Feb. 28, 1939. H. GEBHARDT 2,148,935

ACETYLENE GAS PRODUCING PLANT

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Fig. 1

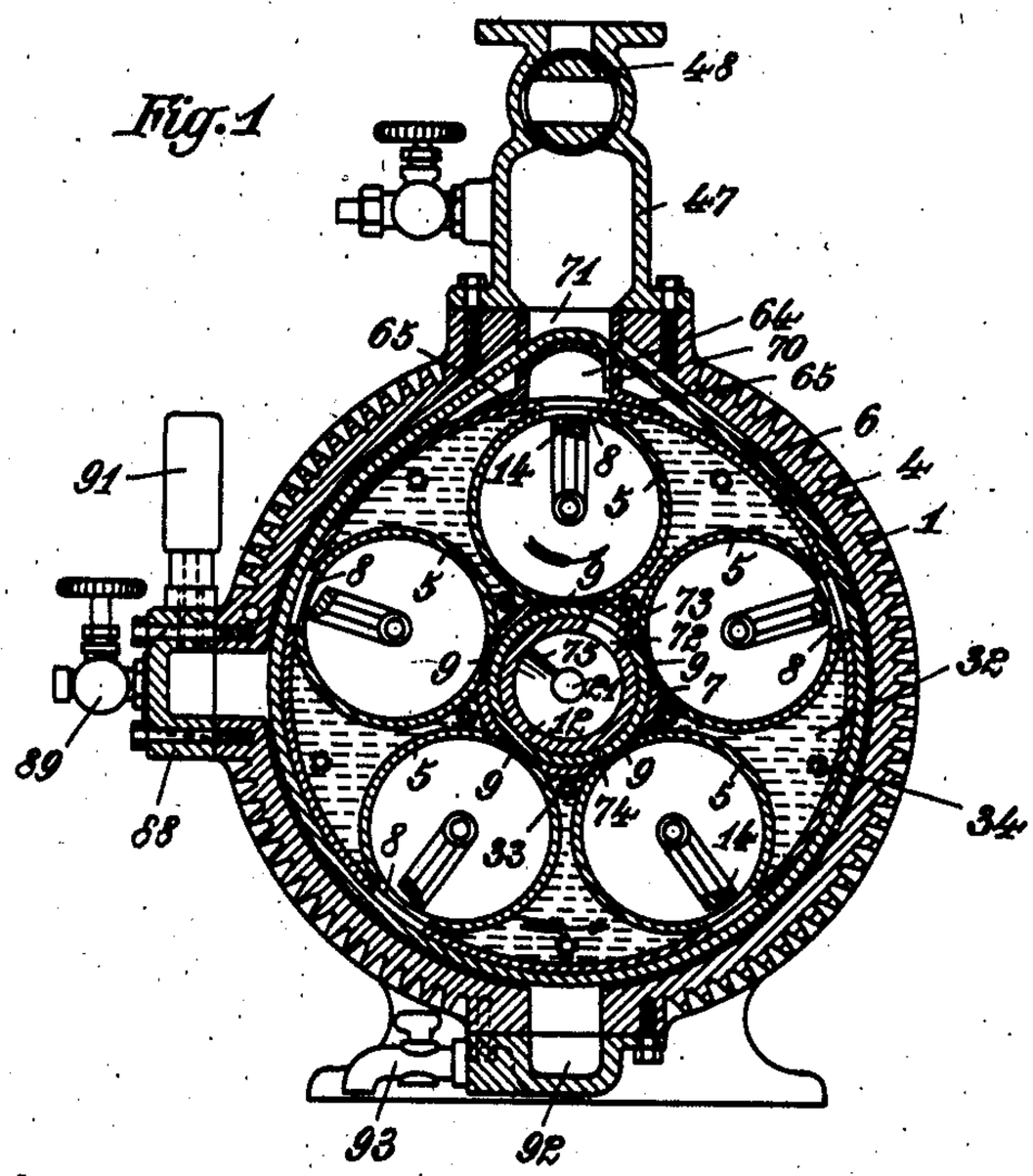

Fig. 2

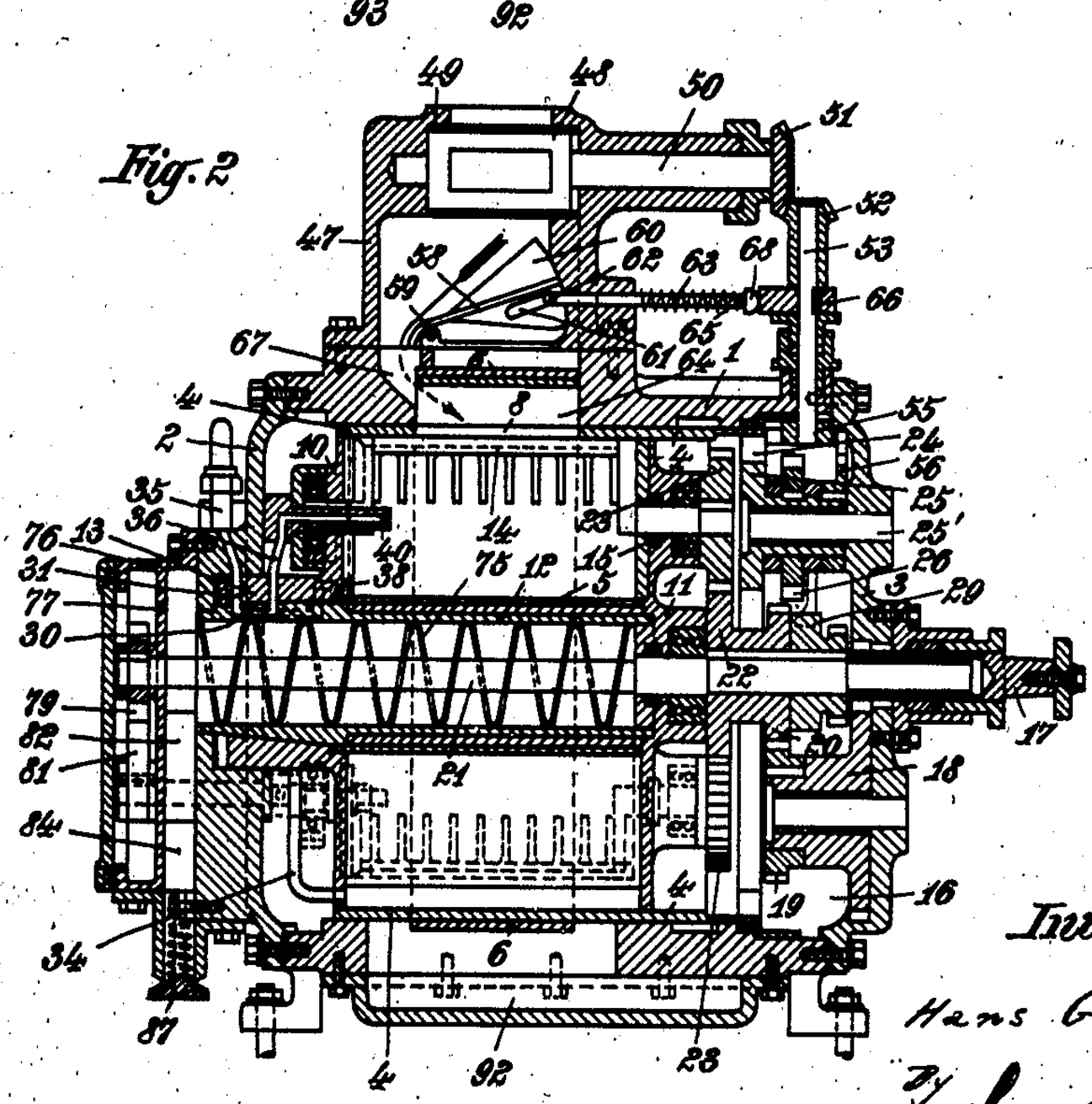

