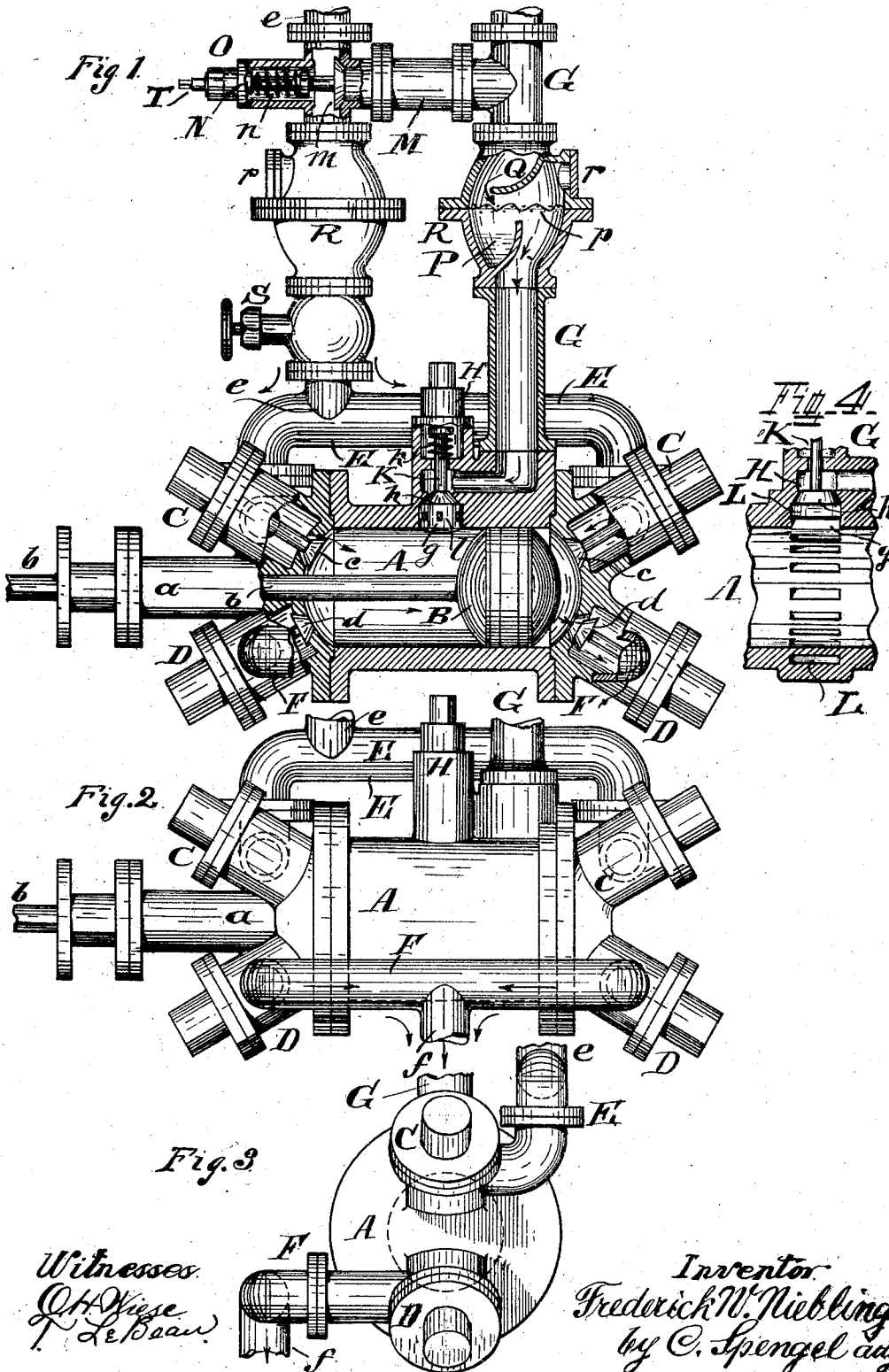


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F. W. NIEBLING.
COMPRESSION PUMP.

