

# The Siebe Gorman Mistral

Der nachfolgende Beitrag soll die fundierten Beiträge von Lothar Seveke in der Tauchhistorie 4 und 5 über die Entwicklung der berühmten französischen Lungenautomaten CG 45 und Mistral ergänzen. Der Tauchhistoriker Bob Campbell berichtet hier, wie die traditionsreiche englische Tauchgerätefirma Siebe & Gorman die französischen Konstruktionen in Lizenz baute und auch variierte.

## The Siebe Gorman Mistral

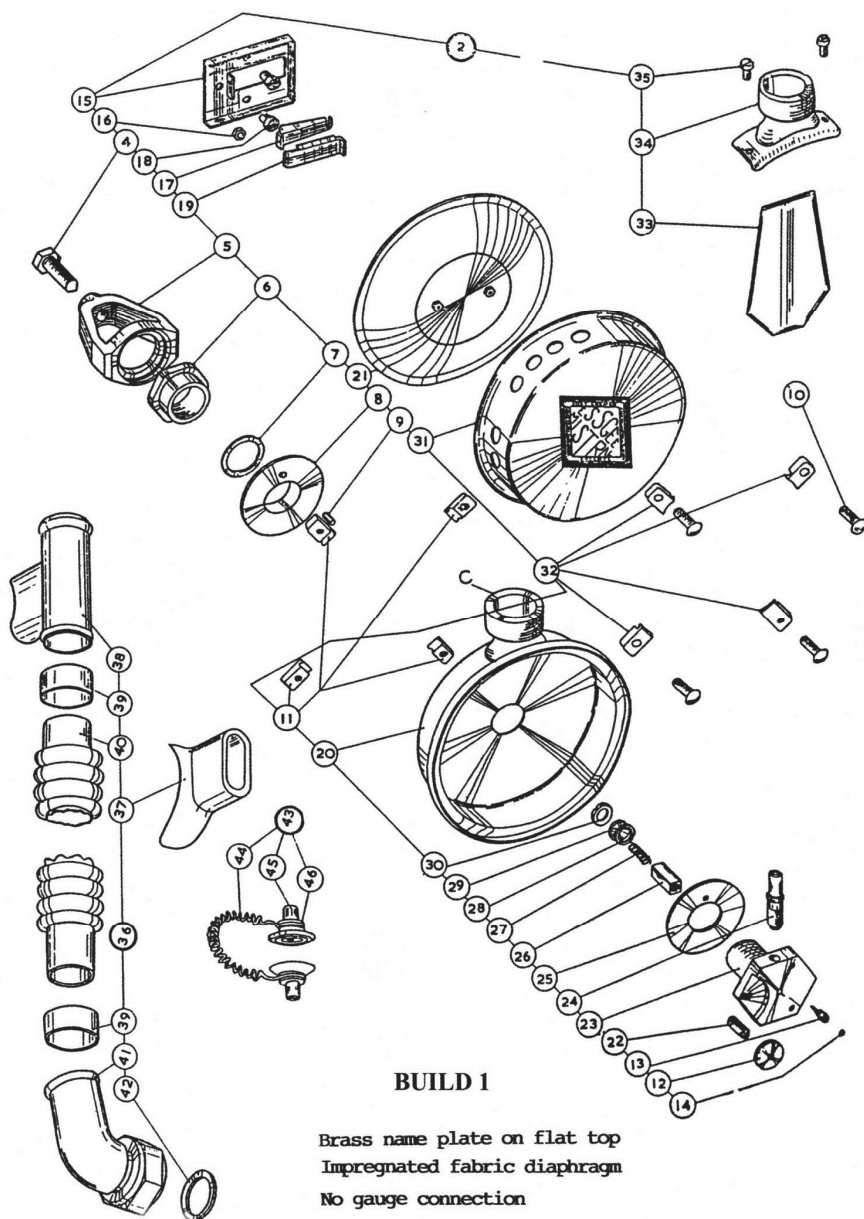
Siebe Gorman produced the Mistral single stage, twin hose, demand valve from 1956 to 1972. It was built under licence from Spirotechnique being a copy of the Spiro 'Mistral STD'. The Siebe Gorman version followed closely the configuration of the French model, but introduced enough changes to define it as their own version whilst maintaining the same working principles.

Over the twelve years of Siebe Gorman production a progressive series of alterations was made in the detail of the configuration. However, Siebe never distinguished these changes, there was no introduction of mark numbers, or even model year numbers to show that the build standard had been altered in some way. Outwardly it remained a Mistral, plain and simple. By tracking these alterations it is possible to identify six stages, where the alterations were significant enough to justify calling it a change of build standard.

