

Aug. 18, 1942.

F. A. MILLER ET AL

2,293,160

PORTABLE CONTAINER FOR CALCIUM CARBIDE AND THE LIKE

Filed Aug. 14, 1941

3 Sheets-Sheet 1

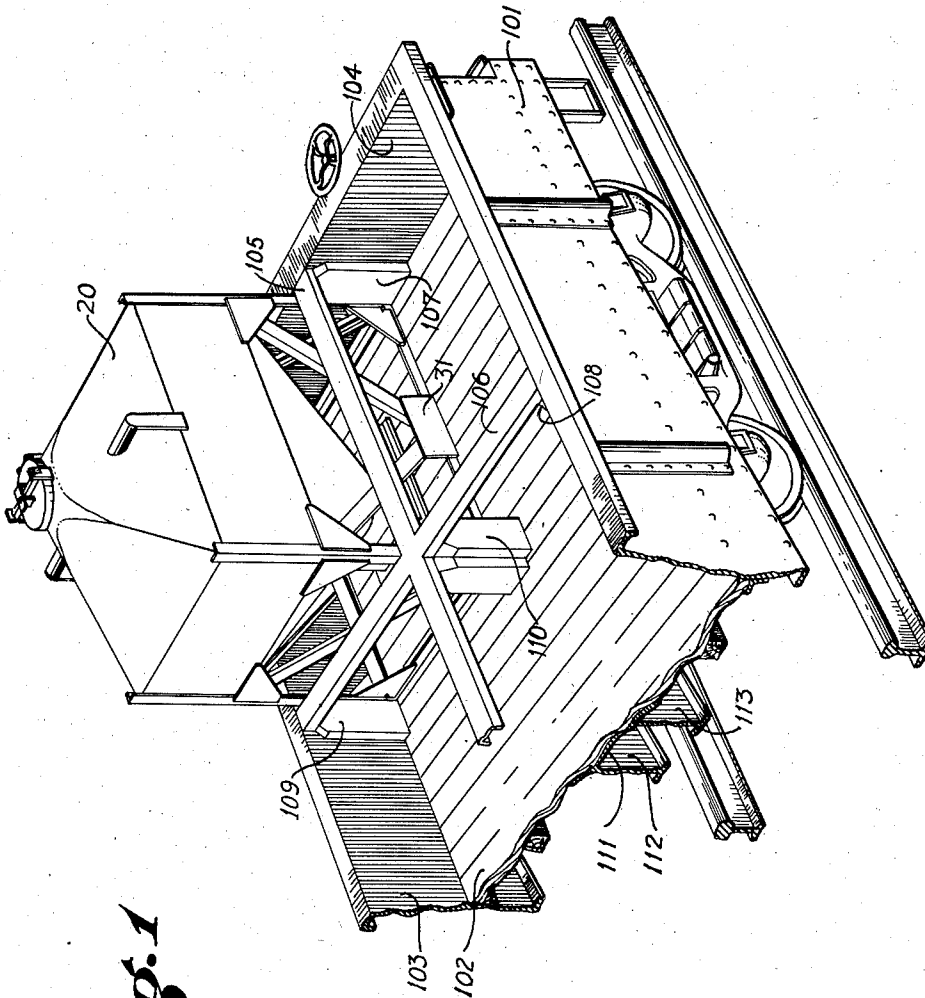


Fig. 1

Fred A. Miller
Frederick C. Mitchell
William N. Wherrett INVENTORS

BY

Paul H. Galt
ATTORNEY

Aug. 18, 1942.