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Fig. 3

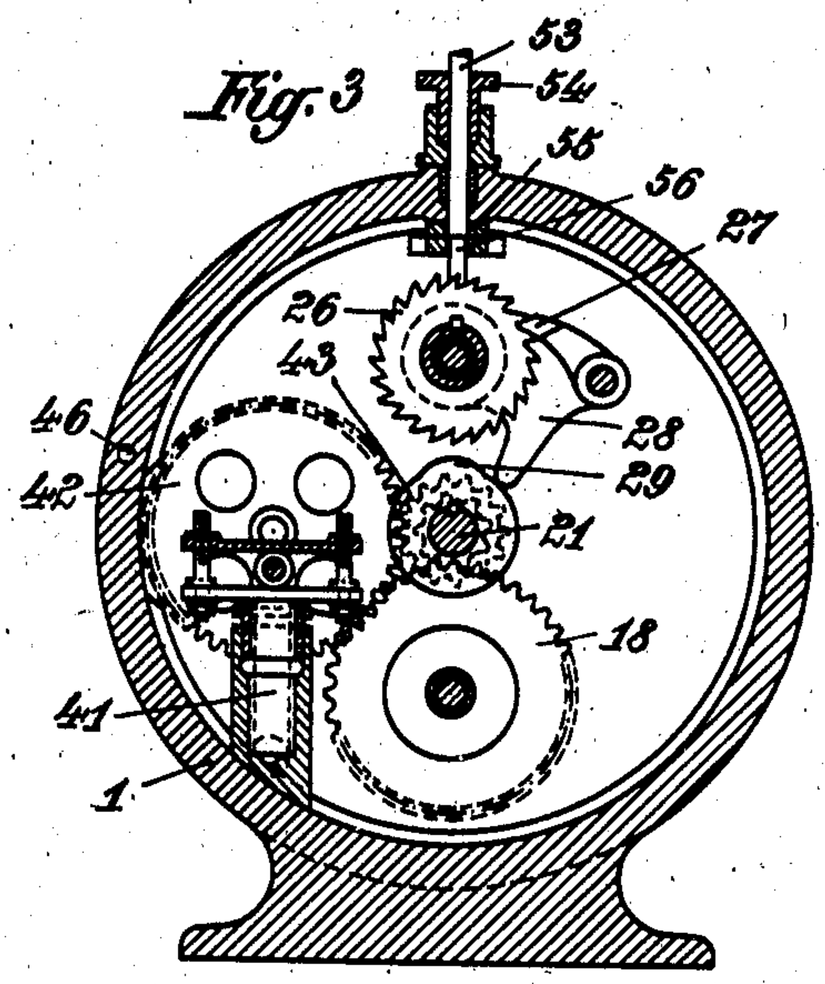


Fig. 4

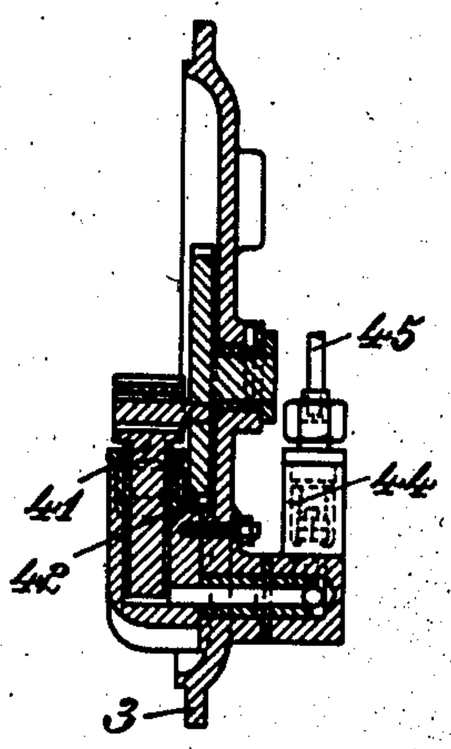


Fig. 6

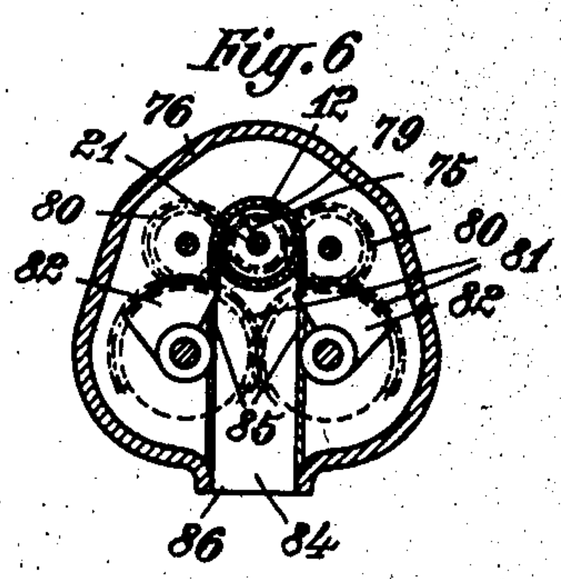


Fig. 5