This review will work through the succession of build standards for the benefit of collectors and restorers with advice, hints, tips and warnings.

### 1st Build Standard, 1956

Easily recognised, as this initial model does not feature a pressure gauge connection. The top casing is flat and carries a diamond shaped metal name plate bearing the



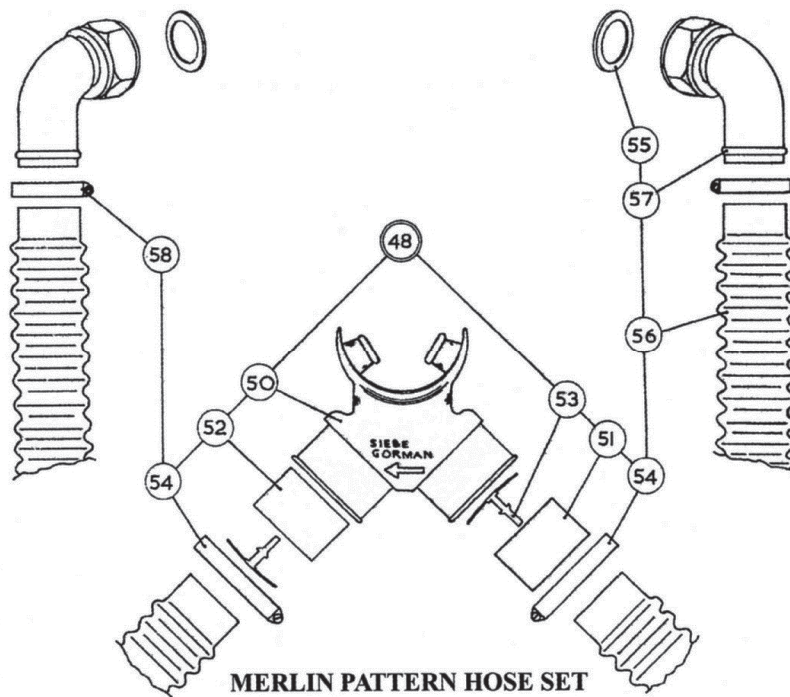
legend 'ESS GEE MISTRAL'. These engraved name plates were originally nickel plated and painted yellow with the engraving picked out in black. By now many will have lost the original paint and plating, so that the brass beneath could well have become polished.

As previously mentioned, the general configuration follows closely that of the Spiro Mistral STD with a few innovations introduced by Siebe Gorman. The two halves of the casing are held together, clamping the diaphragm in place, by four detachable split clamps. Spiro had originally used fixed clenches, but later a clamped ring. A flat fabricated diaphragm separated the upper, water, chamber from the lower demand valve chamber and comprised an impregnated fabric disc with a thick rubber rim and a central metal pressure plate bonded to the fabric but also secured by two small screws.

Below the diaphragm was a compound, two lever system with the second lever bearing upon the first to increase the mechanical advantage. The levers hooked into the carrier plate, only being loosely held. It was only the presence of the diaphragm that stopped them falling out. Lever adjustment (of which, more later) was achieved by means of a thumb wheel under the end of the carrier plate. The lower lever bore down on a short shaped pushpin, which carried a very small O-ring where is passed into the central body. On the Spiro Mistral this O-ring was in the bore, not on the pin.

The central body enclosed the single stage metering valve, it was of rectangular section the corners of which centered the valve head within the bore. The valve seat was a small conical projection at the bottom of the bore and machined in-situ with the central body. Care needs to be taken not to damage this seating by injudicious probing "to see what is down there", as a damaged seat would mean replacing the complete central body. Spiro, on the other hand, used a replaceable valve seat.

The valve head was held in place by a compression spring, interposed between it and the inlet filter. This 1/2-in filter is held in place by a screwed ring (9/16-in BS Brass thread). A gland nut



**MERLIN PATTERN HOSE SET  
AS USED ON THE MISTRAL**

clamped the central body into the lower casing whilst holding the attachment yoke captive. Internally, a venturi jet protruded from the side of the central body and focused the air jet directly into the inhalation port.

Adjustment of the lever height, to ensure correct air delivery, was achieved by rotation of the thumb wheel beneath the carrier plate. This in effect distorted the carrier plate, altering the alignment of the slots in which the levers were located. Lever height was set at 1/4-in above the circumferential rim of the lower casing. A lock nut held the adjustment secure.

