

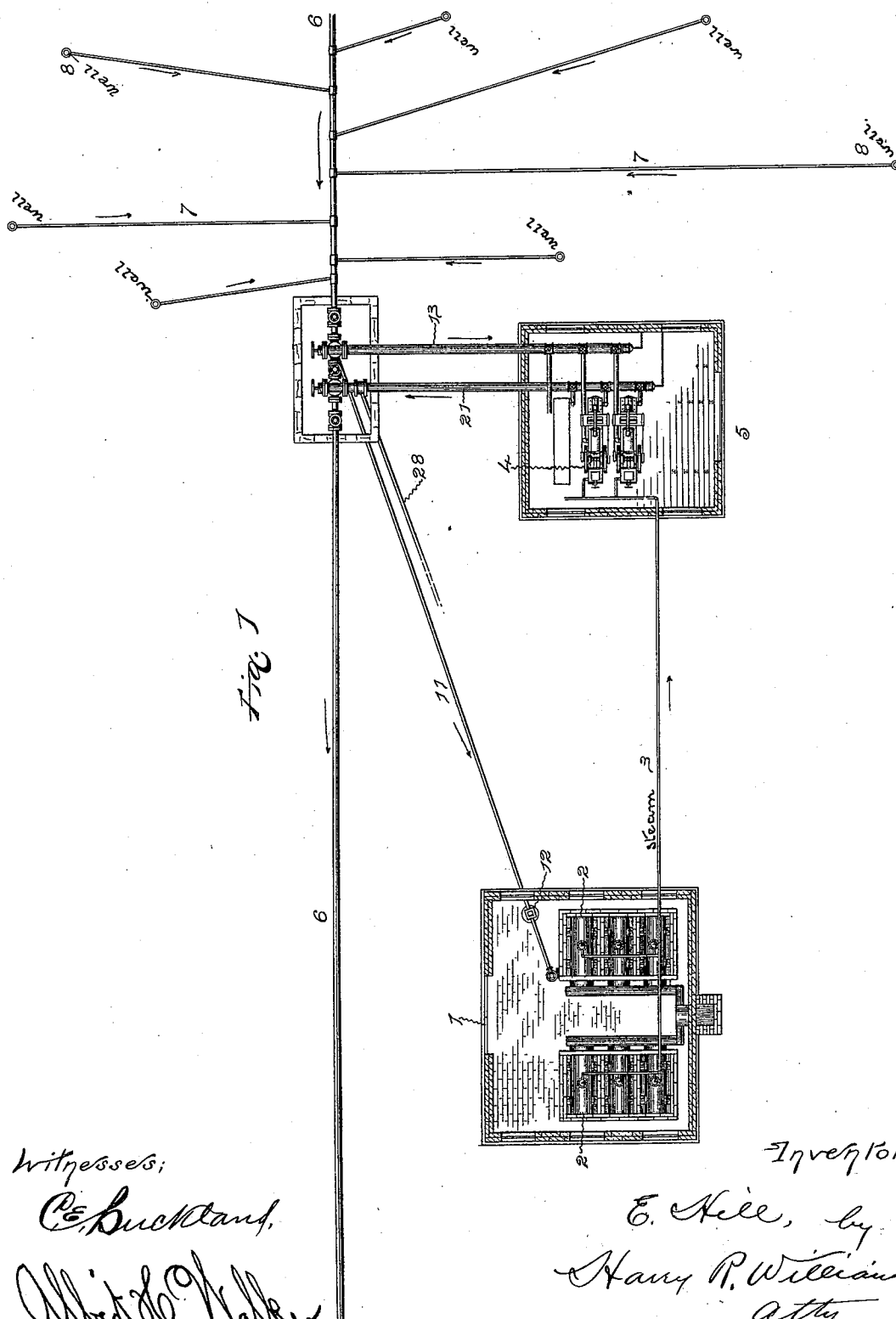
(No Model.)

2 Sheets—Sheet 1.

E. HILL.
GAS FORCING PLANT.

No. 512,703.

Patented Jan. 16, 1894.