F. A. MILLER ET AL

2,293,160

PORTABLE CONTAINER FOR CALCIUM CARBIDE AND THE LIKE

Filed Aug. 14, 1941

3 Sheets-Sheet 2

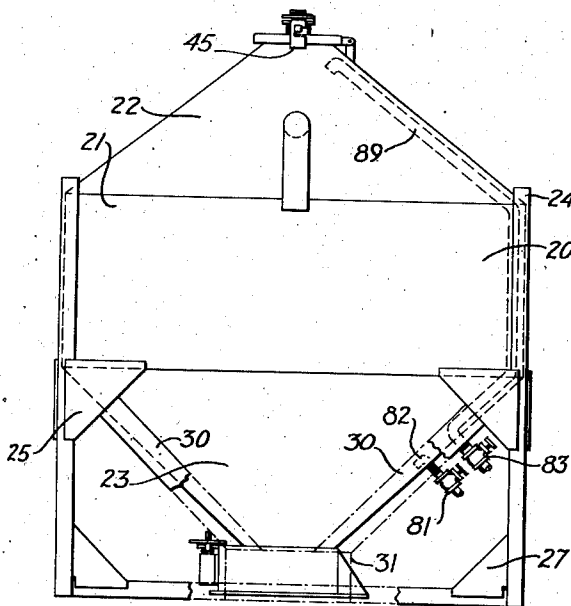


Fig. 2

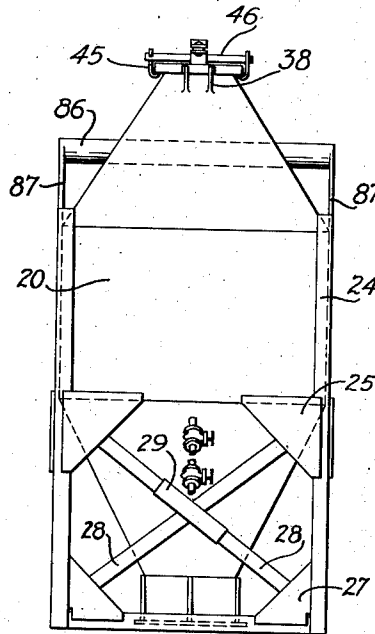


Fig. 3

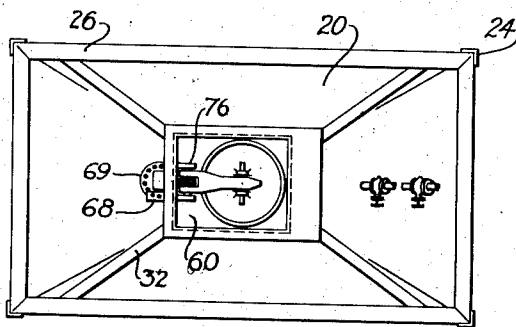


Fig. 4

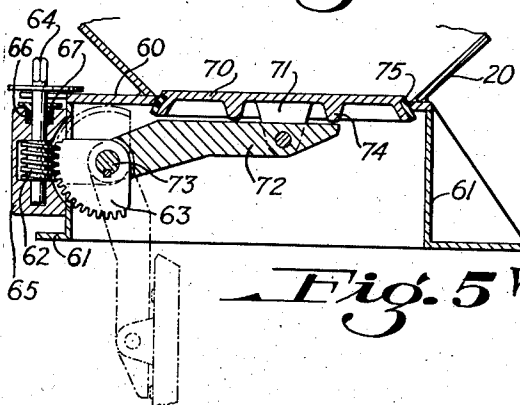


Fig. 5

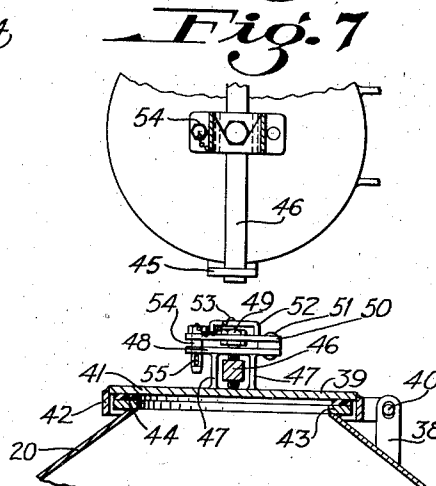


Fig. 6

Fred A. Miller
Frederick C. Mitchell
William N. Wherrett INVENTORS

BY *James B. Miller*
ATTORNEY

Aug. 18, 1942.