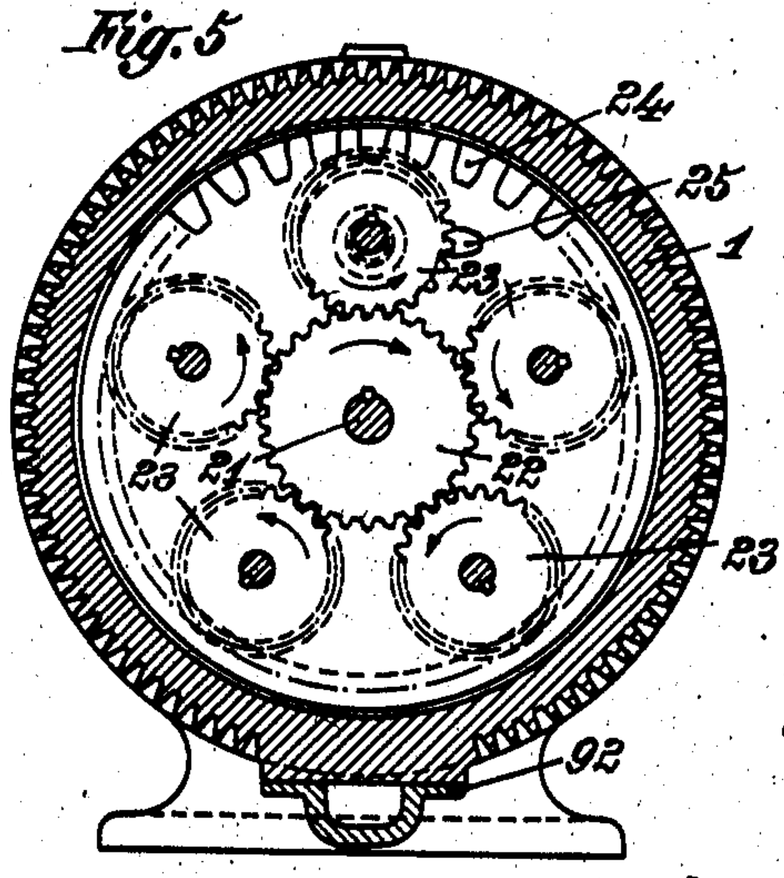
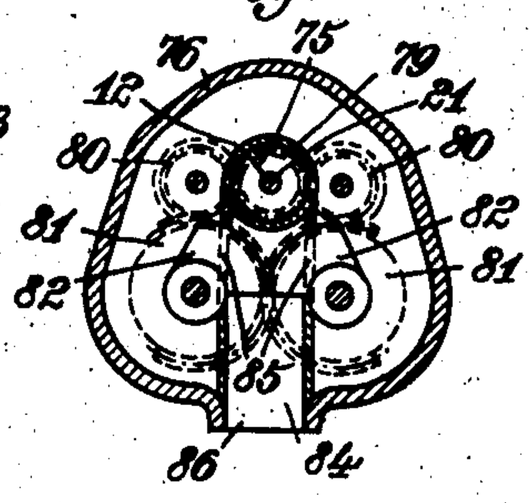


Fig. 7



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UNITED STATES PATENT OFFICE

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ACETYLENE GAS PRODUCING PLANT

Hans Gebhardt, Munich, Germany

Application May 27, 1935, Serial No. 23,767
In Germany February 6, 1933

9 Claims. (Cl. 48—48)

This invention relates to a device for producing acetylene gas.

