PATENT SPECIFICATION

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2596

COMPLETE SPECIFICATION.

Improvements in Devices for Simultaneously Effecting the Compression and the Circulation of Gaseous Mixtures.

I, GEORGES LEON EMILE PATART, a citizen of the Republic of France, of 50, rue Spontini, Paris, Seine Department, France, Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The major part of the processes which are at present in use for effecting the synthetic combination of gases under pressure consist in circulating the mixtures of these gases, which have been preliminarily compressed, over a catalyst which is contained in a reaction chamber. After each passage over the said catalyst, the portions of the gases which have combined are eliminated from the mixture by dissolving, liquefaction, combination, or other suitable means, whilst the part which has not entered into combination is circulated under pressure over the said catalyst together with a fresh quantity of gas which replaces the amount which has entered into combination and has been therefore eliminated.

The functioning of processes of this kind is attended with serious difficulties (—when high pressures must be employed as is the general rule—) as concerns the construction of the circulation pumps which must operate at maximum pressure both for suction and delivery. It will thus be necessary to employ stuffing boxes which are large and complicated and, in spite of this precaution, leakage cannot be avoided, and this will occasion serious inconvenience and even a certain danger when the gases in circulation are of a noxious character, for instance, when they contain ammonia, or carbon monoxide. But it has been found according to the present invention that the construction of circulation pumps can be much simplified and the risks of leakage diminished by combining, in one apparatus, the compressor itself and the circulation pump in such manner that the said pump will have but a single joint where it is connected with the last cylinder of the compressor, the latter being supposed to comprise a plurality of cylinders in alignment, although it will be understood that the invention can be used where the compressor comprises a single cylinder.

In this manner the gas which tends to escape from the cylinder of the circulation pump, through the packing around the piston, or piston-rod, will have no exit other than into the last, (or high pressure), cylinder of the compressor, this cylinder operating at the highest pressure employed in the latter apparatus, or near that of the gas in the circulation pump; so that the leakage will be reduced to a minimum for any given packing arrangement, and the leaking gas will be returned to the circuit and cannot escape into the atmosphere.

The single figure of the drawing appended to the present description shows an example of the said arrangement as applied to a compressor which herein comprises three stages of compression, and the said stages may also represent the last three stages of a compressor having a greater number of stages. It is also supposed that the cylinders are disposed in tandem, (as is the general rule) with the several pistons mounted upon a common piston rod.

The gases which are withdrawn through the conduits 1, 1 and enter into contact with both faces of the first piston 2, which operates, by double action, in the cylinder 3, 3, are discharged through the conduits 4, 4, traverse the cooling device 5, and enter the second cylinder 6, 6 in which they are again compressed by the piston 7; they are then discharged through the conduits 8, 8, traverse the cooling device 9, and enter the third cylinder 10, 10 in which they are compressed by the piston 11, and are discharged through the conduit 12. They

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may be cooled by the cooling device 13, before entering the reaction chamber 14, in which the gases become partially combined. The combined portion is eliminated in the separating device 15, whilst the uncombined portion proceeds through the conduit 16, 16 to the circulation pump whose cylinder 17, is a restricted extension of the third cylinder 10, 10, of the compressor itself, the piston 18, of the said cylinder being formed by the extension of the piston rod 11; the gases are discharged by the piston 18, through the conduit 19 into the pipe 12, preceding the reaction chamber.

The cooling device 13,—if such be used,—may obviously be disposed at 13^1, forwardly of the junction of the conduit 19, with the conduit 12.

If a plurality of compressors be mounted in parallel, the conduits respectively connecting the different cylinders may be suitably inter-connected, and the same is true for the circulation pumps which may be mounted upon each compressor or upon one, or more than one, compressor.

In like manner, the circulation pump, instead of being placed at the end of the compressor, may constitute only the next to the last stage thereof, this being however less advantageous. The important point is that its cylinder shall communicate with the atmosphere, at the joint of its piston, or piston-rod, solely through the medium of the cylinders of the compressor wherein the operating pressure is the highest.

Obviously, the cylinder volume of the circulation pump should have a determined ratio to the volume of the cylinder which is adjacent the compressor, taking due account of the amount of the gases which are combined during each passage at the same through the reaction chamber. But should it be desired, during the course of the operation, to vary the amount of gas circulated, without any change in the output of the compressor, —its speed being thus unaffected,—this may be carried out, according to the present invention, by disposing, between the suction conduit 16, and the discharge conduit 19, of the circulation, a branch conduit 20 whose flow will be regulated by more, or less, opening the controlling valve 21, which may be either single, or double. Inversely, should it be desired to vary the output of the compressor without any change in the amount of the circulation, the plant will comprise, between the suction conduits 1, 1, and the discharge conduits 4, 4 of the first cylinder of the compressor, a branch conduit 22, whose output is regulated by more, or less, opening the controlling valve 23. This branch 22, may obviously be disposed between the suction end of the first cylinder and the delivery conduit of any one of the other cylinders.