Witnesses;

C. E. Buckland,

Albert G. Walker

Inventor

E. Hill, by
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atty.

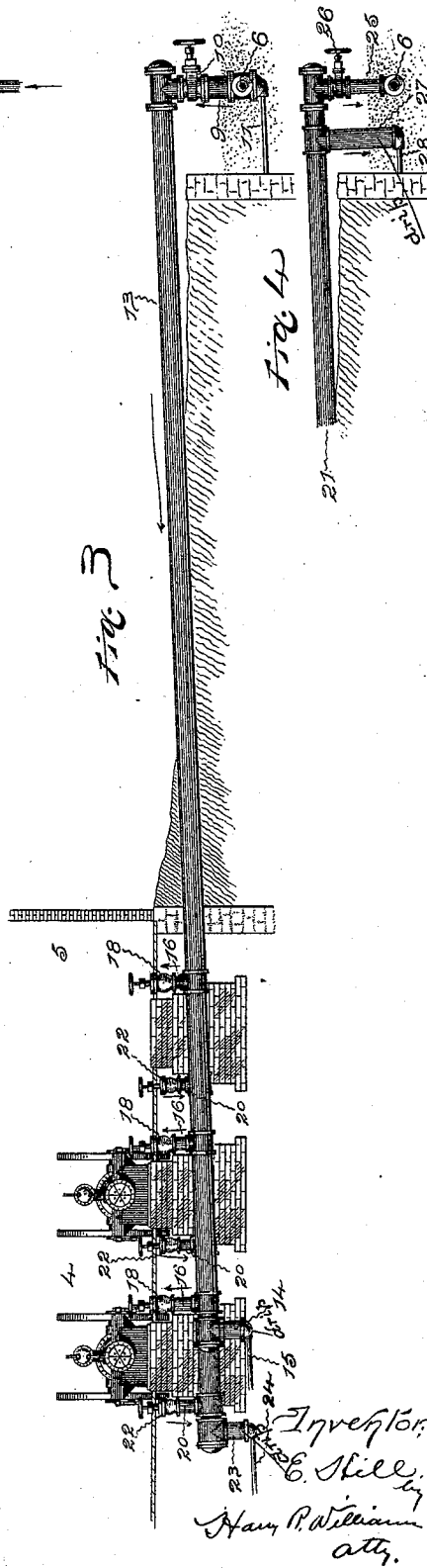
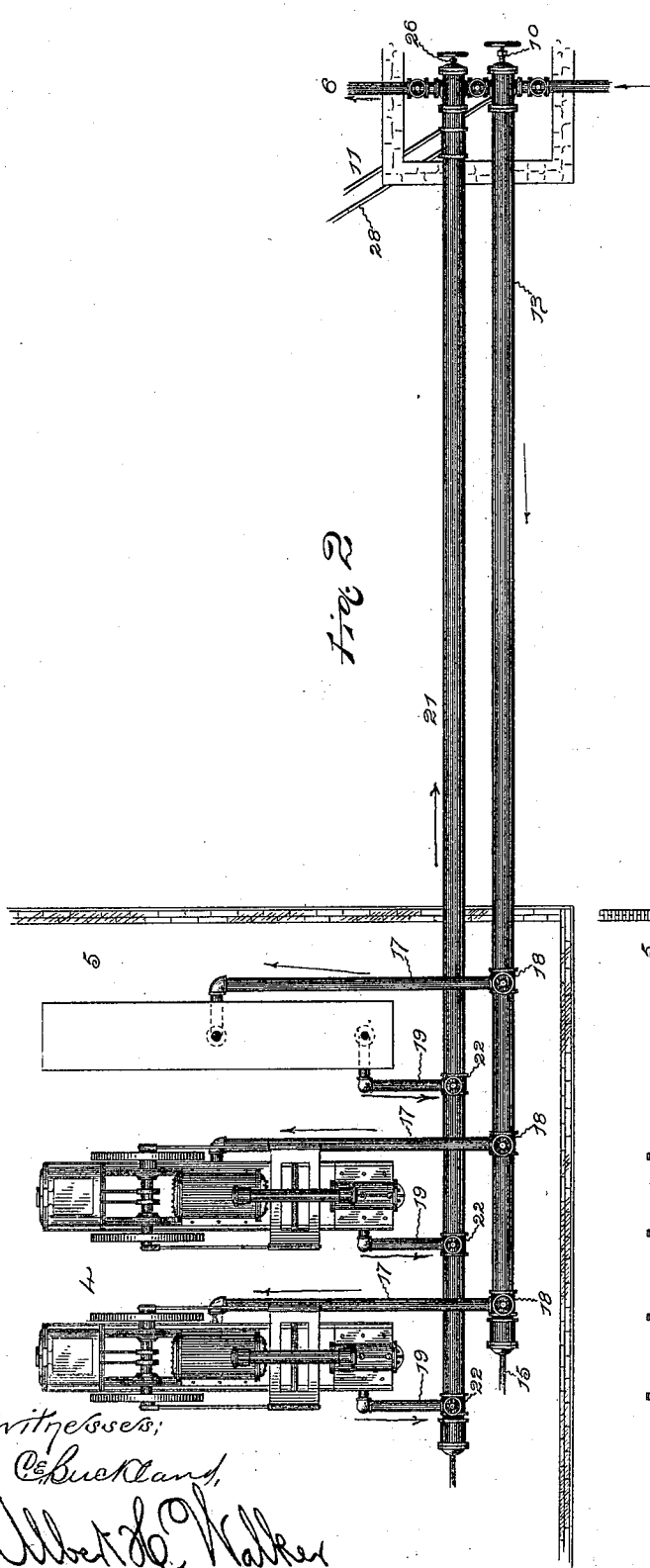
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2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

EBENEZER HILL, OF SOUTH NORWALK, CONNECTICUT.

