, a supporting plate having apertures presenting marginal surfaces on which said convex cylinder ends seat

and whereby they are gravitationally centered in their respective openings, a conduit disposed beneath said plate and connected to each of said cylinders at the lower ends of the latter whereby moisture in said cylinders may drain into said conduit, a trap in said conduit for collecting said moisture, and a blow-off valve at the lower end of said trap.

2. A vehicular compressed gas cylinder battery including a plurality of vertically disposed cylin-

ders each having a convex lower end terminating in a neck provided with an opening for said cylinder, a supporting plate having apertures within which said ends seat and through which said necks extend, a manifold pipe below said plate 5 and communicating with said openings, and transverse bars engaging the upper ends of said cylinders and holding them in predetermined relationship to said supporting plate.

JAMES W. DUNHAM. 10