

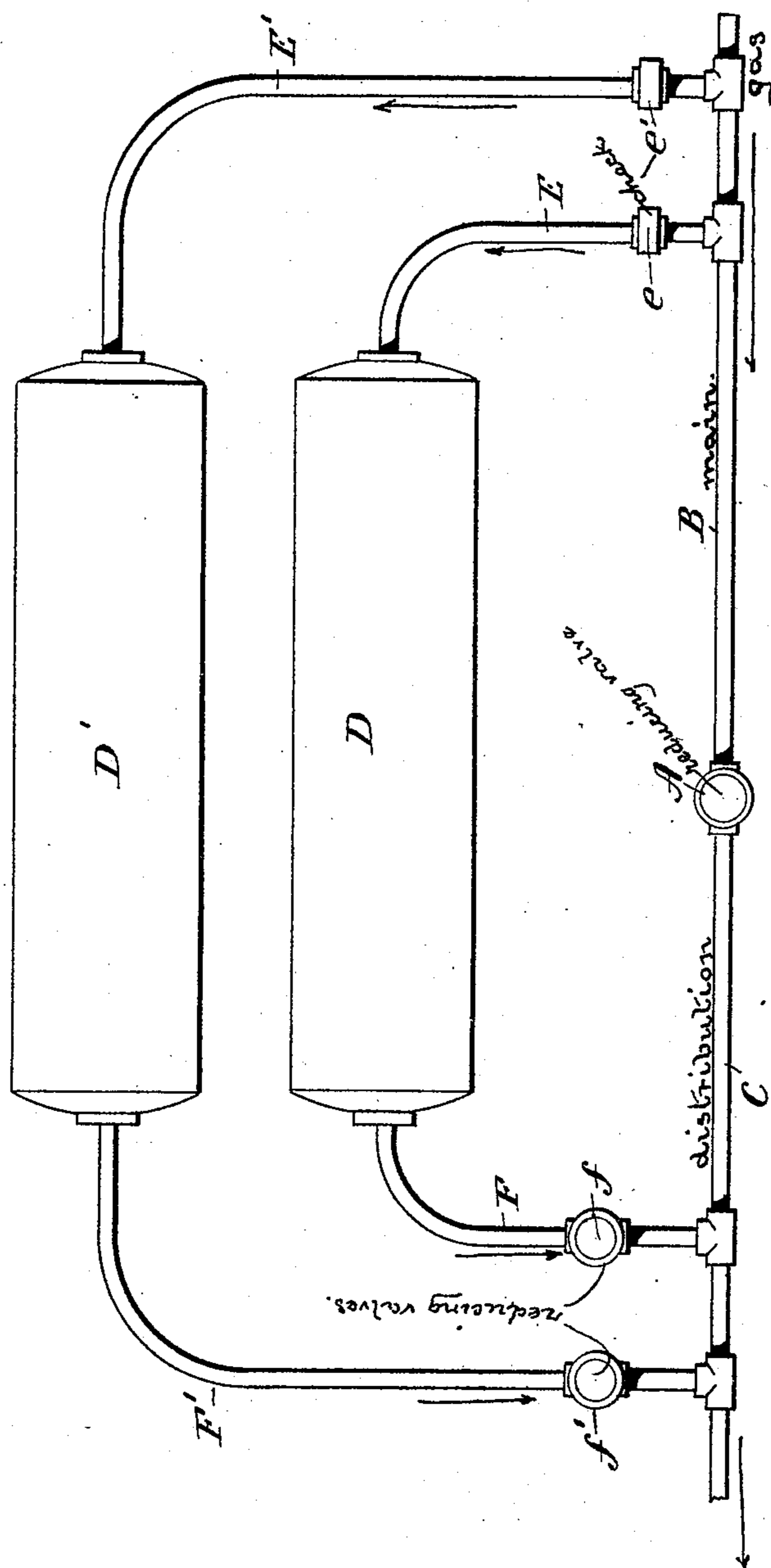
(No Model.)

E. HILL.

APPARATUS FOR STORING AND DISTRIBUTING GAS.

No. 497,545.

Patented May 16, 1893.



Witnesses.

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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR STORING AND DISTRIBUTING GAS.

SPECIFICATION forming part of Letters Patent No. 497,545, dated May 16, 1893.

Application filed March 27, 1893. Serial No. 467,717. (No model.)

*To all whom it may concern:*

Be it known that I, EBENEZER HILL, of South Norwalk, in the county of Fairfield and State of Connecticut, have invented a new Improvement in Apparatus for Storing and Distributing Gas; and I do hereby declare the following, when taken in connection with accompanying drawing and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawing constitutes part of this specification, and represents an illustrative view in side elevation of one form which an apparatus constructed in accordance with my invention may assume.

