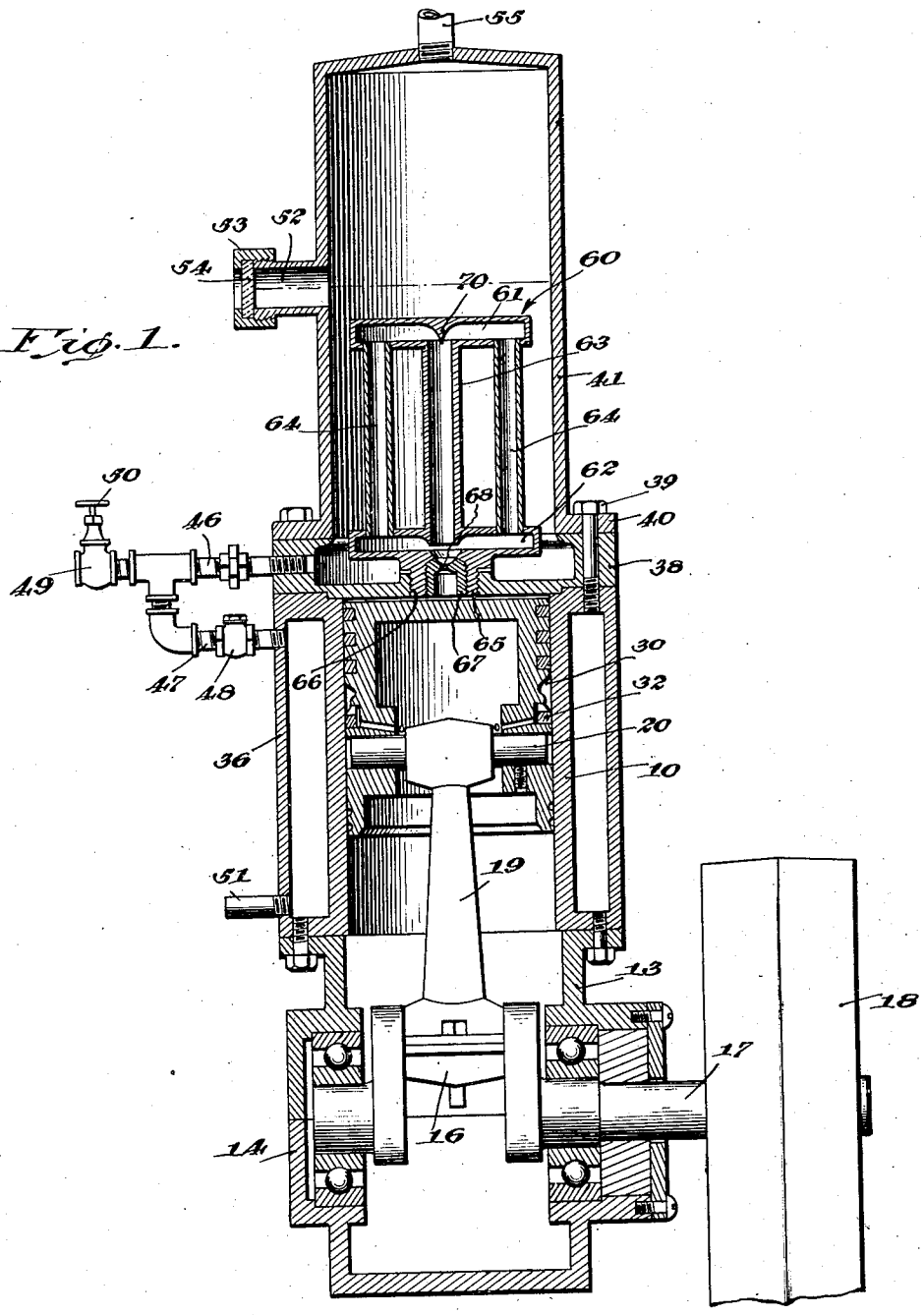
Oct. 2, 1934. J. L. WALL ET AL 1,975,440

STEAM GENERATING APPARATUS

Filed March 2, 1934 2 Sheets-Sheet 1

Fig. 1.



WITNESS

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Fig. 2.