GAS-FORCING PLANT.

SPECIFICATION forming part of Letters Patent No. 512,703, dated January 16, 1894.

Application filed October 24, 1893. Serial No. 488,988. (No model.)

To all whom it may concern:

Be it known that I, EBENEZER HILL, a citizen of the United States, residing at South Norwalk, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Gas-Forcing Plants, of which the following is a specification.

The invention relates more particularly to the plants or systems constructed for forcing natural gas from the wells to the points of consumption, which wells at certain periods and under certain conditions not only do not give sufficient pressure to cause the proper flow of gas but also flow of liquids, as oil or water.

The object of this invention is to provide an easily constructed system for forcing the gas when the natural pressure is low, in which the liquids are automatically separated from the gases by simple and inexpensive but efficient means that will not be liable to get out of repair and which can be easily inspected and cleaned.

Referring to the accompanying drawings:—
Figure 1 is a diagrammatic view of the plant. Fig. 2 is an enlarged plan of a portion of the plant. Fig. 3 is an elevation of this portion; and Fig. 4 is a detail elevation of a part not shown in Fig. 3.

In the views, 1 indicates a boiler house of convenient construction in which are located the desired number of ordinary steam boilers, 2, the plant illustrated having a double battery of three boilers each. Steam is conducted from these boilers by a pipe 3, to one or more air or gas compressors 4, located in a compressor house 5, a little distance away, the views showing two compound air compressors connected so as to be run by steam from the boilers, the compressor motors indicated being steam engines located on the same bed with and connected directly to the compressors in a common manner.

The main gas line 6, composed of pipe of suitable diameter to conduct the gas, leads to any suitable distributing point or storage reservoir, and into this run the usual small feed pipes 7, from the wells 8, that are bored or sunk in various localities.

Between the wells and the distributing point, preferably in the vicinity of the wells,

the connections between the main and the compressors are made.

Extending from the main, which is below the surface of the ground to a level preferably at or just above the surface is a pipe 9, by preference larger in diameter than the main, and from near the bottom end of this pipe, leads a small gas pipe 11, to the combustion chamber of the boiler furnaces, a separator 12, being located in the boiler house near the furnaces to separate any liquid from the gas. This pipe 9, which is provided with a valve 10, for opening and closing the passage, preferably above the surface, connects with a pipe 13, of about the same diameter, that leads on a considerable decline into the compressor house where it terminates in the vicinity of the compressors. The pipe 13, has a removable cap at each end, and at its lowest point a catch well 14, with a drip pipe 15, that usually leads to a drain, but may, of course, if desired, lead to a boiler furnace for furnishing a supply of fuel from any fluid that may collect in the well.

Connected at suitable points along the supply pipe 13, are the vertical pipes 16, joined to pipes 17, that lead to the inlets of the compressors, which pipes are provided with ordinary controlling valves, 18.

Leading from the outlets of the compressors are pipes 19, joined to the vertical pipes 20, that connect with the discharge pipe 21, these outlet pipes being of course, provided with the necessary controlling valves 22. The discharge pipe 21, extends from the compressor house to the main, usually on the same incline as the supply pipe, and has removable caps on its ends, and a catch well 23, at its lowest point, from which a drip pipe 24, leads to conduct away any liquid that may collect in the well. The discharge pipe, which is connected with the main by a pipe 25, having a valve 26, is provided near the main with another catch-well 27, and from this leads a pipe 28, to conduct away any liquid that collects in this well, or to supply a boiler furnace with gas under pressure, if desired.

The main, on each side and between the rising connections of the supply and discharge pipes, is provided with valves to control the flow of gas. When the natural press-