Acetylene gas is required for numerous purposes, such as illumination, the operation of motors, cutting and welding, and the device according to the invention produces large amounts thereof for any length of time so as to have always fresh gas available for use and avoid large accumulations of gas in case of service troubles, which would decrease in power during storing prior to use. Furthermore, the device according to the invention can be easily built into vehicles, as required for operating the motors thereof. Portable acetylene gas producers are also needed for other purposes, for instance military ones, when iron bridges, etc. are to be destroyed, or in case of railroad accidents when iron cars have to be cut up, or for construction work when larger work pieces are to be welded together.

An important point is that the water is supplied to the container filled with carbide, and closed towards the outside in such a way that the residual carbide forms an almost dry powder, and is not excessively wetted to prevent the formation of slime which develops in the known types of acetylene gas generating plants. This slime is difficult to remove from the generating plant and requires special pits, etc. for storing. Residual carbide forming an almost dry powder can, on the other hand, easily be removed from the producer and advantageously utilized, for instance as fertilizer or in the manufacture of artificial stone.

In order to meet the conditions outlined above and continually to produce large quantities of gas by a device having small dimensions and little weight, the invention provides that the container of the gas generator is alternately connected with a carbide feeding and discharging device and is further provided with a knife rotating therein for stirring the carbide during gasification, the water required for gas generation being supplied to the container by a conveyor in quantities preventing the formation of slime, or in the form of a spray.

By way of example, the invention is illustrated in the accompanying drawings, in which Figure 1 is a cross section of the gas generator taken on line 1—1 of Fig. 2; Fig. 2, a longitudinal section thereof taken on line 2—2 of Fig. 1; Fig. 3, a cross section of the gear space of the gas generator and the water pump taken on line 3—3 of Fig. 2; Fig. 4, a vertical axial section of the pump drive taken on line 4—4 of Fig. 3; Fig. 5, a cross section of the gear space showing the drive of the stirring knives and gasifying chambers; and Figs. 6 and 7 are sectional views taken on line 7—7 of Fig. 2 and explaining the operation of the ejecting device.

Referring to the drawings, the acetylene gas is produced within the cylindrical casing 1, both ends of which are closed airtight by the covers 2 and 3. The casing 1 contains a rotatable cylinder 4 within which several gasifying cylinders 5 are arranged between the cylinder 4 and an inner cylinder 7. The cylinder 4 is shut off on both ends by the cover plates 10 and 11, the parts 4, 5, 7, 10, 11 forming a firm structure. At the points where the gasifying cylinders 5 touch the cylinder 4 they are provided with the charging slots 8, whereas the outlet slots 9 are located at the points of contact between the gasifying cylinders 5 and the inner cylinder 7.

An endless felt band 6 is placed around the outside of the cylinder 4 and guided only at the top where the carbide is filled in as will be explained below over a stationary charging duct 64 which with its lower enlarged edges 65 directly abuts against the outside of the cylinder 4. The felt band 6 closes the charging slots 8 except the top one through which fresh carbide is fed from the duct 64 to the gasifying cylinder 5 concerned.

The inner cylinder 7 surrounds a stationary casing 12 through which the shaft 21 extends on which the conveyor worm 75 is disposed. Between the casings 7 and 12 a felt layer 74 is provided which at the same point as the cylinder 12 possesses the passages 72 and 73. These slotlike passages, however, are not arranged in the vertical central plane of the gas generating plant, but staggered about 35° relative to that plane oppositely to the direction of rotation of the cylinder 4, so that the outlet slots 9 of the gasifying cylinders 5 during rotation of the cylinder 4 and the parts connected therewith pass the slots 73 and 72 before the inlet slots 8 of the cylinders 5 permit the filling of the latter with fresh carbide through the duct 64. During the charging process the connection of the gasifying cylinder 5 with the inside of the casing 12 must be completed, as indicated in Fig. 1.

The casing 12 is firmly connected with the cover 2. The bearing surface between the boss 13 of the rotary cover 10 and the stationary casing 12 is slightly conical.

In each gasifying cylinder 5 a rotating blade 14 is arranged and provided with a cutting edge which is moved along the inner wall of the cylinder 5 concerned to remove residual carbide adhering thereto. Each blade 14 possesses several

comblike prongs directed towards the axis of rotation of the blade. The two journals of each stirring blade 14 are supported in the covers 10 and 11 by ball bearings protected against soiling by carbide particles by the stuffing boxes 15.