F. A. MILLER ET AL

2,293,160

PORTABLE CONTAINER FOR CALCIUM CARBIDE AND THE LIKE

Filed Aug. 14, 1941

3 Sheets-Sheet 3

Fig. 8

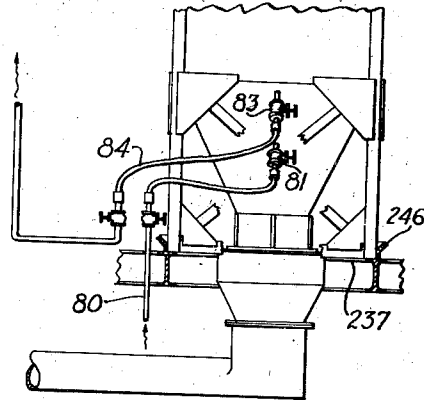
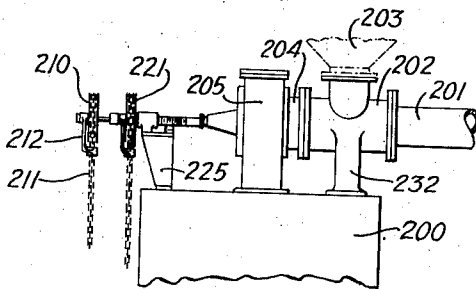


Fig. 10

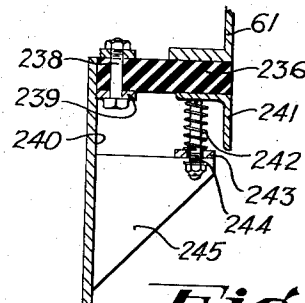
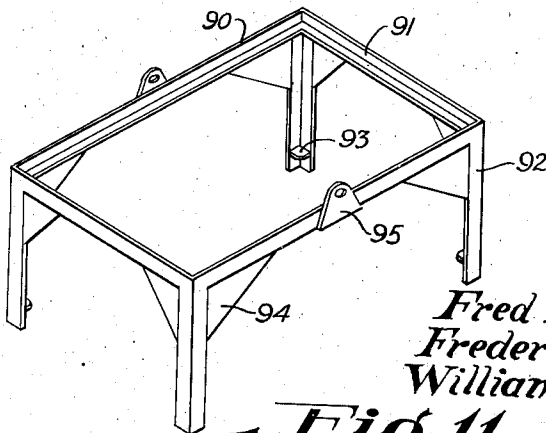
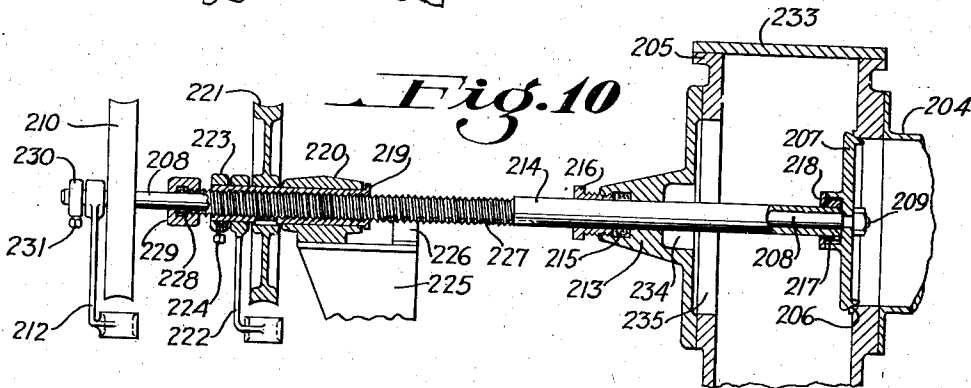


Fig. 9

Fred A. Miller
Frederick C. Mitchell
William N. Wherrett INVENTORS

BY *James E. Edger*
ATTORNEY

UNITED STATES PATENT OFFICE

2,293,160

PORTABLE CONTAINER FOR CALCIUM CARBIDE AND THE LIKE

Fred A. Miller, Frederick C. Mitchell, and William N. Wherrett, Wilmington, Del., assignors to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware

Application August 14, 1941, Serial No. 406,836

6 Claims. (Cl. 48—38)

This invention relates to containers, especially receptacles for the storage and transport in bulk of materials subject to deterioration upon contact with the atmosphere. More particularly, it appertains to gas-tight shipping containers for calcium carbide which can be employed as bins for acetylene generators.