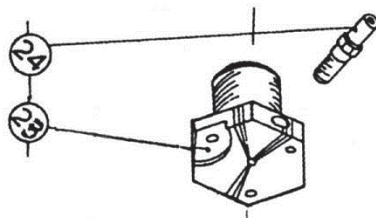
Two screwed spigots were provided for the attachment of the hose set. One spigot formed the attachment for the exhaust valve and was bolted into the side of the top casing. The exhaust valve itself being a simple rubber spear valve bound on to the internal spigot of the carrier.

The inhalation spigot was permanently fixed to the bottom casing, the hoses being 1-in bore, corrugated, with equal sized ends.

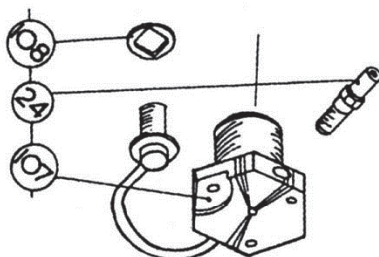
The mouthpiece was a simple tubular metal T-piece without any valves, comprising a circular section transverse tube with an oval tube connected to carry the rubber mouthpiece. Connection between the hoses and the demand valve casing was made by heavy curved elbows bound to the hoses, which were retained throughout the subsequent build standards. Both hoses and mouthpiece were secured in place with wire bindings.

## SIEBE GORMAN MISTRALS DEVELOPMENT OF CENTRE BODY & GAUGE CONNECTIONS

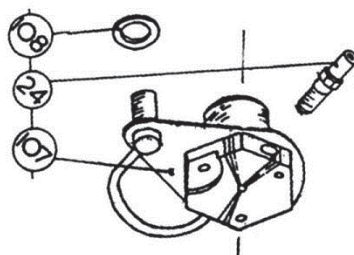
**INITIAL BUILD 1**  
No gauge connection



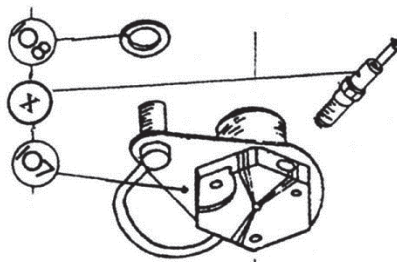
**BUILD 2**  
Introduction of gauge connection  
on cantilevered tube



**BUILD 3**  
Tube reinforced by  
a support plate.



**BUILDS 4, 5 & 6**  
Extended venturi jet  
(not listed as a spare part)



### 2nd Build Standard

The second build standard saw the introduction of the gauge connection. It may be surprising that Siebe Gorman had not fitted such a connection from the start, as they had already done so on their earlier Aqualung and Aqualung Mk. II two stage regulators.

Inside the lower casing a loop of 1/8-in diameter copper tubing ran from the central body, with a 1/8-in BSP threaded spigot suspended at the end

which was pushed through the bottom of the casing and lay parallel to the yoke. The hole in the casing was 7/8-in square and reinforced with a kidney plate. A corresponding square shoulder on the spigot engaged in this hole and it was held in place by an external lock nut. A trap had been sprung for the unwary! To limit the effects of a broken gauge or hose, a restrictor screw was fitted inside the spigot.

Unfortunately this assembly was very prone to damage when servicing, or replacing the gauge hose. It was fine when all was new but after a season's use its vulnerability was exposed. This stemmed from the very shallow engagement of the pressure gauge connection in the lower casing and the security of the lock nut. It was absolutely essential that the spigot remained in rigid engagement with the square hole, as that was the only restraint which prevented it from rotating of its own accord. Adding to the problem, was the fit of the gauge hose to the spigot. Naturally this was screwed down tight to ensure a pressure tight seal, which in turn caused the top threads to spread out. This made it tighter to remove, than it had been to screw on. Struggling to do so could inadvertently loosen the lock nut, allowing the spigot to be pushed back into the casing where it could spin

round and shear off from the internal copper tube.

It was, and still is, essential that the spigot be rigidly retained in its location. This was best achieved by opening up the casings to confirm that this was so, rather than working blind on the closed casing.

Later in the life of the second build standard, Siebe Gorman introduced a non-return valve mouthpiece. This was a metal tubular assembly with the non-return valves built into the screwed coupling attaching the hoses.