I am aware that it has already been proposed in a carbonic anhydride refrigerating machine to provide a double-acting piston working in a cylinder, the said piston acting to compress gas on either side so that it is possible that gas may escape past the piston from one side to the other side thereof; but it must be observed that, according to the present invention, I combine with a compresser, which may be of any suitable kind, a circulation pump and not another compressor and that the circulation pump is constituted by a piston and cylinder which is distinct from the piston and cylinder of the compressor but is in alignment therewith.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. An arrangement for effecting the simultaneous compression and circulation of gaseous mixtures, and chiefly of those which are adapted for chemical synthesis under pressure, the said arrangement consisting in using a compressor having one, or more than one, cylinder and in disposing a circulation pump, constituted by a piston and cylinder distinct from the piston and cylinder of the compressor, in line with, and in immediate proximity to, the said cylinder of the compressor, the piston of the compressor pump acting conjointly with the piston of the circulation pump, so that any leaking gas in the circulation pump will have no other issue than the said cylinder of the compressor and will be discharged into the circuit.

2. An arrangement as claimed in Claim 1 consisting in using a compressor pump having a plurality of cylinders and in varying the respective outputs of the circulation pump and of the compressor by the use of branch conduits between the suction and the delivery conduits of the pump, on the one hand, and of the first cylinder of the compressor, on the other hand.

Dated this 16th day of January, 1925.

JOHNSONS & WILLCOX,
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Agents.

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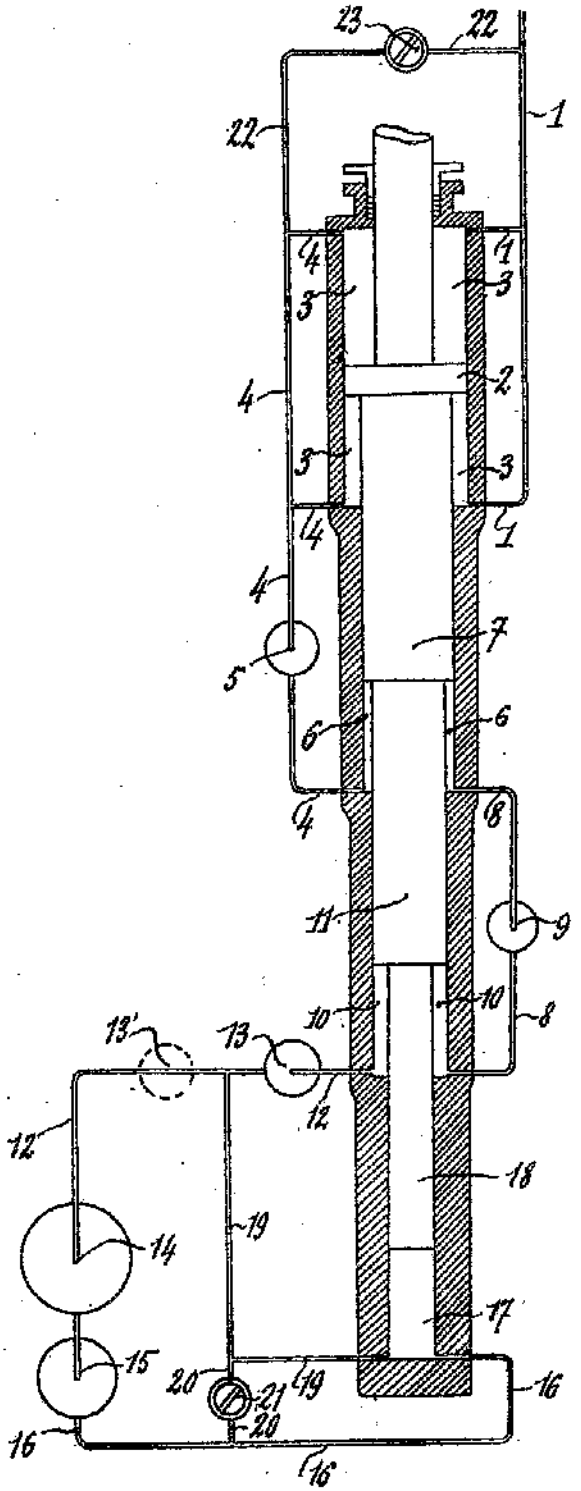
[This Drawing is a reproduction of the Original on a reduced scale]



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