In the past it has been customary to ship calcium carbide in simple, air-tight, thin sheet metal drums, the largest of which was capable of holding only about 1100 pounds of the granular material. This practice is very uneconomical when acetylene is generated on a large scale because of the handling costs and the inconvenient features of the construction of such containers.

The present invention had for its principal object the provision of an improved calcium carbide shipping container. Other objects were to provide a calcium carbide container which could be tightly attached to an acetylene generator feeding hopper for direct feeding, and which would contain sufficient material to feed a large acetylene generator for several hours, to design a calcium carbide container which would eliminate the cost incident to the handling of drums of calcium carbide, and to provide a large shipping container for calcium carbide which could be conveniently loaded and stored by the manufacturer of calcium carbide. A general advance in the art, and other objects which will appear hereinafter, are also contemplated.

It has now been found that great economies in the manufacture of acetylene gas can be secured by utilizing a container resembling two truncated pyramids placed base to base on their vertical axes and capable of holding approximately six tons of calcium carbide. The lower tapered section of this construction serves as a very efficient feeding bin for the acetylene generator, and the upper tapered section obviates an accumulation of dangerous gas in the full container during storage.

How the foregoing objects and related ends are accomplished will be apparent from the following exposition, in which are disclosed the principle and divers embodiments of the invention, including the best mode contemplated for carrying out the same. The written description is amplified by the accompanying drawings, in which:

Figure 1 is a fragmentary diagrammatic perspective view partly in section of the container of this invention (with some parts omitted in the interest of clarity) and the railroad car designed for transporting these containers;

Figure 2 is a diagrammatic side elevation view of the container;

Figure 3 is a diagrammatic end elevation view of the container;

5 Figure 4 is a diagrammatic bottom view of the container;

Figure 5 is a fragmentary sectional side elevation view of the bottom closure of the container with the closure gate in closed position and a dotted outline indicating the open position of the gate;

10 Figure 6 is a fragmentary side elevation view, partly in section, of the top closure of the container;

15 Figure 7 is a fragmentary plan view of the top closure of the container;

Figure 8 is a fragmentary diagrammatic side elevation view of a container in position for feeding an acetylene generator and the top part of the generator with connection apparatus;

20 Figure 9 is a fragmentary sectional elevation view of the connecting portions of the container and the hopper upon which it rests while its contents are being discharged;

25 Figure 10 is a fragmentary elevation view, partly in section, of the means for closing the acetylene generator against the escape of acetylene and the entry of additional calcium carbide; and

30 Figure 11 is a diagrammatic perspective view of a saddle or frame employed in stacking one container of the present invention on top of another container.

Referring now to Figure 1, 20 indicates a container and 101 the railroad car in which such containers are shipped. In this figure, certain small parts of the container have been omitted in order to show its general arrangement more clearly. The specific features are shown more in detail in Figures 2, 3 and 4.

The container

The container comprises a central prism-shaped section of rectangular cross-section indicated at 21, an upper section 22 resembling somewhat an upright truncated pyramid, and a lower section 23 resembling an inverted truncated pyramid. The container is constructed of sheet metal such as steel, welded at the joints in the sheet to make it gas-tight, and is supported by four upright or vertical corner angles 24 which extend slightly above the central prism section for stacking purposes (the details of which will be discussed later). These angles are welded to the prism section of the container with

fillet welds along each angle edge where it adjoins the container, and this construction is strengthened by light gusset plates 25 fillet welded to the angles and the container. These gussets are offset with reverse bends by the thickness of the metal making up the angle in order to provide horizontal surface contact with the container and angle along the upper portion of the plate and vertical surface contact with the angle below the prism section 22.

The bottoms of the angles 24 are braced and spaced apart by a rectangular frame 26 made up of angles, and this structure is further strengthened by eight gusset plates 27 fillet welded to both this frame and the corner angles.

End cross bracing is provided by channels 28. In order to keep these end channel braces in the same plane, one is cut to permit the passage of the other. A plate 29 is fillet welded outside or over the uncut channel and the adjacent ends of the cut channel are similarly welded to the under side of this plate. These end channel braces are welded to the upper corner gussets 25 and the lower corner gussets 27.