### 3rd Build Standard

Obviously something had to be done about the vulnerability of the gauge connection on the 2nd Build Standard, as a fractured tube meant the replacement of the whole centre body. Consequently, to protect the internal loop of the gauge connection. Siebe Gorman no soldered in a radius plate stretching out from the central body to the gauge spigot, so that it was no longer left dangling at the end of the tube. This done, the connection no longer had to rely on its engagement with the lower casing for support. The square hole remained for a while whilst existing stocks were used up, after which it became a plain circular hole.

There was also a change to the top casing. The diamond shaped metal badge was still retained, but it was now protected to some extent as it sat in a corresponding recess in the casing. The most noticeable difference with this build was a change of hose set. Siebe Gorman had recently taken over their old rivals Heinke and with that the production of the recently introduced Merlin demand valve. They now decided to use the Heinke pattern hose set on the Mistral. This had a large moulded rubber mouthpiece assembly with non-return valves and replaced the metal assembly which Siebe Gorman had only introduced a short time before. The new hoses were still 1-in bore at the

regulator but opened up to 1 3/4-in at the mouthpiece.

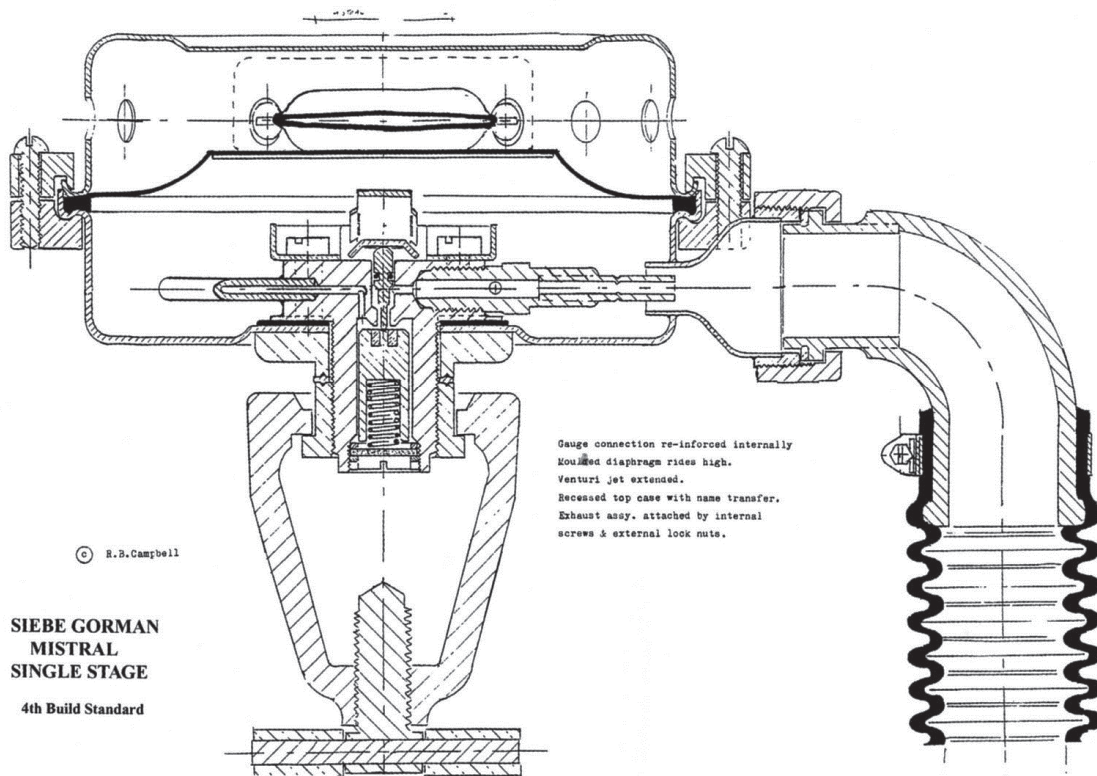
Warning note. Replacement hoses for US Divers regulators look similar, but are only 1 1/2-in bore.

