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P. SHARP.

AUTOMATIC GAS CUT-OFF.

(Application filed Apr. 27, 1901.)

(No Model.)

Fig. 1.

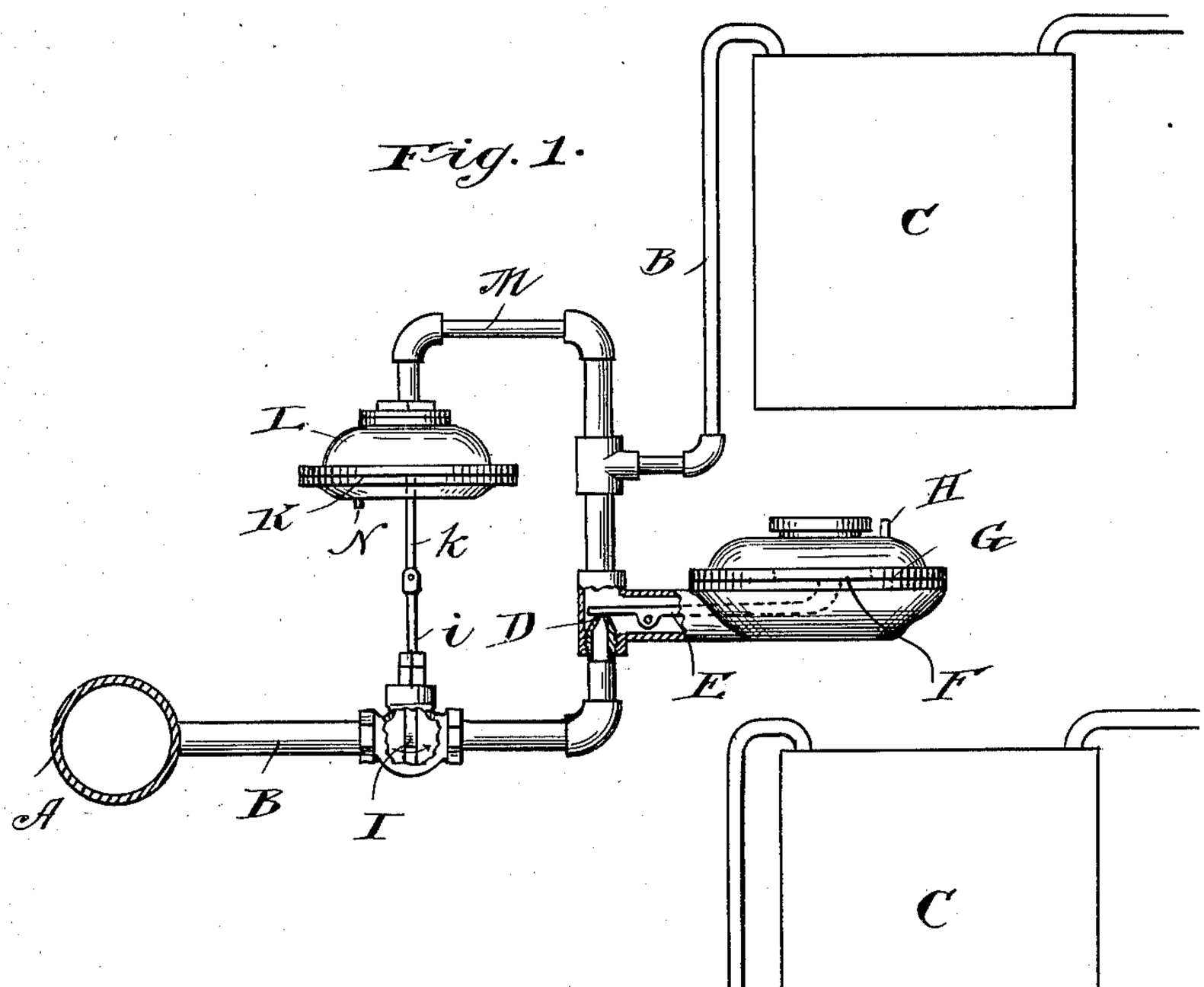

Fig. 2.

Witnesses,
D. S. Mann,
S. N. Fond.

Inventor,
Pearl Sharp,
By Offield, Dowle & Linthicum
Atty's.

UNITED STATES PATENT OFFICE.

PEARL SHARP, OF WAUKEGAN, ILLINOIS.

AUTOMATIC GAS CUT-OFF.

SPECIFICATION forming part of Letters Patent No. 685,950, dated November 5, 1901.

Application filed April 27, 1901. Serial No. 57,800. (No model.)

To all whom it may concern:

Be it known that I, PEARL SHARP, of Waukegan, Illinois, have invented certain new and useful Improvements in Automatic Gas Cut-Offs, of which the following is a specification.