APPLICATION FILED DEC. 10, 1906.



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COMPRESSION-PUMP.

No. 851,248.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, FREDERICK W. NIEBLING, a citizen of the United States, and residing in the city of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Compression-Pumps; and I do declare the following to be a clear, full, and exact description thereof, attention being called to the accompanying drawings, with the reference characters marked thereon, which form also a part of this specification.

This invention relates to improvements in compression pumps used in connection with machinery for refrigerating and ice-manufacturing purposes. In such connection these pumps are used to effect circulation of the refrigerating agent, usually ammonia gas by moving the same through the various parts, pipe-systems etc., of a plant, the attenuated gas being received by these pumps and after compression forced by them again into the system.

The object of my invention is to arrange such a pump in a manner whereby it becomes enabled to operate upon gases at different pressures and receive them at the same time, but from different parts of a plant where different temperatures prevail, as for instance in cooling-rooms, brine-tanks etc.

In the following specification and particularly pointed out in the claims at the end thereof, will be found a full description of my invention, together with its operation, parts and construction, which latter is also illustrated in the accompanying drawing, in which:—

Figure 1, shows such a pump, the cylinder of the same and adjacent parts being in section. Fig. 2, is an external view thereof. Fig. 3, is an end-view of the same. Fig. 4, in a view similar to Fig. 1, shows middle-portion of the cylinder, the construction of certain parts being modified.

In the drawing A, is the pump-cylinder, B, the piston operating therein, *b*, the piston-rod on it and *a*, the stuffing-box through which it passes.

C, C, and D, D, are valve-chambers, the first containing the receiving valves *c*, *c*, and the other, the discharge-valves *d*, *d*. Valve-chambers C, C, are in open communication with each, other, being connected by a side-

pipe E. Valve-chambers D, D, are likewise in open communication, being connected by a side pipe F. This permits the valves to operate alternately in response to the action of the piston, a receiving-valve at one end, and a discharge-valve at the other end always working together.

The attenuated gas having done its work is received by side-pipe E, entering through a pipe *e*, and after compression in the pump is forced out by it through the side-pipe F, and by pipe *f*, reenters the circulating system of the refrigerating plant. This general arrangement of the pump is not new. Pipe *e*, is used to carry gas which has been used to produce low temperatures in certain parts, (rooms, tanks) of the system where such is needed, and which is returned at correspondingly low pressure. Gas which has been used to produce higher temperatures in other parts of the plant and returns at higher back pressures is received through a separate pipe G, entering cylinder A, through a port *g*. Passage through this port is controlled by a valve *h*, contained in a valve-chamber H. The stem K, of this valve has a shoulder at its end and a spring *k*, is provided whereby this valve is kept normally closed. A number of bars *l*, are provided across port *g*, and below this valve *h*, whereby this latter is prevented from dropping into the cylinder, should it ever become detached from its stem. The construction shown in Fig. 4, obviates this, the inlet ports being in form of narrow, elongated openings, which communicate with valve-chamber H, by means of an annular passage L. Some distance from their discharge ends, low pressure pipe *e*, and high-pressure pipe G, communicate with each other by means of a branch-pipe M, controlled by a valve *m*. The stem N, of this valve is contained in a valve-chamber O, and provided with a spring *n*, keeping valve *m*, normally closed.

Each of the pressure-pipes is provided with a pocket P, forming a trap to retard liquid matter, and a screen *p*, to catch any solid substances which perchance might possibly have entered the circulation. Above this there is a deflector Q, which intercepts passage of liquid matter and guides it into trap P. These devices are contained in a housing R, to which access may be had through a hand-hole *r*.

Valves as shown at S, may be provided in both pressure-pipes to positively control passage through them. Ordinarily however they are not used during normal operation of the plant.