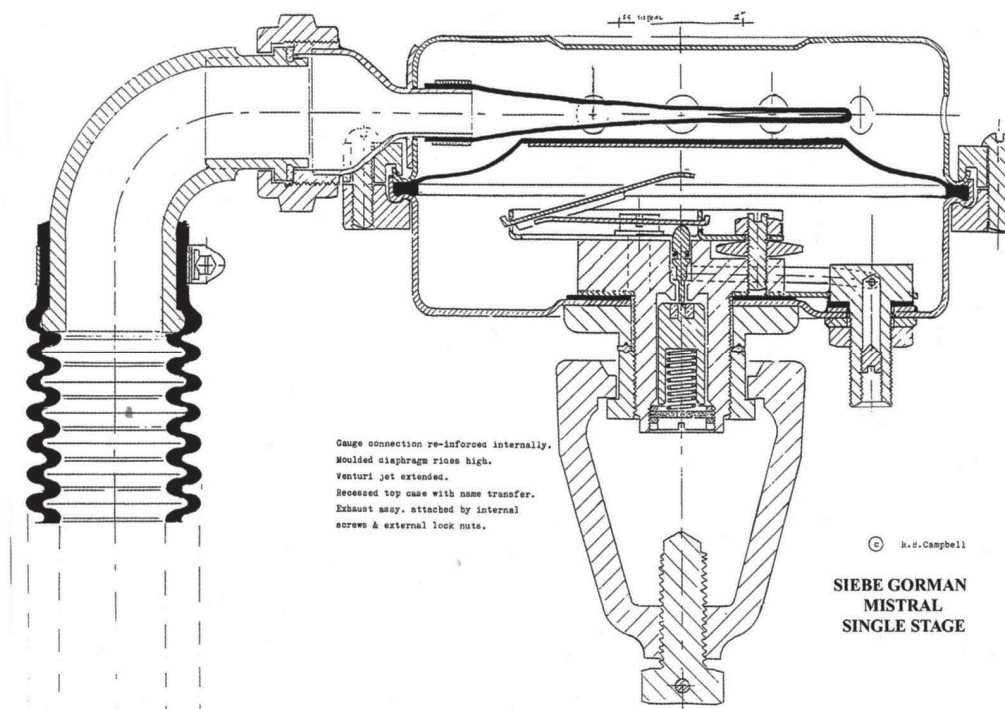
### 4th Build Standard

With this build, Siebe Gorman dropped the brass name plate, replacing it with a simple transfer label. Gone was the ESS GEE title, now it was 'SIEBE GORMAN - MISTRAL' on a pale blue and cream background.

The internal bushes, which had secured the exhaust valve assembly, had been soldered to the casing and as the solder fatigued these could separate from the casing. This caused problems when stripping the casing for servicing. The response was to delete the bushes and insert the retaining screws, now round headed, from inside of the casing with lock nuts on the outside.

The venturi jet was also modified to improve the response of the regulator, by soldering a tubular extension into the end of the existing jet so that it now protruded into the inhalation port. At the factory the new venturi jet was 'tuned' by gently squeezing the extended tube to achieve the required boost. Siebe Gorman now considered the venturi jet to be an integral part of the central body and stated that it should not be removed. In fact they deleted it as a separate item from the





At this time the width of the yoke clamp was increased from 1 3/4-in to 2-in to accommodate the newer cylinder valves.

## 5th Build Standard

Two changes were introduced into the fifth build standard.

To protect the exhaust valve from contact with the diaphragm a separator plate was included. This

parts list. This 'permanent fixture' produced a problem when servicing the regulator. Although it was possible to loosen the central body from the lower casing, it was not possible to extract it entirely, as the venturi jet protruded into the inhalation port. In practice I think that this was an unnecessary precaution. I do not believe that removing and then replacing the venturi jet in the same central body produced any significant change in the regulator's response.

A far more significant change was the introduction of a moulded diaphragm, in place of the fabricated version. This new diaphragm resembled a shallow inverted dish and was to bring problems of its own. The depth of the dishing was 3/4-in which made it stand high in relation to the rim of the lower casing. The previously stated lever height of 1/4-in above the rim was no longer adequate and a greater height was required, but no further instruction was given. To bring the lever tip into close proximity with the diaphragm pressure plate was on the limit of what could be attained by using the adjustment thumb wheel. Presumably it had been assumed that the diaphragm would subside evenly with the pressure plate remaining parallel to the casing rim, but this did not happen. The diaphragm inevitably tilted to one side bringing the upper edge into contact with the exhaust valve. While the demand valve still functioned adequately, further thought was needed on this feature.