The stirring blades 14, the cylinder 4 and all parts firmly connected with the latter are driven by a gear disposed in the space 16 between the two covers 3 and 11.

For this purpose, the end of the shaft 21 extending through the cover 3 carries the loosely rotatable hollow shaft 17 which passes through a stuffing box and carries a toothed rim inside the cover 3. The toothed rim directly engages the toothed wheel 18 which is loosely rotatably disposed on a bearing pin secured to the cover 3 and which is further firmly connected with the spur gear 19 which rotates the toothed wheel 20 firmly connected with the shaft 21. The gear ratio of the gear described is so chosen that the shaft 21 makes only 80 revolutions per minute as against 300 revolutions of the hollow shaft 17.

To the shaft 21 a spur wheel 22 is secured which is in mesh with the spur wheels 23, one of which is provided for each of the five gasifying cylinders 5. Each spur wheel 23 is firmly connected with the journal of the stirring blade 14 arranged in the gasifying cylinder concerned, so that the blade carries out about 100 revolutions per minute and thus insures thorough stirring of the calcium carbide in the cylinders 5.

To permit rotation of the cylinder 4 and the parts firmly connected therewith by means of the gear described, the cylinder 4 overlaps the cover 11 for a relatively large distance. On the free edge of this projecting cylinder portion an internal toothing 24 is provided, within range of which a toothed wheel 25 is arranged having only one tooth, so that at each rotation thereof the cylinder 4 is turned only slightly. The wheel 25 is loosely rotatably positioned on a pin 25' secured to the inside of the cover 3. On the hollow-shaft-like boss of the wheel 25 the feed wheel 26 is secured and engaged by the pawl 27 which is disposed at the free end of the lever 28 movable about the pin 25'. A side arm of the lever 28 is located within range of the cam disc 29 secured to the shaft 21, so that at each rotation of the shaft 21 the feed wheel 26 is moved to the extent of one tooth and at each rotation of the wheel 26 the cylinder 4 and all parts connected therewith are moved only a short distance, the arrangement being such that the cylinder 4 requires ten minutes to make a full rotation.

The water required for the decomposition of the carbide in the production of acetylene gas is drawn in through a firm or flexible conduit from a reservoir by means of a suction valve and the pump 41 (Figs. 3 and 4) and then introduced through the pressure valve 44 and the pressure piping 45 at the connection 35 (Fig. 2) into a bore of the cover 2 whence it passes into the bore 31 arranged in the boss 13 of the rotary cover 10 and thence into the duct 30 in the conical part of the casing 12. From the duct 30 the pressure water flows through the conduit 36 firmly connected with the boss 13 of the cover 10 to the spraying nozzles 40, one of which is provided for each gasifying cylinder 5 and extends in the axial direction of the latter into the cylinder concerned. The general arrangement is so chosen that the water delivered from the pump under pressure is sprayed in a finely distributed state into a gasifying cylinder 5 after the latter has been filled with carbide while the cylinder 4 is rotated about 60°.

The lift of the pump 41 can be varied by means of the driving link of its piston. The driving pin of the pump 41 is secured to the toothed wheel 42 which is rotated from the shaft 21 by means of the toothed wheel 43.

To provide for reliable elimination of the heat developing during the formation of acetylene gas, the gasifying cylinders 5 are cooled. For this purpose, fresh cooling water, in a similar manner as described above with respect to the water coming from the pump 41, is introduced through bores provided partly in the boss 13 and partly in the portion of the casing 12 surrounded thereby and through the bores 33 into the spaces 32 within the cylinder 4 between the cylinders 5. The heated water flows through the bores 34 out of the spaces 32 and then through a discharge conduit, not shown, of the cover 2 into the reservoir or a cooling device.

The spraying nozzles 40 extend through the journals of the knife edge 14 without, however, participating in the rotation of the latter.

Carbide is fed to the gasifying cylinders 5 by means of the charging casing 47, in the upper part of which a stop cock 48 is rotatably arranged by means of the shaft 50. To insure satisfactory arrangement of the cock 48 in the charging casing 47, it is surrounded by a steel bushing 49 provided with recesses for the passage of the carbide.