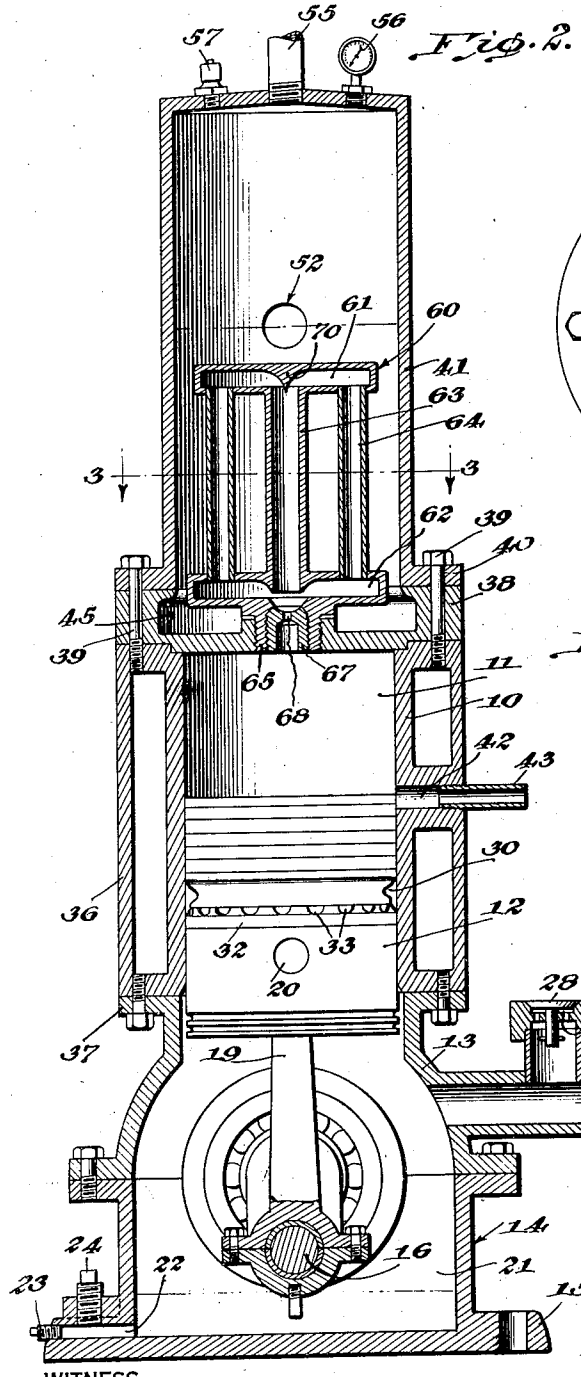


Fig. 3.

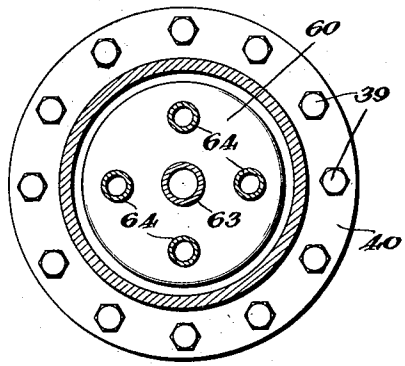
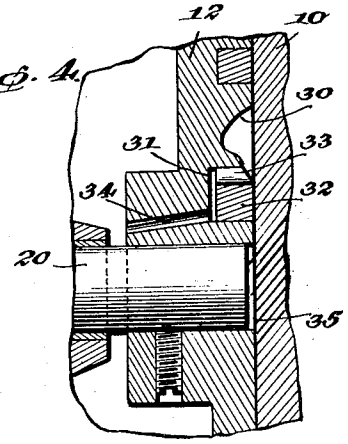


Fig. 4.



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UNITED STATES PATENT OFFICE

1,975,440

STEAM GENERATING APPARATUS

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Washington, Ga.

Application March 2, 1934, Serial No. 713,717

8 Claims. (Cl. 122—26)

This invention relates to an apparatus for generating steam.

An object of the invention is the provision of a device including an air compressor in which a restricted amount of air at each down stroke of a reciprocating piston is drawn into the cylinder and compressed with the quantity of air in the cylinder for creating a high temperature with the air being forced through a radiator submerged in the water in a boiler so that the heat may be used for converting the water into steam which is conducted away from the device and used in those plants, such as pressing establishments, where it is inconvenient or too expensive to supply a steam plant, the air compressor being driven by an electric motor.

Another object of the invention is the provision of a simple, compact, and economical apparatus for generating steam for use in establishments where the source of electricity is available but where it is impractical and too expensive to supply and operate under the usual steam generating plants.

A further object of the invention is the provision of a compact, simple, and inexpensive steam generating plant including an air compressor having a boiler connected to the cylinder head with the steam dome above the level of the water in the boiler, the heat interchange means being located in the boiler and submerged in the water, the heat exchange means including a plurality of spaced headers connected by a plurality of pipes with a restricted communication between the cylinder of the air compressor and one of the headers, the cylinder of the air compressor being provided with a restricted air port in communication with the atmosphere for supplying to the air compressor a limited quantity of air at each down stroke of the piston.