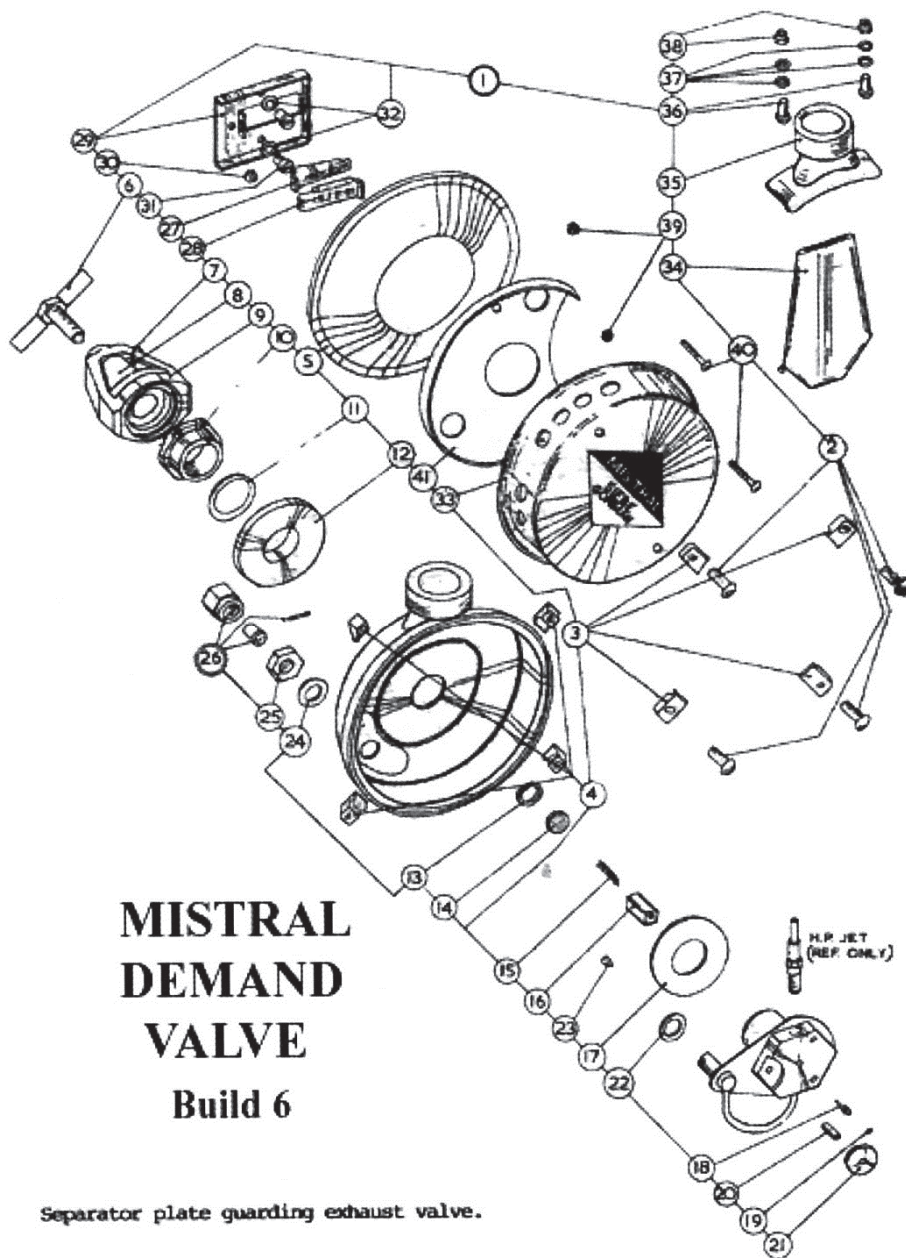
was a metal strip 4-in long by 1-in wide which was attached to the underside of the top cover. It spanned the exhaust valve and curved upwards towards it, two small screws (6 BA) with spacers holding it in place.

As explained earlier, the lever adjustment was produced by distorting the carrier plate and that the limit of that movement had been reached. To allow for further distortion and consequent higher lever setting, two slots were cut in the upright sides of the carrier plate.

A new diagram was added to the maintenance manual showing the lever height setting now to be 1/2-in, which seems reasonable compared with the previous 1/4-in. It might have been, had not the new dimension been shown as the height from the carrier plate, rather than the rim edge, which placed the lever tip just above the rim and nowhere near the diaphragm pressure plate. I suggest setting it measuring from the rim.

## 6th Build Standard

Apparently not satisfied with the previous separator, which formed a bridge over the exhaust valve, Siebe Gorman now provided a much bigger version in the form of a flanged disc, closely fitting inside the top cover. This disc was scalloped to clear the exhaust valve carrier with three other holes to allow water movement. It was suspended from the top cover by the two small screws, but



without the spacers as the flanged rim now served that purpose.