To the free end of the shaft 50 the bevel wheel 51 is attached which meshes with the bevel wheel 52 on the shaft 53. The shaft 53 is rotated by means of the vane wheel 55 secured to the lower end of the shaft 53 and engaging the vane wheel or toothed segment 56 which is secured to the boss of the toothed wheel 25, the ratio of gearing being such that when a previously emptied gasifying cylinder 5 is disposed below the charging duct 64 and the superposed charging casing 47 the cock 48 will be temporarily closed and only opened again after the passage of the measured quantity of carbide kept in the casing 47 and the closing of the charging slot 8. It is further possible to employ the cock 48 for measuring the amount of carbide needed for a gasifying operation and thus to dispense with the charging casing 47.

Below the cock 48 a guide plate 58 is arranged in the casing 47 and rotatable about the pin 59. On both sides the guide plate 58 has the walls 60 in which the slots 61 are provided. Into the slots 61 extends the adjusting rod 62 carried by the adjusting rod 63 which is guided in a projecting part of the casing 47. At its free end the rod 63 carries a head 68 against which the spring 65 abuts and pushes the rod 63 outwardly whereby the guide plate 58 is moved into lowermost position. The head 68 hugs a cam 66 secured to the shaft 53 and adapted to move the plate 58 once up and down at each rotation of the shaft 53, the guide plate 58 being moved up every time the charging slot 8 of a gasifying chamber 5 is located under the filling duct 64.

To supply carbide to the duct 64 a channel 67 is provided in the axial direction of the filling duct 64 near the felt strip 6. A corresponding channel may also be provided on the other side of the felt strip 6 and instead of a single inclined guide plate 58 two wall faces disposed wedgelike to one another may be used for passing the carbide coming from the cock 48 partly through the channel 67 and partly through its companion channel on the other side into the filling duct 64 whence it drops into the gasifying cylinder.

The total arrangement is such that the charging cock 48 is temporarily closed only when a

charging opening 8 of a cylinder 4 is positioned below the filling duct 64. As the cylinder 4 revolves once in ten minutes and five gasifying cylinders are provided, one of the latter will be newly filled every two minutes, but the amount of carbide put in has ten minutes' time for developing acetylene gas. Since the gas is simultaneously generated in several cylinders, it can be taken out of the generating plant described in a perfectly uniform stream.

The quantity of water required for complete utilization of a charge of cabide in a gasifying cylinder 5 is supplied in such fine distribution that the period of injection is approximately equal to one-fifth revolution of the cylinder 4 and therefore lasts about two minutes. By means of the blades 14 the carbide and the injected water are thoroughly mixed, so that all particles of the carbide are uniformly used for generating gas and the remaining hydrate of lime constitutes an almost dry powder.

For removing this powder serves the casing 12 and the worm conveyor 75 firmly connected with the shaft 21, and rotated by the latter within the casing 12. Every time one of the outlet openings 9 of a cylinder 5 is moved past the slot 72, 73 in the casing 12 and the surrounding felt ring 74, the hydrate of lime formed in the respective cylinder is brought into the cylinder 12 and within range of the worm conveyor 75 which moves it towards the end of the casing 12.

The hydrate of lime then drops into the discharge shaft 84, indicated in Figs. 6 and 7, which is provided inside an auxiliary casing 76 screwed onto the outside of the cover 2. At the lower end of this discharge shaft 84 a shut-off valve 87 is kept closed by spring power and shuts off the inside of the casing 12 and the shaft 84 to prevent the useless escape of acetylene gas.

To open the valve 87 if sufficient hydrate of lime is collected in the shaft 84, it would be possible to have a piston move up and down in the latter, but the invention provides the following device:

In the opposite side walls of the discharging shaft 84 recesses 85 are provided into which the ejecting segments 82 are moved which are supported by two pins located outside the shaft 84. These pins extend through the partition 77 in which they are arranged and which is positioned in the casing 76 and carry, beyond this partition 77, the gear wheel segments 81 which mesh with one another and are thus always moved to and fro in opposite directions. Each of the two rim segments 81 is engaged by a toothed wheel 80, and between the two toothed wheels 80 and on the free end of the shaft 21 a semi-circular rim segment 79 is so secured that during rotation of the shaft 21 it alternately engages one or the other of the two toothed wheels 80. In this way the wheels 80, the rim segments 81 and the ejecting segments 85 connected therewith are alternately moved to and fro, the segments 85, on extending into the discharging shaft 84 and striking the residual carbide therein, pressing the latter down, so that the valve 87 will be opened and admit the discharge of a corresponding amount of hydrate of lime.

