PATENT SPECIFICATION

325,678

Application Date: Feb. 6, 1929. No. 3992/29.

Complete Left: Oct. 15, 1929.

Complete Accepted: Feb. 27, 1930.

2399

PROVISIONAL SPECIFICATION.

Improvements relating to High Pressure Reaction Vessels.

We, GILBERT THOMAS MORGAN and HAROLD TONGUE, both of the Chemical Research Laboratory, Teddington, Middlesex, both British subjects, do hereby declare the nature of this invention to be as follows:—

This invention relates to high pressure reaction vessels such as are used for example, in the synthesis of ammonia, methanol and the like.

Such vessels usually comprise a cylindrical hollow container having its ends closed by end plates bolted to flanges of the cylindrical wall.

According to the invention, we provide a heating or cooling means adapted to be variably positioned relatively to the interior of the vessel, and capable of being withdrawn and/or replaced without interfering with the reaction.

According to the invention we provide one or more tubes extending inwardly from one of the end plates, the tubes having a closed inner end and being capable of withstanding the reaction pressure.

In the case of heat control, we provide an electrical resistance unit adapted to be a loose fit in each tube. For maximum heating, the resistance unit is inserted into the bottom of the tube so that the whole tubular wall is subjected to heating, but in cases where, for example, the application of heat is only or principally required at a certain zone the unit may be partly withdrawn to any required extent.

Alternatively, we provide a series of units of various heat capacities adapted to produce a heating zone at any given point in the length of the tube.

Alternatively, for cooling purposes, we provide the open ends of the tubes, which may project through the end plate, with an inlet and an outlet port, and provide a centrally disposed tube through the inlet port to lead a supply of cooling fluid to the bottom of the cooling tube whence it passes exteriorly of the feed tube to the outlet port.

In this modification also we may provide any suitable blocking means and size of feed tube to confine the cooling effect to the upper part of the tube held by the end plate when desired.

It is to be understood that the invention as described may be combined with any usual or well known forms of permanent heating means such as coils surrounding the body of the container or mounted within it, as the invention provides more specifically for a ready means of control for the exact amount of heat required. At the same time in many cases where the amount of heat required is not excessive, the invention is intended to be adopted instead of the usual or known means, since with the heating means externally accessible as complete units a replacement of a broken down part may be readily effected without necessarily arresting the reaction taking place within the vessel.

Dated the 6th day of February, 1929.

ANDREWS, BEAUMONT & BYRNE,
Agents for the Applicants,
201—6, Bank Chambers, 329, High Holborn, London, W.C. 1.

COMPLETE SPECIFICATION.

Improvements relating to High Pressure Reaction Vessels.

We, GILBERT THOMAS MORGAN and HAROLD TONGUE, both of Chemical Research Laboratory, Teddington, Middlesex, both British subjects, 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:—

This invention relates to high pressure reaction vessels such as are used for example, in the synthesis of ammonia, methanol and the like.

Such vessels usually comprise a cylindrical hollow container having its ends closed by end plates bolted to flanges of the cylindrical wall.

For the purposes of this invention, high

[illegible] Price 4s 6d

pressures are defined as pressures from five atmospheres upwards but, as will be readily apparent, the invention becomes more economical and efficacious at higher pressures such as are now used, for example, in the synthetic production of methyl alcohol.

According to the invention, we provide a heating or cooling means adapted to be variably positioned relatively to the interior of the vessel, and capable of being withdrawn and/or replaced without necessitating the release of the pressure in the vessel or interfering with the reaction.

In one preferred form of the invention, we provide one or more tubes extending inwardly from one of the end plates, the tubes having a closed inner end and being capable of withstanding the reaction pressure.

In the case of heat control, we provide an electrical resistance unit adapted to be a loose fit in each tube. For maximum heating, the resistance unit is inserted into the bottom of the tube so that the whole tubular wall is subjected to heating, but in cases where, for example, the application of heat is only or principally required at a certain zone the unit may be partly withdrawn to any required extent.

Alternatively, we provide a series of units of various heat capacities adapted to produce a heating zone at any given point in the length of the tube.

Alternatively, for cooling purposes, we provide the open ends of the tubes with an inlet and an outlet port external to the end plate, and provide a centrally disposed feed tube through the inlet port to lead a supply of cooling fluid to the bottom of the cooling tube whence it passes exteriorly of the feed tube to the outlet port.

In this modification also we may provide any suitable blocking means and size of feed tube to confine the cooling effect to the upper part of the tube held by the end plate when desired.

The invention is illustrated in the accompanying drawing in which

Fig. 1 shows a modification for supplying heat, and

Fig. 2 a modification for cooling.

Referring now to Fig. 1, the reaction vessel comprises a cylindrical flanged chamber 1 having end plates 2 bolted to the flanges 3 of chamber 1 in known manner.

According to the invention, one of the end plates 2 is provided with one or more tubes 4 opening externally of the reaction chamber 1, the tubes and the joints between the tubes and end plate 2 both being capable of withstanding the reaction pressure. The tubes are formed of any suitable non-porous material capable of withstanding the temperatures involved and are adapted to receive heating units 5 which in the form shown are electrical. It will be realised that as the heating units are freely insertable into and withdrawable from the tubes 4 the advantages set out above are thereby afforded, the units being of such capacity or output to afford the required variation sufficient to effect the control of the reaction within the desired limits.

In Figure 2, the control tubes 4 are intended to receive a circulating fluid which may be a cold fluid, and they are mounted in the end plate 2 similarly to the tubes of Figure 1.