This invention relates to devices for automatically cutting off, in case of accident, the flow of gas or similar fluid from a principal distributing-main, in which the gas is maintained at a considerable pressure, to and through a system of service-pipes connecting the main with individual sources of utilization, as the heat and light producing devices distributed throughout a dwelling-house or other place of gas consumption.

In modern gas-distributing systems in which the gas is supplied from a manufacturing plant to an area of considerable extent in order to reduce the cost of the system and effect an economy in the outlay required for the necessary mains and pipes the practice has arisen of making the principal distributing-mains of relatively small capacity as compared with the older practice and forcing the gas through the same by the employment of a pressure considerably in excess of that formerly employed in connection with larger mains, this pressure varying, of course, with the extent of territory supplied, but seldom falling below a minimum of five pounds, and in some cases rising to twenty-five or thirty pounds. This high pressure existing in the principal main of course necessitates the employment of a pressure-reducing valve between the main and the meter at each individual point of service, the meters being incapable of withstanding anything like the pressure maintained in the main, to say nothing of the incapacity of the gas-consuming devices to properly and economically utilize the gas at such high pressure. Heretofore in such high-pressure systems with which I am acquainted it has been the practice to apply a suitable pressure-reduction valve to the service-pipe at a convenient point in the latter between the main and the meter, such reduction-valve being controlled automatically by the usual diaphragm, while the service-pipe is tapped at a suitable point between the reduction-valve and the meter by a blow-off pipe, in which latter is included a safety-siphon in the form of a vertical loop, the two parallel legs of which contain an oil seal and the said blow-off pipe at its free end extending above the surface of the ground and communicating freely with the atmosphere. The purpose of this blow-off pipe, with its oil seal, was to prevent injury to the meter through the failure of the reduction-valve to work properly, thereby allowing the full main-pressure to escape past the reduction-valve and reach the meter. The oil seal in the blow-off pipe would normally withstand the reduced pressure at which the gas normally entered the meter; but in case the high pressure accidentally escaped past the reduction-valve the oil seal would thereby be blown out of the blow-off pipe, and thereby broken, thus furnishing a free vent for the high-pressure gas to the atmosphere and saving the meter from explosion or other injury.

The above-described safety appliance has been found unsatisfactory in practice for two principal reasons, not to mention other minor ones. In the first place, when such an accident occurred, while the meter might be saved, yet a serious leak and consequent waste of gas would arise and would continue until the leak was located and the apparatus repaired or restored to normal working condition. The leak would often be difficult of detection in a large system serving a large number of consumers. In the second place the safety device was often rendered nugatory by becoming clogged with snow, dirt, or other foreign matter or becoming filled with water and subsequently freezing.

My present invention proposes to remedy the objections alluded to by a radical change in the character of the safety appliance; and the principal object of my invention has been to provide a safety appliance which will be reliable and effective under any and all conditions of possible derangement of the apparatus and which at the same time shall absolutely prevent leakage and waste of gas when such an accident does occur by entirely and automatically cutting off the supply of high-pressure gas from the main.

To these ends my invention resides in an automatic gas cut-off constructed and operating substantially in the manner hereinafter described and illustrated and embodying cer-

tain novel features of structure and operation, all as hereinafter set forth, and defined in the appended claims.

A preferred embodiment of my invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevational view, somewhat in the nature of a diagram, illustrating the principal form of my invention; and Fig. 2 is a similar view showing a slightly-modified arrangement of the parts.

In the drawings, A indicates the principal main, communicating with the gas holders or reservoirs at the manufacturing plant. This main is tapped at numerous points by the various service-pipes B, through which gas is supplied at individual points of consumption. This pipe B extends from the main A to the receiving side of the meter, (indicated at C.) At a suitable point in the pipe B is interposed any ordinary type of pressure-reduction valve D, this latter in the instance shown being connected by a suitable pivoted arm E with the under side of a diaphragm F, contained within an inclosing casing G, said diaphragm communicating on its under side with the pressure in pipe B and on its upper side with the atmosphere through a vent H, all as is common and well understood in gas-regulators. By means of the pressure-reduction valve the high pressure in the main is reduced to a pressure suitable for consumption and such as may safely pass through the meter C without danger of injuring the same.

Referring now more particularly to the improvements constituting my present invention, I represents a cut-off in the nature of a sliding gate-valve, which is interposed in the service-pipe B at any suitable point between the main A and the reduction-valve B. The stem *i* of this valve is connected by any suitable connections (here shown as a rod *k*) with a sliding piston or diaphragm K, contained within a casing or chamber L. The top of chamber L above the diaphragm K is placed in communication with the pipe B on the low-pressure side of the reduction-valve D by means of a pipe M. A vent N in the lower face of casing L permits the free movement of the piston or diaphragm K responsive to its pressure above the same. The normal position of the valve I is open or elevated, as shown, and in practice I have found that by packing the stem *i* in a manner to make the same perfectly tight the friction between the stem and its packing, together with the high pressure acting against the under edge (which is of appreciable thickness) of the gate-valve I, is amply sufficient to maintain the said valve open against the low pressure (normally about one and one-half ounces) existing on top of diaphragm K.

