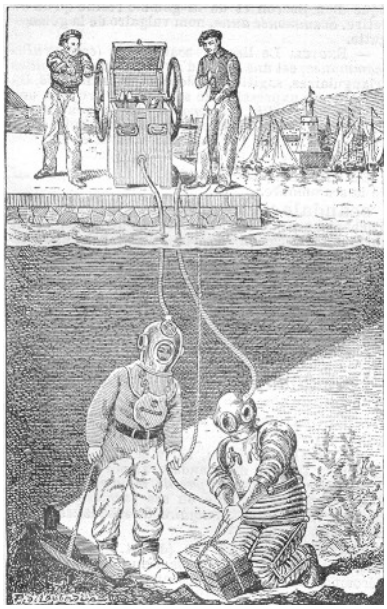
Water in the gas generator …

When, for the first time, in 1936, Jacques-Yves Cousteau tried on the diving goggles lent to him by his friend and captain Philippe Tailliez, he was immediately enchanted by the landscape that opened up before him. He was so enchanted by the undersea world that henceforth he became obsessed with the idea of allowing humans to penetrate its secrets.



Existing diving apparatus was much too restrictive to achieve this, since it comprised a hose which fed oxygen to the diver from the surface and which was liable to get caught at any time, thus depriving the diver of vital oxygen. A solution had to be found that would give the diver complete autonomy.

While the three « mousequemers » Cousteau, Tailliez and their friend Frédéric Dumas were accumulating dives, the war and its restrictions led Emile Gagnan, an « Air Liquide » engineer, to develop a control valve for gas generator motors.

In those days, when petrol supply was difficult, fuel was provided by wood. From partial wood combustion, gas generators were able to produce carbon monoxide that was then burned in spark ignition engines. The problem with these gas generators, apart from their relatively low yield, was that the outlet pressure of the gas was much too high for it to be used as it was in existing engines. The pressure thus had to be adapted while controlling the gas flow.

When Gagnan was introduced to Cousteau by his father-in-law, the conversation quickly turned to the technical aspects of regulating gas flow and gas pressure

reduction. If the « Gagnan » valve solved the problem for a gas generator motor, why shouldn't it do the same for the compressed air from a diver's tank?

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Perfectionnements aux installations pour la respiration des scaphandriers.

Société dite : L'AIR LIQUIDE (Société anonyme pour l'étude et l'exploitation des procédés Georges CLAUDE) et M. Jacques-Yves COUSTEAU résidant en France (Seine).

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[Brevet d'invention dont la délivrance a été ajournée en exécution de l'art. 11 § 7 de la loi du 5 juillet 1844 modifiée par la loi du 7 avril 1902.]

La présente invention est relative à des perfectionnements apportés aux installations pour la respiration de scaphandriers qui fonctionnent en circuit ouvert, c'est-à-dire sans réutilisation du gaz expiré par le scaphandrier ; dans ces installations, celui-ci respire par une embouchure qui est par exemple maintenue par un collier élastique qu'il serre dans sa bouche, (ou tout dispositif analogue) et par laquelle arrive le gaz à respirer, le gaz expiré étant rejeté dans l'eau. Dans lesdites installations, le gaz respirable est fourni sous une certaine pression, mais il n'arrive au scaphandrier que par l'intermédiaire d'un détendeur dont la membrane est soumise à la pression de l'eau sous laquelle opère le scaphandrier.

Une première caractéristique de l'invention consiste en ce que ce détendeur est un détendeur de dépression, c'est-à-dire qu'il fonctionne sous l'action de la dépression causée par l'inspiration du scaphandrier ; sous chacune de ses inspirations le clapet ou soupape du détendeur s'ouvre, puis il se referme à la fin de cette inspiration. De cette façon, le scaphandrier n'est alimenté que par la quantité de gaz juste nécessaire, et aucune perte de gaz respirable n'a lieu comme au contraire cela se produit dans les installations où le gaz est débité d'une façon continue. D'autre part, comme la membrane du détendeur placé de préférence au voisinage des poumons, est soumise à la pression de l'eau sous laquelle opère le scaphandrier, le gaz respirable arrive, après que l'inspiration du scaphandrier a ouvert la soupape du détendeur, sous la pression nécessaire, et on réalise ainsi automatiquement l'équilibre de pression entre le gaz inspiré et l'eau ambiante.

Une autre caractéristique de l'invention, et qui peut être employée isolément ou en combinaison avec la caractéristique ci-dessus, consiste en ce que l'évacuation dans l'eau du gaz expiré par le scaphandrier se fait non pas autour de l'embouchure portée par lui, mais au voisinage immédiat de la membrane du détendeur. De cette façon, le scaphandrier peut prendre toutes les positions possibles sans risquer l'inconvénient de l'ouverture spontanée du détendeur lorsque celui-ci se trouve à un niveau sufflamment inférieur à celui de l'évacuation dans l'eau des gaz respirés, ce qui constituerait un gaspillage de gaz respirable. Dans tous les cas, l'orifice d'évacuation de l'air expiré

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Prix du fascicule : 15 francs.

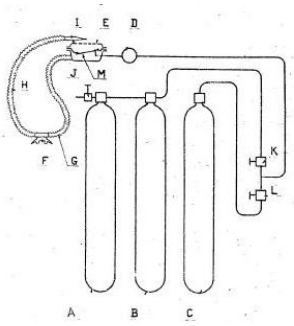
After several months of adjusting and adapting the valve to the constraints of the aquatic environment, the divers' regulator was finished and worked to the complete satisfaction of the three "mousquemers", who thus opened the door to the "silent world".

The invention was patented in 1943 by Cousteau and "Air Liquide", which, three years later, created the subsidiary "La Spirotechnique", currently still a leader in diving equipment, and of which Cousteau was to become director.

From the filing of this patent application until his death in 1997, Cousteau benefited from an "annuity" from the royalties on the turnover of "La Spirotechnique". Given the considerable development of the new sport of diving, made possible by his invention, this annuity provided him with a comfortable income.

Thus the patent fulfilled its function perfectly. From the public's point of view, it made technical knowledge available to interested researchers enabling new products to be developed, adding improvements as regards comfort and safety. This also contributed to opening up a new field of knowledge, marine ecology, the importance of which has continually increased over time. From the patent holders' point of view, the patent gave them a monopoly right that converted into hard cash, thus rewarding them for their creative activity. This monopoly right also enabled them to control the manufacture of the invention, both from a commercial point of view and from the point of view of quality, and to attract investors and other patrons.

It may seem as though each of the technical elements that led to the invention of the regulator already existed, in a more or less similar form to the final form. A valve of the same type had already used similar principles for miners for example. So, was the grant of a patent justified?



Yes, without any doubt, since prior valves did not resolve certain problems. Activation of the regulator on inhalation by the diver, for example, meant that the exact quantity of air necessary was supplied without any waste of breathing gas.

Exhausting the expired air in immediate proximity to the regulator membrane enabled the diver to adopt all possible positions, without any risk of the regulator opening spontaneously when it was at a lower level than the exhaust.

This invention was certainly more of an improvement on existing devices used in other fields than a real technical revolution. In spite of this, or perhaps because of it, it was a true commercial success for which its designers have been rewarded; a reward that the patent was certainly instrumental in securing.