The acetylene gas generated escapes through the slots 8 and the surrounding felt band 6 into the annular space formed between the cylinders 1 and 4, whence it flows towards the discharge cocks 89 provided on a lateral cover plate 88 on which the pressure of the gas produced may also be measured by means of the gauge 91. On passing through the felt band 6 the gases are purified, and entrained particles of carbide are retained. The impurities carried by the felt band 6 are removed by the scraper 70 on the filling duct 64 and drop into the latter whence they pass into one of the gasifying cylinders 5 and then into the discharge casing 12.

The water carried along by the gas settles on the inside of the casing 1 and flows into the collector 92 where it is removed by the cock 93.

For driving the movable parts of the acetylene gas generator described an internal combustion engine is preferably employed which is operated by the acetylene gas produced and can be started with the aid of the gas remaining in the plant after stopping operation.

I claim:

1. An acetylene gas producer comprising a cylindrical casing, a rotatable cylinder within said casing, a plurality of gasifying cylinders mounted in said rotatable cylinder, a discharge cylinder located centrally relative to the gasifying cylinders and adapted to receive the carbide residue, a carbide feeding device, and means for alternately connecting the gasifying cylinders with the carbide feeding device and the discharge cylinder.

2. An acetylene gas producer according to claim 1, in which an endless felt band is provided between the casing and the rotatable cylinder and in which aligned openings are provided in each gasifying cylinder and the rotatable cylinder adjacent each gasifying cylinder, said felt band acting as a closure for the gasifying cylinders but permitting the generated acetylene gas to pass therethrough.

3. An acetylene gas producer according to claim 1, in which a scraping blade is provided in each gasifying cylinder, and in which means is provided for rotating said blade in its cylinder to scrape the residual carbide from the sides of its cylinder.

4. An acetylene gas producer according to claim 1, in which means are provided to admit and force a cooling fluid into the rotatable cylinder and around each of the gasifying cylinders to cool said gasifying cylinders.

5. An acetylene gas producer comprising a cylindrical casing, a rotatable cylinder within said casing, a plurality of gasifying cylinders mounted in said rotatable cylinder, a discharge cylinder located centrally relative to the gasifying cylinders, and adapted to receive the carbide residue, a carbide feeding device, means for alternately connecting the gasifying cylinders with the carbide feeding device and the discharge cylinder, each gasifying cylinder having two diametrically opposite openings therein and the rotatable cylinder and the discharge cylinder having a plurality of openings therein corresponding to and adjacent every opening in the gasifying cylinders, an endless felt band between the rotatable cylinder and the casing to close the openings in the rotatable cylinder but which permits the generated acetylene gas to pass therethrough, and a second felt band between the discharge cylinder and the gasifying cylinders.

6. An acetylene gas producer according to claim 1, in which a comb-like scraping blade is provided in each gasifying cylinder, and in which means is provided for rotating said blade in its cylinder to scrape the residual carbide from the sides of its cylinder.

7. An acetylene gas producer according to claim 1, in which a worm conveyor is provided

in the discharge cylinder to remove the carbide residue therefrom.

8. An acetylene gas producer according to claim 5, in which the carbide feeding device includes a charging duct of arched construction over which the first-mentioned felt band passes.

9. An acetylene gas producer comprising a cylindrical casing, a rotatable cylinder within said casing and having an opening therein, a gasifying container mounted in said rotatable cylinder to rotate therewith and having a pair of openings therein, a discharge device in the rotatable cylinder having an opening therein and adapted to receive the carbide residue, a carbide feeding device, and means for alternately connecting the gasifying cylinder with the carbide feeding device and the discharge cylinder by alternately connecting one opening of the gasifying container with the opening in the rotatable cylinder to feed the carbide and connecting the other opening in the gasifying container with the opening in the discharge device to discharge the carbide residue.

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