At the sides of the container, support and rigidity are supplied by channels 30 welded to the gussets 25 and plates 31, which in turn are welded to frame 26 midway of its sides. The under structure is further strengthened with horizontal bracing consisting of four angles 32 (Figure 4) welded near the corners of the vertical side of the angle frame 26 inside the gussets 27, and to the sides of the connecting piece or housing 61 about the lower outlet of the container.

The filling hatch

As shown in Figures 3 and 6, straps 38 are welded near the top of the container on one end to furnish a means for hinging a cover 39 over the container top opening, or filling hatch. The hinge pin is shown at 40. The hatch cover comprises a plate 41 with a downward extending weather flange 42 (to obviate opening difficulties which might be caused by snow and ice). The opening in the container has a flange 43 which supports a sealing gasket 44 upon which the lid rests. Straps 45 (Figures 2, 3 and 7), welded to the container on opposite sides of the cover, are provided with bayonet slots to receive a clamping bar 46. Near the center of the hatch cover there are welded two upright straps 47, and to these there is welded a horizontal strap 48.

A clamping bolt 49, extending through a hole in the strap 48 and threaded through the clamping bar 46, enables the closure to be made gas-tight. It is believed obvious that proper rotation of the bolt head (the point of the bolt resting on the cover 39) tends to force the bar 46 upward and the plate 41 downward. Since the bar 46 cannot rise (being in the slots in straps 45), the lid is tightly pressed against the gasket 44. Movement of the bolt in the opposite direction provides sufficient play for the bar 46 (between it and the top cover) to permit its being slipped out of the bayonet slots in the strap 45. The cover may then be swung back about the hinge pin 40 to open the filling hatch.

To prevent tampering during transit, a sealing arrangement (shown most clearly in Figure 6) is provided. It comprises a strap 50 rotatably secured with a loose rivet 51 to the strap 45. The strap 50 is notched to fit tightly about the hexagon head of the clamping bolt 49, as shown in Figure 7. A housing for the bolt head is pro-

vided by fillet welding a U-shaped strap 52 over the notched portion of the strap 50. To this U-shaped strap 52 there is riveted a retaining chain 53 which is also riveted to a slotted pin 54. Registering holes are provided in straps 50 and 48 for this pin. The slot 55 in the pin 54 is designed to receive the conventional metal ribbon seal used with railroad freight traffic.

The discharge gate

About the circular bottom opening in the container there is welded a horizontal plate 60 (Figure 5), and beneath this plate and welded thereto is a frame gate-housing or connecting piece 61 against which the primary hopper for the acetylene generator tightly fits while the container is being emptied into the said generator. This housing provides support for a worm 62, sector 63, and horizontal shaft 73 gate operating mechanism. The vertical worm operating shaft 64, which is journaled in the worm casing or housing 65, is surrounded by packing 66 and gland 67 to prevent the escape of any acetylene gas which may work its ways up into the housing 61 into the casing 65.

An extension or strap 68 (Figure 4) on the plate 60 has apertures which register with apertures in disc 69 on the worm shaft 64. The purpose of these registering apertures is to provide a location for a railroad car seal when the filled container is being transported. A gate locking device is thereby provided.

The bottom of the container is closed by a conical-face gate 70 having projecting lugs 71 through which a pin connection is made with the gate lever 72. The gate lever and sector 63 are keyed to the shaft 73 to provide positive raising and lowering of the bottom closure. Lugs 76 journal the shaft 73, and lugs 74 limit the tilting movement of the gate (by contact with the gate lever). A sealing gasket 75 is carried by the closure gate and is compressed against the plate 60 when the gate is seated to close the container in a gas-tight manner. The upper surface of the gate lever is tapered to prevent an accumulation of the calcium carbide thereon.