This was to be the final configuration of the Siebe Gorman Mistral, which finished production with the close of the company in 1972. By this time single hose regulators were in the ascendancy and the single stage twin hose regulators had definitely been eclipsed.

comprehensive advice on the use of the diving regulator with maintenance instructions and diagrams. Only reference to the exploded diagram shows it to cover the gauge-less model. The combined diagram depicts the full set, hoses including an open mouthpiece without NRVs, cylinder valve with reserve, cylinder and harness.

It was issued in a green and cream coloured cover.

There was an earlier publication, entitled THE ESSGEE 'MISTRAL' AQUALUNG and Ancillary Underwater Swimming Equipment This was really a catalogue depicting the newly introduced Mistral in combination with its cylinder sets, The ancillary

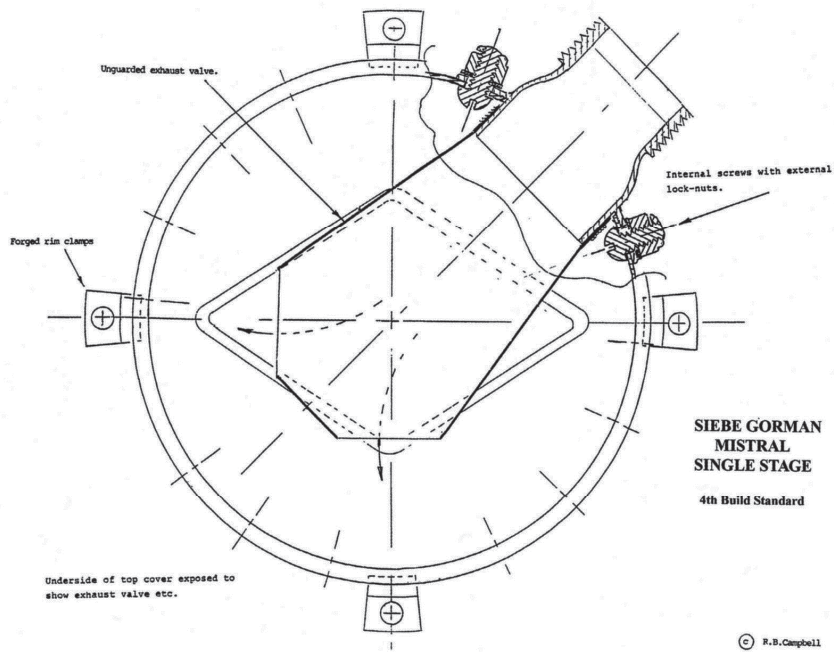
## Mistral Manuals

Siebe Gorman published a series of manuals for the Mistral, but once again the lack of model numbers for the various versions produced makes matching the manual to the specific model tricky. These were user manuals and the first editions contained much general advice on underwater swimming, as well as details of the regulator and cylinder sets. Their publication dates were not specifically mentioned and it is only by examination of the exploded diagrams and parts lists that the intended model may be identified.

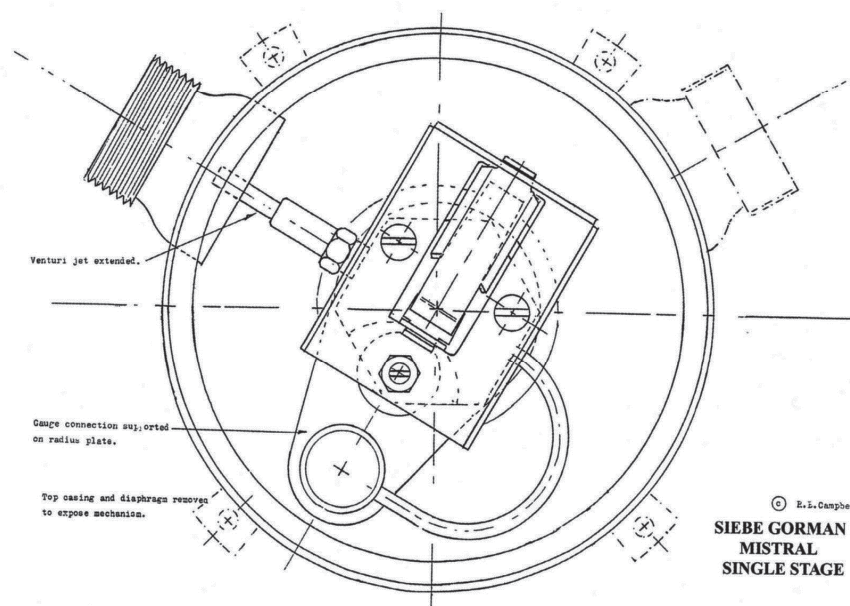
### 1st Edition

This covered the first build standard of the Mistral ie the gauge-less version. It was entitled THE MISTRAL MANUAL and UNDERWATER SWIMMING GUIDE, not dated directly but the exploded diagram is shown as having been traced on the 11.10.57. It contained