ure of the gas from the well is sufficient to cause a proper flow the valves each side and between the connections of the compressor supply and discharge pipes are opened, and the valves in those connections shut, allowing the gas to flow freely through the main without passing to the compressor. When however, the natural pressure is not as great as desired, the valve in the main between the compressor connections is closed and the valves in the connections opened, and when steam is sent from the boilers and the compressors are run, gas is drawn from the wells through the main and forced by the compressors again into the main and to the reservoir or distributing point. With the arrangement shown, when the natural pressure is reduced, and the wells tend to flow liquid with the gas, the gas frees itself from the bulk of the liquid at the connection of the supply pipe with the main, as at that point it rises vertically through a larger pipe than the main, and the liquid being the heavier does not rise but flows away out of the bottom through the drip pipe, or pipe which may be led to the boiler house, where, after separating the remaining gas from the liquid, this gas may be used under the boilers as fuel. As the supply pipe is above the surface at the main, the rising gas is somewhat chilled so as to condense and precipitate the vapor, and the liquid of condensation, or any other liquid that may be in the supply pipe flows down the decline into the catch well at the end, from which it is conducted away by the drip pipe. Then again there is another rise from the lower sections of the supply pipe into the compressors, so that no moisture will be sucked up, but the gas will be drawn into the compressors in a very dry state. Any liquid of condensation in the discharge pipe flows down the incline and collects in the catch well at the end, from which it is conducted away by means of the drip pipe there shown, and whatever liquid that collects in the catch well at the outer end of the discharge pipe may be conducted away by the drip pipe of this part to any desired locality. Of course, these drip pipes may lead into a drain away from the vicinity of the compressor, or they may lead to a furnace where the gas or oil can be separated from the water and used as a fuel. The fuel which flows in this manner through the drip pipes connected on one side of the compressors moves under natural head and that which flows through the drip pipes connected on the other side of the compressors moves under the compressor-head.

By means of the plant described, at any time when the natural pressure of the gas in the wells is not sufficient, that natural pressure may be supplemented by the artificial pressure produced by the compressors, and the gas forced to the distributing point by the compressors without any liability of sending through the pipes liquid or moist gas that might freeze and clog the main, and without any danger of drowning out the compressors

with liquid; so that the apparatus will work properly, and dry gas be furnished to the consumers any required distance away. This system is simple in its operation, efficient in its working and not liable to get out of repair, as there is no complicated gas and liquid separating mechanism, and it is easily inspected, for when the caps on the ends of the supply and discharge pipes are removed, those pipes can be quickly examined, and any fouling or obstacle removed, and any frozen liquid cleared away from the open pipes, the exposure above ground of the outer ends of the supply and discharge pipes allowing all moisture to be frozen from the gas in a locality from which it can be easily cleaned.

I claim as my invention—

1. A plant for forcing gas, which consists of a main leading from the gas supply or well to the distributing point, a gas compressor having branch supply and discharge pipes connected, respectively, with the main between the supply and distributing points, said branch supply pipe having a declension between its outer end, which is above the level of the main with which it is connected, and its inner end, which is connected with the compressor, and is below the level of the outer end, substantially as specified.

2. A plant for forcing gas which consists of a main leading from the gas supply or well to the distributing point, a gas compressor having supply and discharge branch pipes connected with the main between the supply and distributing point, the outer end of the supply pipe being above and connected with the main by a pipe larger in diameter than the main, substantially as specified.

3. A plant for forcing gas, which consists of a main leading from the gas supply to the distributing point, a gas compressor having supply and discharge pipes, the outer end of the supply pipe being above the surface of the ground and connecting with the main between the supply and distributing point by a descending pipe, a drip pipe leading from the bottom of the descending connection, and a motor for running the compressor, substantially as specified.

4. A plant for forcing gas which consists of a main leading from the gas supply to the distributing point, a gas compressor having supply and discharge pipes connected with the main between the supply and distributing point, a boiler for generating power to run the compressor, and a drip pipe leading from the connection between the main and the compressor-supply-pipe to the furnace of the boiler, substantially as specified.

5. A plant for forcing gas, which consists of a main leading from the gas supply to the distributing point, a gas compressor having supply and discharge pipes connected with the main between the supply and distributing point, the compressor-supply-pipe having its outer end above the level of the main with which it is connected, and its inner end, which

is below the level of the outer, provided with a catch well having a drip pipe, and a motor for running the compressor, substantially as specified.

5 6. A plant for forcing gas, which consists of a main leading from the gas supply to the distributing point, a gas compressor having supply and discharge pipes, the outer ends of which are above the surface and connected with the main below the surface of the ground between the supply and distributing point, and the inner ends of which are below the level of the outer ends, and terminate in catch wells with drip pipes leading
10 from the catch wells, and a motor for running the compressor, substantially as specified.

7. A plant for forcing gas, which consists of a main leading from the gas supply to the distributing point, a gas compressor having
20 supply and discharge pipes connected with

the main between the supply and distributing point by descending pipe connections, a catch well near the outer and higher end of the discharge pipe, a drip pipe leading from this well, and a motor for running the compressor, substantially as specified. 25

8. A plant for forcing gas, which consists of a main leading from the gas supply to the distributing point, a gas compressor having inclined supply and discharge pipes connected with the main between the supply and distributing point, catch wells at the lower ends of the inclined pipes, and removable caps on each end of the same pipes, substantially as specified. 30

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Witnesses:

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