Miscellaneous container features

While the container is being emptied into the acetylene generator some acetylene gas finds its way into the container, and for safety purposes the empty container is cleared of this before being returned for filling. The purging operation is accomplished by passing inert gas through the purge line 80 (Figure 8), through the valve 81 into the pipe 82 (Figure 2) inside the container. The vent valve 83 is connected inside the container to a pipe 89 and outside the container to a vent line 84 through which any acetylene present is carried away.

For moving the individual containers, a "teakettle" type pick-up device is provided. A pipe 86 (Figures 1, 2 and 3), extending through the upper section of the container, serves as a bail for crane hooks. It is fillet welded to the container to provide a gas-tight connection. The ends of this pipe are welded to straps 87 which are in turn welded to the central section of the container. This arrangement makes the handling of the individual containers very simple because a double hook from a crane will engage the bail by movement of the crane, thus dispensing with the hand operation required in connecting a crane hook to the conventional portable container lifting means.

The stacking frame

In Figure 11 there is shown a container stacking frame 90 which is used for storing the containers in a two-high relation. This frame consists of a rectangular arrangement of angle irons 91 adapted to fit about the bottom of the container supporting framework and vertically disposed angles 92 connected at the corners thereof to rest on the top of another container. Supports 93, welded inside these vertical angles, rest on top of the container corner angles 24 when the frame has been placed on top of a container. The angles 92 fit outside the angles 24. The stacking frame is strengthened by eight gussets 94 joining the lateral or horizontal frame section angles 91 to the vertical angles 92. Lifting lugs 95 facilitate handling of this frame. Fillet welding is used throughout the construction.

The connecting hopper

In Figure 9 the seal between the discharge opening of the container and the primary hopper for the generator is shown in detail. As a container is lowered on to the hopper, the housing 61 contacts a rubber gasket 236, which in its normal position inclines slightly upward. Centering guides 246 facilitate proper positioning of the container over the hopper. These are welded to the structural steel platform 237 which supports the container and the feeding hopper. By the time the under structure of the container reaches the platform 237 which supports it above the feeding hopper, this gasket is depressed into the horizontal plane shown. The gasket is secured by bolts such as that shown at 238 to an inwardly extending flange or continuous gasket holding ring 239 welded onto the upright hopper wall 240. The inner part of the gasket is supported and pressed upward by a frame 241 made of angle irons. Resilient support for this frame is provided by springs, one of which is shown at 242, extending between the frame 241 and plate 243 about the bolt 244. The plate 243 is supported on a series of brackets 245 secured to the inside of the hopper wall 240. In operation, calcium carbide drops through the hopper into the conveyor and is transported thereby to the generator. A screw or auger-type feed (not shown) in the conveyor casing 201 has been found quite satisfactory.

The feed line valve

At the exit end of the conveyor casing 201 (see Figure 8) there is a T 202, the cross-arm of which constitutes an extension of the casing. Its vertical arm connects with an auxiliary feeding hopper 203. Support for these parts is provided by the integral bracket or post 232 which is bolted to the top of the generator 200. The hopper 203 is present only as a precaution, its purpose being to facilitate the charging of the generator in case of stoppages in the normally employed portions of the apparatus.

Connecting the T 202 and the calcium carbide feeder port of the generator is a valve body 205 and a flanged coupling 204. The valve disc 207 seats against the edge 206 of an aperture in housing 205 (by which the material from the flanged coupling 204 enters) to close the same, thereby shutting off the supply of calcium carbide from the conveyor and reducing the amount of acetylene escaping into the charging apparatus (as shown in detail in Figure 10). The valve disc is non-rotatably secured to a

valve stem 208 by means of a nut 209 and a threaded extension of the stem. The stem 208 (see the left-hand side of the Figure 10) is keyed to a sprocket wheel 210. A chain 211, extending through chain guide 212, is provided for turning sprocket wheel 210, and as a result, also the stem 208 and disc 207.

The valve bonnet is shown at 213, and in it is journaled a tube 214 which covers the major portion of the valve stem. Packing 215, held in place by the gland 216, provides a gas-tight stuffing box arrangement. On the end of the tube or stem sleeve 214 there is welded or otherwise firmly secured a stem collar 217 which is free to rotate in a recess in the rear of the valve disc. A plate 218, secured by bolts or equivalent means to the back of the valve disc, confines this collar so that the lateral motion of the sleeve and disc is the same.