The cavities 8 are fitted by ported tubes or nozzles 6 having inlet and outlet ports. Through the inlet ports fluid tubes 7 are slidably inserted to convey cooling liquid to the bottoms of the tubes 4, the liquid thereafter passing between the walls of the tubes 7, 6 and escaping through the outlet ports, suitable glands which will usually be low pressure glands being provided to prevent escape of liquid between the tubes 7 and the walls of the inlet ports.

Normally, this modification is primarily intended for use with cooling fluids, but of course it is equally applicable for use with heating fluids where the ranges of temperature involved render such fluids desirable or convenient.

In both cases the recesses 8 in the inner face of the plates 2 which receive the tubes 4 are wider than the bores 9 through which access is given to the tubes, intervening shoulders serving as abutments for the ends of the tubes 4.

Any suitable form of packing may be laid on these abutments so that the reaction pressure ensures therewith a satisfactory closure of the joint between the tubes and the end plates.

For localised heating, the coil wire resistance unit may be arranged to have its coils set up more closely together in the region where the heat zone is required as will readily be understood.

It is to be understood that the invention as described may be combined with any usual or well known forms of permanent heating means such as coils surrounding the body of the container or mounted within it, as the invention provides more specifically for a ready means of control for the final adjustment of the exact amount of heat required. At the same time in many cases where the amount of heat required is not excessive, the invention is intended to be adopted instead of the usual or known means, since with the heating means externally accessible as complete units a replacement of a broken

down part may be readily effected without necessarily arresting the reaction taking place within the vessel.

Although the invention has been described with more particular reference to reaction vessels of the type referred to in the first paragraph, it is obvious that the invention is equally applicable to reaction vessels of the autoclave type in which a top plate is bolted to flanges on the cylindrical portion of the autoclave.

We are aware that, in apparatus for the production of cyanogen compounds comprising a chamber having a cover loosely secured as, for example, by a luted joint, it has been proposed to fix refractory tubes to the cover and to insert therein electrical heating elements, but such a construction is obviously not suitable for use in high pressure apparatus.

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

1. High pressure reaction vessel having heating or cooling means externally accessible and adapted to be variably positioned within the interior of the vessel, the construction being such that the removal or adjustment of the heating or cooling means does not necessitate the release of pressure in the system.

2. Reaction vessel as claimed in Claim 1, having an externally open tube extending inwardly from a wall thereof and adapted to receive heating or cooling means.

3. The combination with a reaction vessel as claimed in Claim 2, of an electrical resistance slidable into and out of said tube.

4. The combination with a reaction vessel as claimed in Claim 2, of means to deliver a current of liquid to the bottom of said tube.

5. The combination with a reaction vessel as claimed in any of the preceding claims, of means whereby the application of the heating or cooling medium may be localized.

6. The improvements in reaction vessels substantially as described.

Dated the 15th day of October, 1929.

ANDREWS, BEAUMONT & BYRNE,
Agents for the Applicants,
201—6, Bank Chambers, 329, High Holborn, London, W.C. 1.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1930.

Fig. 1.

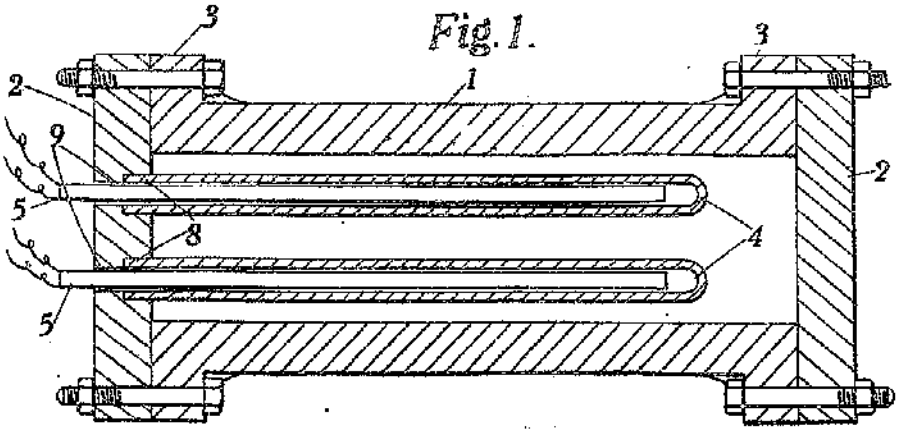
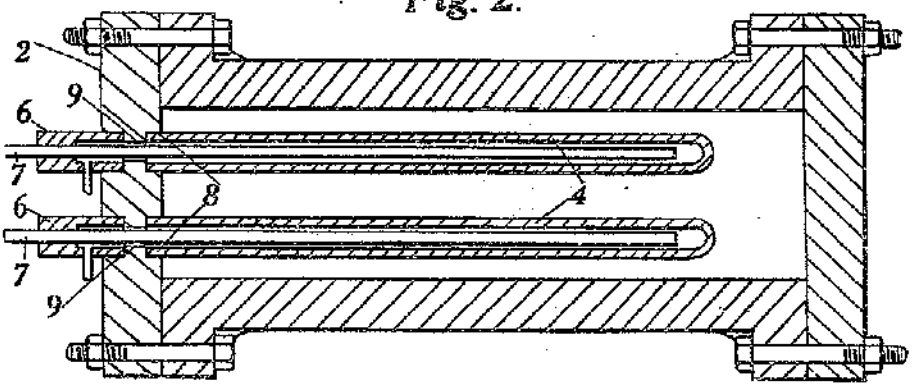


Fig. 2.



Charles & Read Ltd. Photo-Litho.