The operation and advantages of my invention will be readily understood from the foregoing description. So long as the reduction-valve D properly performs its functions the valve I and its operating devices will remain idle, the gas flowing unobstructedly through pipe B at full main-pressure to the reduction-valve and thence through the extension of pipe B at the reduced pressure to the meter C; but should the reduction-valve D become disarranged or clogged or for any reason fail to work properly the full main-pressure acting through pipe M upon diaphragm or piston K will instantly force the valve I downwardly to its closed position, thereby completely cutting off the admission of high-pressure gas from the main A.

Fig. 2 illustrates a slightly-modified arrangement of the parts which may be employed when the exigencies of space or other considerations require or make preferable the placing of the diaphragm-chamber below instead of above the pipe B. In this arrangement the diaphragm-chamber is indicated by L′, and the weight of the valve, its connections, and the piston or diaphragm coöperates with the high pressure upon the upper edge of the valve to normally maintain the valve I open against the reduced pressure acting on the under side of diaphragm or piston K′ through connecting-pipe M′.

The valve I is in no sense a pressure-regulating valve with a function merely similar and supplemental to the function of the reduction-valve D and is not designed to operate at all upon the flow of gas so long as the valve D works properly. As hereinabove stated, the valve I is designed to become operative and effective only in an emergency or accident to prevent damage to the meter, and when it does become operative it constitutes a complete cut-off and not a mere pressure reducer or regulator. The valve I is not intended to and in point of fact does not automatically reopen upon a subsequent reduction of pressure beyond the valve D, but when automatically closed remains closed permanently until the regular reduction-valve D has been repaired or restored to normal operation, whereupon the valve I is again opened by hand to permit the flow of gas through the service-pipe.

From the foregoing it will be seen that my invention not only effectively safeguards the meter C against all danger of explosion or injury through exposure to the full main-pressure, but it also when called into operation completely prevents the leakage and waste of gas that has heretofore taken place by automatically cutting the gas out of the local system. The valve I is in no sense a pressure-reduction valve and is entirely idle so long as the system is working properly. It comes into play only in case of accident arising from derangement or failure to work properly of the regular reduction-valve D and when once closed remains closed until again opened manually. I have found in practice that the valve I when once closed requires a very considerable pull to open it, owing to the high pressure against its exposed face, which holds its opposite face to its vertical seat in the casing

with great tenacity. So far as I am aware I am the first to provide in connection with a pressure-reducing mechanism a cut-off valve capable of automatically effecting this desired result through a direct and positive connection with a pressure-operated piston or diaphragm. My invention, therefore, is not limited to the precise construction and relative arrangement of the parts as shown; but the latter may be varied to a considerable extent within the scope and purview of my invention.

I claim as my invention—

1. The combination with a service-pipe leading from a high-pressure gas-main to a point of consumption, of a pressure-reduction valve interposed in said pipe, a cut-off valve interposed in said service-pipe at a point between the main and the reduction-valve, and mechanism connecting said cut-off valve and the service-pipe at a point beyond the reduction-valve, through which mechanism excess pressure of the gas above the limit of normal pressure is directly transmitted to the cut-off valve to close the same, substantially as deseribed.

2. The combination with a service-pipe connecting a high-pressure gas-main with gas-consuming devices, of a pressure-reduction valve interposed in said pipe, a cut-off valve also interposed in said pipe between the main and the reduction-valve, a diaphragm directly connected with and adapted to positively actuate said cut-off valve through its closing movement, and a pipe through which the diaphragm is placed in free and constant communication with the low-pressure side of the service-pipe, whereby excess pressure of the gas above the limit of normal pressure is directly transmitted to the cut-off valve to close the same, substantially as described.

3. The combination with a service-pipe connecting a high-pressure gas-main with a meter, of a pressure-reduction valve interposed in said pipe, a sliding gate-valve also interposed across said pipe between the main and the reduction-valve, a diaphragm directly connected with and adapted to positively actuate said gate-valve through its closing movement, and a pipe through which the diaphragm is placed in free and constant communication with the low-pressure side of the service-pipe, whereby excess pressure of the gas above the limit of normal pressure acts positively through said last-named pipe, the diaphragm or piston, and its connections to the gate-valve to close the same, substantially as described.

PEARL SHARP.

Witnesses:
JOHN B. PITTS,
JOHN LIND.