The left-hand side (Figure 10) of the sleeve is threaded, and co-acts with corresponding threads in the bushing 219. This bushing is supported in a bearing 220. A sprocket wheel 221, chain guide 222 and collar 223 are mounted on the bushing. The collar is secured to the bushing by a set screw 224 to keep the last-mentioned parts in assembled relation.

The bearing 220 is mounted on a bracket 225 which is secured to the top of the generator. This bracket also supports a key 226 which operates in a groove 227 in the threaded portion of sleeve 214 to prevent rotation. Gas-tightness in the valve is also contributed to by means of packing 228 and gland 229 located on the stem 208, and fitting over the end of the sleeve 214.

Rotation of the sprocket wheel 221 causes the sleeve 214 to move laterally, thereby closing or opening the valve. In case the valve seat is blocked by the material being fed to the generator, or otherwise encrusted, it is cleared by rotating the valve disc. This is accomplished by means of the sprocket wheel 210 operating through the stem 208. A collar 230, secured on the stem 208 by means of a set screw 231, maintains the sprocket wheel 210 and chain guide 212 in proper position. A plate 233, removably secured, constitutes the top of the valve body 205 and provides a means of cleaning the valve in case of obstruction. It also permits access to the valve disc and associated parts for maintenance, repair, etc. The valve bonnet is recessed at 234 and the inlet port apertured at 235 to provide for complete removal of the valve disc from the passage-way through which the material being charged enters the generator.

The railroad car

The containers are shipped in flat bottom, gondola-type railroad cars such as that shown at 101 in Figure 1. Preferably a low side, solid bottom car with fixed ends is employed. The car illustrated has wooden plank flooring 102 and steel side and end sheathing as shown at 103 and 104, respectively.

The interior of the car is divided into compartments or sections, each capable of accommodating one container by means of a lengthwise channel iron 105 and crosswise channels, one of which is indicated at 106. The rigidity of this sectioning means is increased by welding it to supports located at the corners of the compartments. The lengthwise channel and cooperating vertical channels, one of which is indicated at 107, are welded together and to the end sheathing of the car. Corresponding side channel iron sup-

ports are indicated at 108 and 109, respectively. These side supporting means are, like the end supporting means, welded to the sides of the car and the transverse partitioning channels.

In the interior of the car the intersecting portions of the lengthwise and crosswise channels are supported by, and welded to, hollow pressed steel columns or center posts, one of which is indicated at 110. These posts in plan view are cross-shaped. They extend through the wooden flooring and are welded to the top cover plate 111 of the center sills 112 and 113.

The bottom boards in the floor of the car are spaced about one inch apart to allow for drainage of water from such sources as melting snow, etc.

Many of the advantages of the present invention are believed obvious from a consideration of the device itself. Nevertheless, it seems desirable to emphasize certain points. A specific form of container and arrangement of car to receive the same is provided, whereby the container may be loaded by the shipper, stored or placed upon a car adapted to receive it, shipped, and removed from the car for immediate use or storage by the consignee with the shipment intact.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that this invention is not limited to the specific embodiments thereof except as defined in the appended claims.

We claim:

1. A portable smooth interior calcium carbide container with gas purging connections and lifting means, said container having its main capacity in a central section and having an upper frustum shaped section based on the top of the central section and a lower inverted frustum shaped section based on the bottom of the central section, a bottom discharge outlet gate valve of cross section large enough to permit easy discharge of granular calcium carbide on the smallest end of the lower section, a gas-tight housing about said discharge outlet adapted to seat on a calcium carbide receiver and form a gas-tight connection between said receiver and the container due to the weight of the container, a filling hatch with gas-tight sealing cover on the upper section, and bottom supporting means for the container adapted to space the discharge outlet and its housing above the surface on which the container rests.