My invention relates to an improved apparatus for storing and distributing gas or compressed-air, the object being to provide for satisfying a fluctuating demand for gas or air, the supply of which is constantly varying.

While my apparatus is particularly designed to facilitate the handling of natural gas which exists under a state of high pressure, it may also be used for the storing and distribution of compressed air, and gas other than natural-gas, when the conditions of supply and demand are as above stated.

With these ends in view, my invention consists in the combination, in an apparatus for storing and distributing gas, with a supply and a distribution pipe, and a reducing valve interposed between the same, of one or more reservoirs, each connected with the supply-pipe by a branch pipe containing a check-valve, and with the distribution pipe by a branch-pipe containing a reducing-valve set to operate under lower pressure than the reducing-valve between the supply and the distribution pipes.

My invention further consists in certain details of construction and combinations of parts as will be hereinafter described and pointed out in the claims.

In carrying out my invention, I interpose a reducing-valve A, of any approved construction, between the main or supply-pipe B, and the distribution pipe C, it being understood that the supply-pipe B, leads from the gas-well, and is often many miles in length, while the distribution pipe C, is tapped and ramified, as may be required for the distribution of the gas to the several consumers thereof.

I also employ one or more reservoirs, having shown two, D, D' herein. These reservoirs have independent connection with the supply and distribution pipes, the passage of gas from the supply pipe into them, being controlled by check-valves, and the discharge of gas from them into the distribution pipe being controlled by reducing valves of approved construction, and set to operate under a lower pressure than the said reducing valve A, interposed between the supply and distribution pipes.

As herein shown, the reservoir D, is connected to the supply-pipe B, by a branch-pipe E, containing a check-valve *e*, while the reservoir D', is connected with the said supply-pipe, by means of a branch-pipe E', containing a check-valve *e'*. A branch-pipe F, containing a reducing valve *f*, connects the reservoir D, with the distribution pipe C, while a branch-pipe F', containing a reducing valve *f'*, connects the reservoir D' with the said distribution pipe.

The form, arrangement and construction of the reservoirs, pipes and valves mentioned, may be varied as desired, the drawing filed herewith serving simply to illustrate the invention.

It has not been thought necessary to explain the detailed construction of the valves, inasmuch as the construction of check and reducing valves is well-known to all familiar with the art to which this invention relates.

Having thus described in general terms an apparatus suitable for the carrying out of my invention, I will proceed to describe its operation. Let it be assumed that in the natural gas fields a well, which is not shown, supplies gas to the supply-pipe B, under a pressure of seventy-five pounds. That pressure is, however, greatly reduced by the friction of the gas with the pipe, before the gas reaches the point of distribution, but nevertheless, the gas may still reach that point at a pressure far in excess of safe and convenient use. The pressure of the gas is therefore throttled down to a low and safe limit for use, by means of the reducing-valve A, which I will assume to be set so as to maintain a pressure of one pound in the distribution pipe C. As gas at a pressure of seventy-five pounds is supplied by the well to the supply pipe B, and no gas

is used, it is evident that the pressure in the supply pipe will be seventy-five pounds throughout its length. If gas is drawn from the distribution pipe C, the tendency is to  
 5 reduce the pressure of gas in that pipe below one pound, but just as soon as the pressure in the said pipe falls below one pound, the reducing-valve A automatically opens, and restores the pressure in the pipe C, to one pound,  
 10 at which it is maintained. When the gas begins to pass from the supply-pipe B, through the valve A, to the distribution pipe C, it is apparent that the pressure in the supply-pipe will be reduced, and it will be readily understood that the demand upon the distribution-  
 15 pipe may be so great that even though the reducing-valve A, is wide open, sufficient gas cannot pass through it from the supply-pipe to the distribution-pipe, to maintain the desired pressure of one pound in the latter. Another source of supply must then be had independent of and in addition to the supply  
 20 through the valve A. This additional supply is provided for by the use of one or more reservoirs, which have independent connection, as has been stated, with the supply-pipe, by means of branch-pipes containing check-  
 25 valves. Now during the small hours of the night, or at any other time when little gas is used, the pressure will be so great in the supply-pipe that the check valves will open, and the reservoirs will be charged to a high pressure, the check-valves preventing any of the  
 30 gas from flowing from the reservoirs back into the supply-pipe when the pressure therein falls. Having assumed that the main reducing-valve A, is set to operate under a pressure of one pound, I will also assume that the reducing valve  $f$  is arranged to op-  
 35 erate under a pressure of fifteen ounces, and the reducing-valve  $f'$  to operate under a pressure of fourteen ounces. Now when the demand upon the distribution pipe C, is so great that the main reducing-valve A  
 40 is not able to maintain a pressure of one pound within the pipe C, the reservoirs will come into play for helping out the supply-pipe, which, as has been seen, is able to furnish only a certain amount of gas to the  
 45 distribution-pipe. When, therefore, the pressure in the pipe C, falls below fifteen ounces, the reducing-valve  $f$  will open, after which the pressure in the distribution-pipe will be maintained at fifteen ounces until the reser-  
 50 voir D, is exhausted. Then if the excessive demand upon the distribution-pipe C, is continued, and the pressure therein falls below fourteen ounces, the valve  $f'$  will open, and the reservoir D' will maintain a pressure of  
 55 fourteen ounces in the distribution-pipe, until the said reservoir is exhausted. If desired, other reservoirs arranged to discharge at still lower pressures may obviously be used.