Describing now a given case, let it be assumed that in certain parts of a plant, whatever they may be, cooling rooms, or brine-tanks, temperatures are to be produced as low as 10 degrees. The ammonia-gas which has produced this effect is returned to the compression pump through pipe *e*, its pressure, sometimes also called back-pressure, under which it is so returned, being governed by its temperature and is in the case given approximately 15 lbs. In other parts of the plant temperatures may be needed not lower than 30 degrees, the gas from which will return at a back-pressure of approximately 35 lbs. In practice however these two pressures cannot be moved in one pipe-system and cylinder because the high-pressure gas, if admitted with the lower pressure gas, will retard and crowd back this latter gas at the point where the two come together, thus interfering with obtaining cooling effects as low as intended. But since in a given case a certain lowest temperature usually must be obtained, plants are arranged and run so that gas at the lower pressure only is returned to the pump and moved by it. This means however at the same time that only a limited volume of gas is received and compressed at each stroke and as a result the compressor has to be worked at a higher rate of speed in order to accomplish its work, since a certain quantity of gas and ammonia has to be moved through the plant to do a given amount of work. The advantage of moving more gas at one stroke and thus running the pump at a slower speed, if gas of higher pressure could also be admitted to the pump, is thus lost, and as a result lower temperatures are produced in certain parts of the plant where they are not needed and the pump has to do this unnecessary work merely to produce the lower temperatures required in other parts. To overcome these difficulties and to obtain the advantage which would be gained, if the cylinder could also move at the same time gas coming from parts where it is carried at a higher pressure, this higher-pressure gas is admitted through pipe *G*, and enters the cylinder directly and independently of any passages where it would come in conflict with the low-pressure gas, and whereby it would affect this latter in a manner to cause an unfavorable re-action on the system. After once in the cylinder, it is clear that it cannot in any way affect the pressure in the low-pressure parts of the plant, because the valves prevent it from returning through the cylinder into the pipe-system. Since gas at

high-pressure means also more gas as to volume, it is clear that the compressor is now at the same time doing more work, because instead of moving with every stroke, gas only at the lower pressure, which means a comparatively small quantity of it, it now moves at the same time more gas, the increase being due to the additional high-pressure gas which enters through port *g*.

Valve *m*, which controls passage through pipe *M*, connecting high and low-pressure pipes, operates automatically, the object being to admit in the usual way and through valves *c*, *c*, any excess of gas returning through pipe *G*, and which cannot enter through port *g*. It can be set to open at any particular pressure and which in the case assumed would be at 35 lbs. so that, whenever the pressure in pipe *G*, should rise above this figure, the excess would flow over into pipe *e*, and by it enter the cylinder in the usual way. For the purpose of such adjustment, the pressure of spring *n*, is accordingly regulated by means of a stem *T*, carrying a movable shoulder, against which the outer end of spring *n*, bears. The same arrangement and construction described is also applicable to a single-acting compressor-pump.

Having described my invention, I claim as new:

1. In a compression pump, the combination of the cylinder thereof having valve-chambers at opposite ends and one between them, which chambers all communicate with the cylinder, an inlet valve in each of these chambers controlling this communication automatically, a low-pressure pipe communicating with the valve-chambers at the ends, a high-pressure pipe communicating with the other valve-chamber, a pipe connecting high and low-pressure pipes, and a valve controlling automatically passage through this pipe.

2. In a compression pump, the combination of the cylinder thereof having the usual inlet and discharge-valves, valve-chambers for them, a low-pressure pipe communicating with the valve-chambers of the inlet-valves and a high-pressure pipe communicating with the cylinder independently of these valve-chambers.

3. The combination with a compression-pump and the usual return pipes connected therewith, of a trap provided for these pipes and consisting of a housing open at opposite ends and alined with a pipe, a pocket contained in this housing, a screen above this pocket and a deflector above the screen.

In testimony whereof, I hereunto set my signature in presence of two witnesses:

FREDERICK W. NIEBLING.

Witnesses:

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T. LE BEAU.