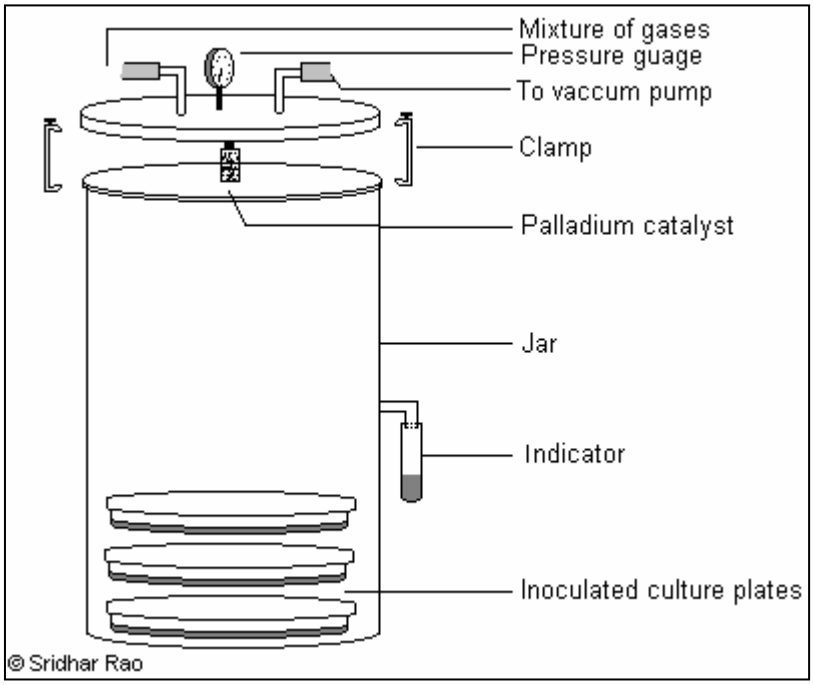
McIntosh Fildes Jar

It is one of the physical methods to produce anaerobiasis. It is used to produce anaerobic environment during the incubation of anaerobic cultures in the laboratory. It works on the principle of evacuation and replacement, where the air inside the chamber is evacuated and replaced with hydrogen or a mixture of gases.

McIntosh and Fildes jar consists of a stout glass or metal (8x5") jar with a lid that can be tightly clamped with a screw to make it airtight. The lid has two taps, one acts as outlet that is connected to a vacuum pump and the other as inlet through which hydrogen gas is supplied. The lid also consists of two electrical terminals, which is connected on the underside to a small porcelain spool wrapped by a layer of palladinised asbestos. Subsequent models did not have electrical terminals as cold catalyst was being used.



The presence of air is deleterious for many anaerobic bacteria and must be incubated in its absence. The inoculated culture plates are placed inside a metal jar and the lid clamped tight. The air inside is removed using a vacuum pump. The pressure inside the chamber is reduced to 100 mm below mercury.

It is not practically possible to evacuate all the air since it will cause boiling in the liquid or detachment of the medium. Despite evacuation of air, some amount of oxygen will still be left behind. Hence the air is replaced with hydrogen gas from a cylinder. For convenience sake, a football bladder filled with hydrogen was used earlier. The pressure inside the chamber is brought back to atmospheric pressure (760mm Hg). Using a palladium catalyst residual oxygen can be made to react with hydrogen to form water, but this reaction is not spontaneous. This reaction is catalysed by palladium catalyst that is heated using electricity. As the reaction continues more hydrogen is used up. This process is allowed to continue for 20 minutes. Use of hydrogen gas and use of electricity can lead to explosions. Hence hydrogen gas has been substituted by a mixture of gases (consisting of 5%CO_2, 10%H_2 and 85%N_2) and a cold catalyst consisting of an alumina tablet coated with palladium. The jar is then placed inside an incubator at 37^{o}C for 48 hours.

Efficiency indicator: Efficacy of anaerobiasis produced and maintained inside the jar can be checked using a methylene blue indicator. This indicator is made up of three stock solutions: 6% glucose in distilled water, 6% solution of N/10 NaOH and 3 ml of 0.5% aqueous methylene blue diluted to 100 ml with distilled water. Equal volumes of these three reagents are mixed in a test-tube and boiled. Boiling reduces methylene blue, turning it colorless. Methylene blue is colorless in reduced conditions and turns blue when oxidized. This tube had to kept inside the jar along with the culture plates. Subsequent models had a side arm to which a tube filled with Luca's semisolid indicator was attached.

Disadvantages: Palladium catalyst is inactivated by excess moisture and has to be rejuvenated by heating them at 160^{o}C for two hours. Subsequently, introduction of silica gel absorbent solved this problem. This system is excellent but requires skill to operate and special apparatus that are costly. Requirements of vacuum pump and supply of gas is a major drawback of this system and hence it is being replaced by more convenient GasPak system.