There is an advantage, as I wish to point  
 65 out, in using two or more reservoirs. Gas for lighting and heating purposes is used in great quantities early in the morning, and soon after

sundown at night. In the winter the draft at night is generally the larger. With two reservoirs arranged as described, I will assume  
 70 that the demand for gas in the morning is sufficient to exhaust the reservoir D. During the day, at such time as the demand for gas may lessen, the pressure in the supply-pipe will rise, and to the amount of such rise in  
 75 pressure, the reservoir D, will be charged. It is possible that such rise in pressure during the day, may amount to twenty-five pounds, and assuming that to be the case, the demand  
 80 at evening would find the reservoir D', charged to seventy-five pounds during the previous night, and the reservoir D, charged to twenty-five pounds during the day. On  
 85 the other hand, if instead of having two reservoirs, as described, I had one reservoir of the same cubic contents as the combined contents of the reservoirs D and D', then the  
 90 morning demand, which was sufficient to exhaust the reservoir D, would not be great enough to lower the pressure of the large reservoir suggested, down to a pressure less  
 95 than about thirty-seven pounds. Therefore, when during the day the pressure in the supply-pipe rose to twenty-five pounds, no gas would be stored in the reservoir, and  
 100 the amount on hand for the evening demand would be simply what was left after the draft on the reservoir in the morning, and that would be much less than I secure  
 105 by the employment of two or more reservoirs, constructed to take advantage of comparatively slight increases of pressure in the supply-pipe. It will thus be seen that by the use  
 110 of two or more reservoirs, I am enabled to take advantage of not only the maximum pressure at night, but also of the maximum pressure during the day, between the hours  
 115 of greatest consumption. The number of reservoirs or tanks employed, and the differentiation in the reducing valves interposed between them and the distribution-pipe, will be  
 120 varied according to circumstances. I might arrange to have the reservoirs discharge simultaneously, but by preference I shall arrange them to discharge successively by a  
 125 suitable differentiation of the reducing valves between them and the distribution-pipe.

I am aware that reservoirs are very commonly employed in installations for the distribution of gas under pressure, but heretofore the actual distribution of gas has been  
 130 arranged to take place from the reservoirs first, none being drawn from the supply-pipe until the reservoirs are exhausted. In most cases the supply-pipe has been arranged to feed directly into the reservoirs, and then a  
 135 flow of gas through the supply-pipe can only take place as the pressure in the reservoirs is reduced, and the supply-pipe is able to get in its maximum work only when the reservoirs  
 140 have been entirely exhausted. On the other hand, in my apparatus, the reservoirs are not drawn upon except when the supply-pipe is unequal to the demand upon it, and then the

reservoirs do not take the place of the supply-pipe, but only make up the quota which it lacks.

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

10 1. In an apparatus for storing and distributing gas, the combination with a supply and a distribution pipe, and a reducing valve interposed between the same, of one or more  
15 reservoirs each connected with the supply-pipe by a branch-pipe containing a check-valve, and with the distribution-pipe by a branch-pipe containing a reducing valve set  
to operate under lower pressure than the reducing-valve between the supply and the distribution-pipe, substantially as described.

2. In an apparatus for storing and distributing gas, the combination with a supply and

a distribution-pipe, and a reducing-valve interposed between the same, of two or more reservoirs, each connected with the said supply-pipe by a branch-pipe containing a check-valve, and with the distribution-pipe by a  
25 branch-pipe containing a reducing valve set to operate under lower pressure than the reducing valve between the supply and distribution pipes, and the reducing-valves in the  
said branch-pipes of the reservoirs being set  
30 differentially for the discharge of the reservoirs in succession, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

EBENEZER HILL.

Witnesses:

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