A still further object of the invention is the provision of an air compressor having a port in its cylinder wall open to the atmosphere to supply a restricted quantity of air to the air compressor at each down stroke of the piston with an annular groove in the piston so that lubricant on the walls of the cylinder and piston will be forced into the grooves and through a plurality of passages in the piston to the interior of the same for maintaining lubrication of the wrist pin and for preventing oil passing beyond the piston and into the air compression chamber of the cylinder.

This invention will be best understood from a consideration of the following detailed description, in view of the accompanying drawings forming a part of the specification; nevertheless, it is to be understood that the invention is not confined to the disclosure, being susceptible of such changes and modifications as define no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

Figure 1 is a vertical section of a steam generating apparatus constructed in accordance with the principles of our invention,

Figure 2 is a vertical section of the apparatus taken at right angles to the section shown in Figure 1,

Figure 3 is a horizontal section taken along the line 3—3 of Figure 2, and

Figure 4 is an enlarged fragmentary vertical section showing the oil grooves adjacent the crank pin.

Referring more particularly to the drawings, 10 designates an air compressor cylinder having an air compression chamber 11 with a piston 12 mounted for reciprocation within the cylinder. This cylinder is mounted upon a crank case formed of the sections 13 and 14. The section 14 is provided with a flange 15 for securing the air compressor to a support.

The piston is operated by means of a crank 16 connected to a shaft 17 which in turn is driven by a pulley 18 and this pulley is adapted to be operated in any approved manner by means of an electric motor (not shown). A rod 19 connects a wrist pin 20 of the piston 12 with a crank pin 16.

The compressor is lubricated by means of a splash system and a predetermined level of oil is maintained within the chamber 21. The oil when desired is drained through a passage 22 which is closed by a plug 23. The plug 24 is removed to fill the chamber 21 to the oil level indicated, after which the plug 24 is screwed into place.

A pipe 25 is in open communication with the chamber 21 and has an offset pipe 26 closed by a valve cage 27. A gravity valve 28 is mounted in a bearing 29 in the valve cage 27 and is open to the atmosphere to permit air to be forced from the chamber 21 upon the down stroke of the piston 12.

In view of the fact that it is necessary to maintain the air in the compression chamber 11 free from oil as far as practical, a special oiling system has been designed to provide for the lubrication of the walls of the cylinder 10 but to prevent the oil from entering the chamber 11. The piston is provided with a groove 30 to collect the oil. Below the groove is formed a ring groove 31 in which is mounted a ring 32 having a plu-

rality of transverse passages 33 through which the oil is adapted to pass from whence it travels through a passage 34 in the piston 12 and lubricates the wrist pin 20 which has its ends supported in bearings 35 of the walls of the piston 12.

The cylinder 10 is provided with a water jacket 36 and this water jacket is bolted to a flange 37 on the section 13 of the crank case and also to a head 38.

Bolts 39 securely fasten a flange 40 of a boiler 41 to the cylinder head 38 and these bolts likewise secure the cylinder head to the top of the water jacket and cylinder.

A passage 42 extends through the water jacket in the cylinder and is connected to a pipe 43 for supplying atmospheric air to the compression chamber 11.

The cylinder head 38 is hollow, as shown at 45, and this is in communication with the boiler 41 so that a portion of the water from the boiler will enter the cylinder head. A pipe 46 is connected to a pipe 47 so that water from the jacket 36 may flow into the boiler 41 but a check valve 48 prevents the water from the boiler entering the water jacket. A connection, as shown at 49, is controlled by a valve 50 for supplying the boiler 41 with a predetermined quantity of water when necessary. An inlet pipe 51 is connected with the lower end of the water jacket 36 for supplying water to the water jacket.

The boiler 41 is provided with a lateral extension 52 and a cap nut 53 by means of a sight glass 54 which closes the end of the extension 52. This extension is in communication with the boiler 41 so that the operator may inspect the water in the boiler by means of the sight glass 54.

The boiler is provided with a steam discharge pipe 55, an indicator 56, and a safety valve 57. A radiator, generally indicated by the numeral 60, is located in the boiler 41 and is adapted to be submerged in the water in the boiler. This radiator consists of a header 61, a header 62, a centrally disposed pipe 63, and a plurality of pipes 64 connecting the headers adjacent their peripheries.

The head 62 is provided with a nipple 65 which is threaded into an opening 66 in the head 38 of the compressor cylinder 10. A plug 67 is threaded into the hollow nipple 65 and has a restricted axial passage 68 for placing the compression chamber 11 in communication with a header 62. The passage 68 is located in the longitudinal axis of the tube 63. A conically-shaped member 70 depends from the inner face of the outer wall of the header 61 and projects across the top of the vertical tube 63. Thus it will be seen that when compressed air enters the pipe 63 it will be forced radially from the center of the pipe towards the plurality of pipes 64. The headers 61 and 62, the pipes 63 and 64 are formed of any suitable materials which will rapidly radiate heat from the compressed air.