2. A portable smooth interior calcium carbide container with gas purging connections and lifting means, said container having its main capacity in a central section and having an upper frustum shaped section based on the top of the central section and a lower inverted frustum shaped section based on the bottom of the central section, a bottom discharge outlet gate valve of cross section large enough to permit easy discharge of granular calcium carbide on the smallest end of the lower section, a gas-tight housing about said discharge outlet adapted to seat on a calcium carbide receiver and form a gas-tight connection between said receiver and the container due to the weight of the container, a filling hatch with gas-tight sealing cover on the upper section, bottom supporting means for the container adapted to space the discharge outlet and its housing above the surface on which the container rests, said discharge outlet gate valve comprising a plate welded to the smallest end of the lower section, a circular discharge opening in said

plate, and a gate having a conical surface adapted to seat in and close said circular opening, a shaft having keyed thereto a sector gear and lever, said lever carrying said gate, another shaft carrying a worm coaxing with said sector gear for opening and closing said gate, and means for preventing the escape of gas about said worm carrying shaft and sector gear.

3. A portable smooth interior calcium carbide container with gas purging connections and lifting means, said container having its main capacity in a central section and having an upper frustum shaped section based on the top of the central section and a lower inverted frustum shaped section based on the bottom of the central section, a bottom discharge outlet gate valve of cross section large enough to permit easy discharge of granular calcium carbide on the smallest end of the lower section, a gas-tight housing about said discharge outlet adapted to seat on a calcium carbide receiver and form a gas-tight connection between said receiver and the container due to the weight of the container, a filling hatch with gas-tight sealing cover on the upper section, bottom supporting means for the container adapted to space the discharge outlet and its housing above the surface on which the container rests, said filling hatch cover comprising a plate with a depending weather flange and locking means, said locking means comprising a bar mounted on said plate and extending across the same to engage hook straps mounted on the container at the sides of the filling hatch, the mounting for said bar comprising a frame about said bar and secured to the cover plate, a bolt extending through said frame and threaded through said bar in such a manner that when the bolt is tightened it bears against the top of the cover plate and forces the said bar into tight engagement with the said side hooks.

4. A portable smooth interior calcium carbide container with gas purging connections and lifting means, said container having its main capacity in a central section and having an upper frustum shaped section based on the top of the central section and a lower inverted frustum shaped section based on the bottom of the central section, a bottom discharge outlet gate valve of cross section large enough to permit easy discharge of granular calcium carbide on the smallest end of the lower section, a gas-tight housing about said discharge outlet adapted to seat on a calcium carbide receiver and form a gas-tight connection between said receiver and the container due to the weight of the container, a filling hatch with gas-tight sealing cover on the upper section, bottom supporting means for the container adapted to space the discharge outlet and its housing above the surface on which the container rests, said lifting means for the container comprising a rod-like member extending through the upper frustum section and having its ends connected to the sides of the container by straps.

5. In combination, an acetylene generator and a portable smooth interior calcium carbide container with gas purging connections and lifting means, said container having its main capacity in a central section and having an upper frustum shaped section based on the top of the central section and a lower inverted frustum shaped section based on the bottom of the central section, a bottom discharge outlet gate valve of cross section large enough to permit easy discharge of granular calcium carbide on the smallest end

of the lower section, a gas-tight housing about said discharge outlet adapted to seat on the acetylene generator receiver and form a gas-tight connection between said receiver and the container due to the weight of the container, a filling hatch with gas-tight sealing cover on the upper section, bottom supporting means for the container adapted to space the discharge outlet and its housing above the surface on which the container rests.

6. A portable smooth interior calcium carbide shipping, storage and feeding container with gas purging connections and lifting means, said container having its main capacity in a central section and having an upper frustum shaped section based on the top of the central section and a lower inverted frustum shaped section based on the bottom of the central section, a bottom dis-

charge outlet gate valve cross section large enough to permit easy discharge of granular calcium carbide on the smallest end of the lower section, a gas-tight housing about said discharge outlet adapted to seat on a calcium carbide receiver and form a gas-tight connection between said receiver and the container due to the weight of the container, a filling hatch with gas-tight sealing cover on the upper section, and bottom supporting means for the container comprising corner braces adapted to space the discharge outlet and its housing above the surface upon which the container rests, said corner braces extending slightly above the central prism section.

FRED A. MILLER.
FRED. C. MITCHELL.
W. N. WHERRETT.