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## 2nd Edition

Now in a blue cover (two shades) and labelled SIEBE GORMAN The MISTRAL MANUAL and UNDERWATER SWIMMING GUIDE. This covered the introduction of the pressure gauge connection, ie the 2nd build standard. The text was the same as the 1st edition, including the advice on the endurance of the sets and a short decompression table extracted from the 1956 R N Diving Manual. However there was no mention in the text of the newly acquired pressure gauge connection, although it does appear in the exploded diagram and parts list. The maintenance instructions do not refer to the gauge connection or the care needed when fitting or removing a gauge hose. It is, of course, the vulnerable unsupported tube.

The manual is undated, but the exploded diagram is dated 16.1.61.

Two diagrams were included, showing the complete breakdown of both single and twin cylinder sets.

## 3rd Edition

Now in a smaller format, in a green and cream cover, titled The Siebe Heinke Mistral Handbook which dates it to after the takeover of the Heinke Company in 1962, but this is the only clue.

Whereas the previous editions had included a great deal of general advice on underwater swimming, this was now deleted from the new edition. The text then remained unaltered for the routine use of the. Essgee 'Mistral' demand valve. Again there was no specific mention of the pressure gauge connection, still unsupported, in the text, but it did feature in both the exploded diagram (a different layout than previous) and parts list. The

equipment included a compressor, four underwater swim-suits, mask and fins (but no snorkle), weight belt, knives, depth gauges, compass and watch. The page headings read "Everything for the diver". The attached price list was dated 26th August 1957.

Examination of the illustrations show what must have been a prototype Mistral, as the casing flanges are flat and held together with six equispaced screws, a configuration not used on the production versions.

This catalogue appeared in a yellow cover.

centre spread diagram only showed the demand valve itself.

## Missing Editions?

A gap now occurs, as there does not appear to have been any revised manuals to cover the next two build standards which saw the introduction of the supported gauge tube, moulded diaphragm and Heinke pattern hose set. We have looked but failed to find any. If anyone knows better we should be pleased to know. If copies do come to light the changes will, in all probability, be confined to the diagram not the text.

## Penultimate (4th?) Edition

Published in a grey cover and spirally bound with a bold company name, this was titled Instruction and maintenance manual Mistral demand valve. The format was slightly larger than the previous edition, devoid of any general diving instructions and the text slightly revised.

This build standard had seen the introduction of the extended venturi jet, along with the instruction that it should not be unscrewed from the main body. The moulded diaphragm had been introduced earlier, but now came a new instruction on lever height setting complete with an explicit diagram, which set the lever height at 1/2-in above the base of the carrier plate. This surely was an error, that height only puts the lever tip just above the casing rim and well short of the diaphragm pressure plate. I can only assume that it should have been 1/2-in above the casing rim.

A separator was now fitted between the diaphragm and exhaust valve, but this is not mentioned in the text although it does appear in the exploded diagram of the demand valve. Four figures cover the Mistral demand valve, hose set (Heinke pattern), cylinder valve and lever height setting. The venturi jet is shown as 'reference only' and does not appear in the parts list. Neither does the central body to which it is attached. The implication being that these were 'factory fit only'. Heinke pattern hose sets had also been introduced earlier and, although there was no specific mention of this in the text, there was a diagram of the assembly, the mouthpiece of which now bore the Siebe Gorman title. A diagram of the Siebe Gorman cylinder valve was reintroduced but not the harness details.

## Final (5th?) Edition

The only difference in the build of the Mistral was the change of the separator, now a scalloped disc. This does not appear in the text, but does so in the exploded diagram and parts list. In all other respects the manual is identical to the previous edition. Still with the dubious lever height setting!

*Copyright Bob Campbell<sup>1</sup>*

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P.S.

Ein weiterer Bericht Bob Campbells über „Siebe Gorman's Prototype Mistral“ in der nächsten Ausgabe.

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<sup>1</sup> Erstmals abgedruckt in Historical Diving Times 2011, Nr. 52, S. 9-13.