The operation of our device is as follows: When the air compressor is operating this air pump is conveniently driven by an electric motor or other suitable power plant. Air is compressed in the chamber 39 while at the same time the air passes through the restricted passage 68 in the plug 67 and enters the header 62. Since the passage 68 is directly in line with the tube 63 most of the compressed air will pass through the tube 63 into the header 61 whence it will be spread out in all directions by the member 70 and it will enter the tubes 64. The construction just described provides for not only placing the air in contact with a large radiating surface but provides for the proper circulation of the air in the radiator 60.

On the downward stroke of the piston 12, the upper end of the piston partially uncovers the passage 42. At this point of piston travel, due to the partial vacuum, a portion of the air from the atmosphere will enter the chamber 11. When the air pressure in chamber 11 is equal to the atmospheric pressure and before passage 42 is closed by the upward stroke of piston 12, the remaining air under pressure in radiator 60 is of its own pressure being forced through restricted axial passage 68 into chamber 11, causing the air pressure in chamber to increase the flow out through passage 42, thus completing a partial interchange of the complete volume of air in chamber 11 and radiator 60.

Due to the compression of the air in chamber 11 and the friction of the air being forced through restricted axial passage 68 into radiator 60, a great deal of heat is developed and this is imparted to the water in the boiler 14 which creates steam. This steam is drawn off by the pipe 55 and used for any suitable purpose. As has been stated this compact unit is especially adapted for use in those establishments where it is impractical to install a steam plant of the usual type such as a cleaning and dyeing establishment, or a clothes pressing plant, and this apparatus may be used in those plants where it is necessary to have steam for treating cotton seed. This device is not to be limited to the commercial enterprises noted above since many other uses may be found for the purpose.

We claim:

1. A steam generating apparatus comprising an air compressor having a cylinder and hollow head, a boiler in direct communication with the head of the compressor cylinder and having a steam dome above the water level in the boiler, a heat radiating means having a single restricted means for placing said radiating means in communication with the air compressor and surrounded by the water in the boiler so that heated air from the compressor may be circulated in the radiating means, the lower end of the radiating means projecting into the hollow head.

2. A steam generator comprising an air compressor including a cylinder having a head, a boiler secured to said head and provided with a steam dome above the water level in said boiler, spaced headers, tubes connecting the headers, one of the headers being in restricted communication with the cylinder, the heated air from the cylinder being adapted to circulate in headers and tubes, said headers being located in the boiler.

3. A steam generating apparatus comprising an air compressor having a cylinder and head, a boiler connected directly to the head of the compressor cylinder and having a steam dome above the water level in the boiler, a heat radiating means in communication with the air compressor and surrounded by the water in the boiler so that heated air from the compressor may be circulated in the radiating means, the heat radiating means including a single restricted means for placing the radiating means in communication with the cylinder, a water jacket embracing the cylinder, and means for placing the boiler in communication with the water jacket.

4. A steam generator comprising an air compressor including a cylinder having a head, a boiler secured to said head and provided with a steam dome above the water level in said boiler,

a pair of spaced headers in the boiler, tubes connecting the headers, one of the headers being in restricted communication with the cylinder, one of the tubes being disposed axially of the headers and in line with the restricted communication, means in the other header and disposed adjacent one end of said tube for causing compressed air from the tube to radiate in all directions towards the open ends of the other tubes.

5. A steam generator comprising an air compressor including a cylinder having a head, a boiler secured to said head and provided with a steam dome, a pair of spaced headers in the boiler and in open communication with each other, one of the headers being in restricted communication with the cylinder.

6. A steam generator comprising an air compressor including a cylinder having a head, a boiler secured to said head and provided with a steam dome, a pair of spaced headers in the boiler and in open communication with each other, one of the headers being in restricted communication with the cylinder, the last-mentioned header having a nipple the head having a passage into which the nipple is threaded.

7. A steam generator comprising an air compressor including a cylinder having a head, a boiler secured to said head and provided with a steam dome, a pair of spaced headers in the boiler and in open communication with each other, one of the headers having a hollow nipple, the head having a passage into which the nipple is threaded, means threaded into the hollow nipple and provided with a passage for placing the cylinders in restricted communication with the headers.

8. A steam generator comprising an air compressor including a cylinder, a boiler, a cylinder head between the boiler and cylinder, the head having a water jacket in communication with the boiler, a pair of spaced headers in the boiler, tubes placing the headers in communication with each other, one of the headers being partially located in the water jacket of the cylinder head, said header having a restricted communication with the cylinder and supported by the cylinder head, and means for supplying a limited quantity of atmospheric air to the cylinder on the expansion stroke of the piston.

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