

AN APPARATUS FOR THE CORONARY PERFUSION OF THE MAMMALIAN HEART

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THE heart removed from the body and kept working is a fundamental experimental preparation used in the study of the role of various factors in the activity of the organ. The technique of doing this with the mammalian heart is not simple. The myocardium of the working heart must be well supplied with nutrient perfusing fluid, which should be well oxygenated and this should be made to circulate through the coronary vessels by maintaining sufficient hydrostatic pressure inside the aorta. The perfusate must also be at about the body temperature of the mammal.

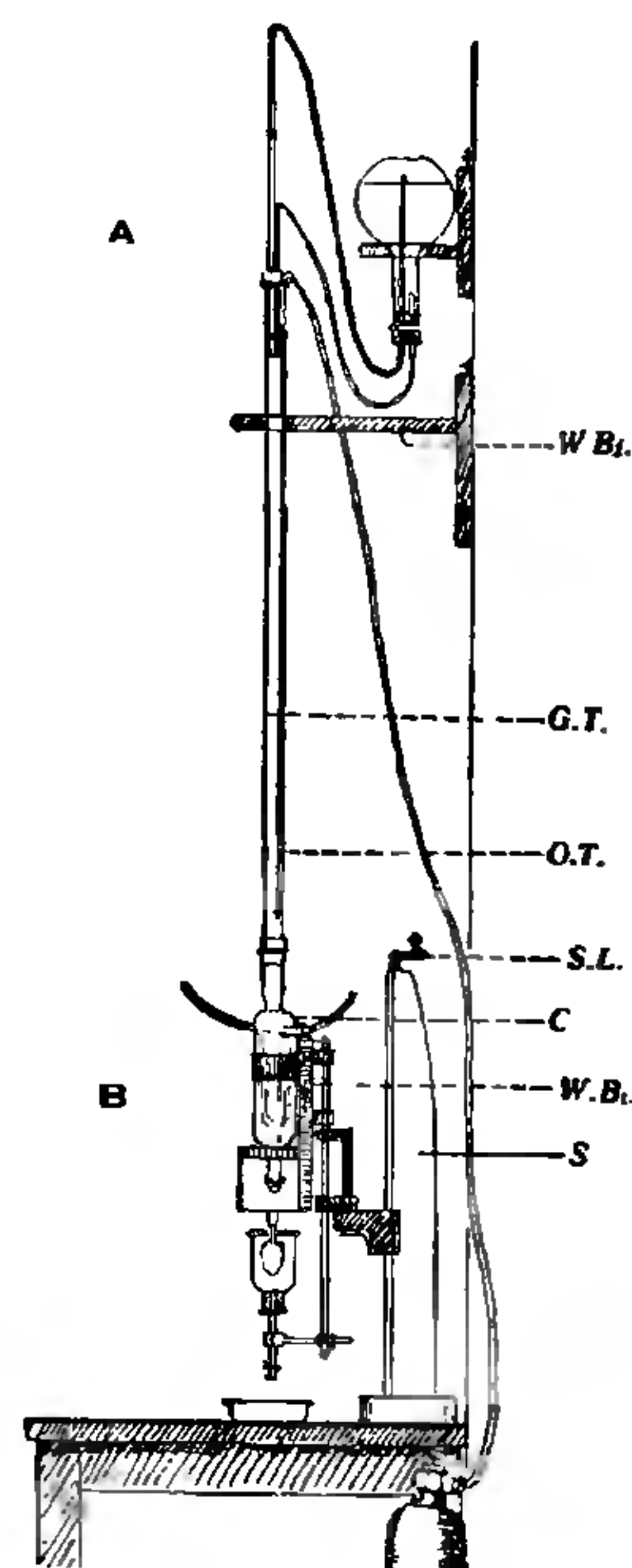
To satisfy the above conditions as regards the oxygen supply, the temperature and the hydrostatic pressure, many forms of apparatus have been designed. The one designed by Gunn¹ is generally used. Harris¹ describes a simpler apparatus which can be constructed in the Laboratory. A very satisfactory one is the Vareed-Pillai apparatus. Messrs. Palmer & Co., Ltd., list in their catalogue another type of assembly.²



Basically the principles involved are simple, but in actual working the simpler types present many difficulties. Satisfactory assemblies using complicated

components on the other hand are not easily available and are costly.

Described below is a comparatively simple form of assembly designed and built in this Department out of components usually available in a Physiological Laboratory. It can be built by anyone who is a bit handy with the ordinary laboratory tools. In working it has been found to be very satisfactory.



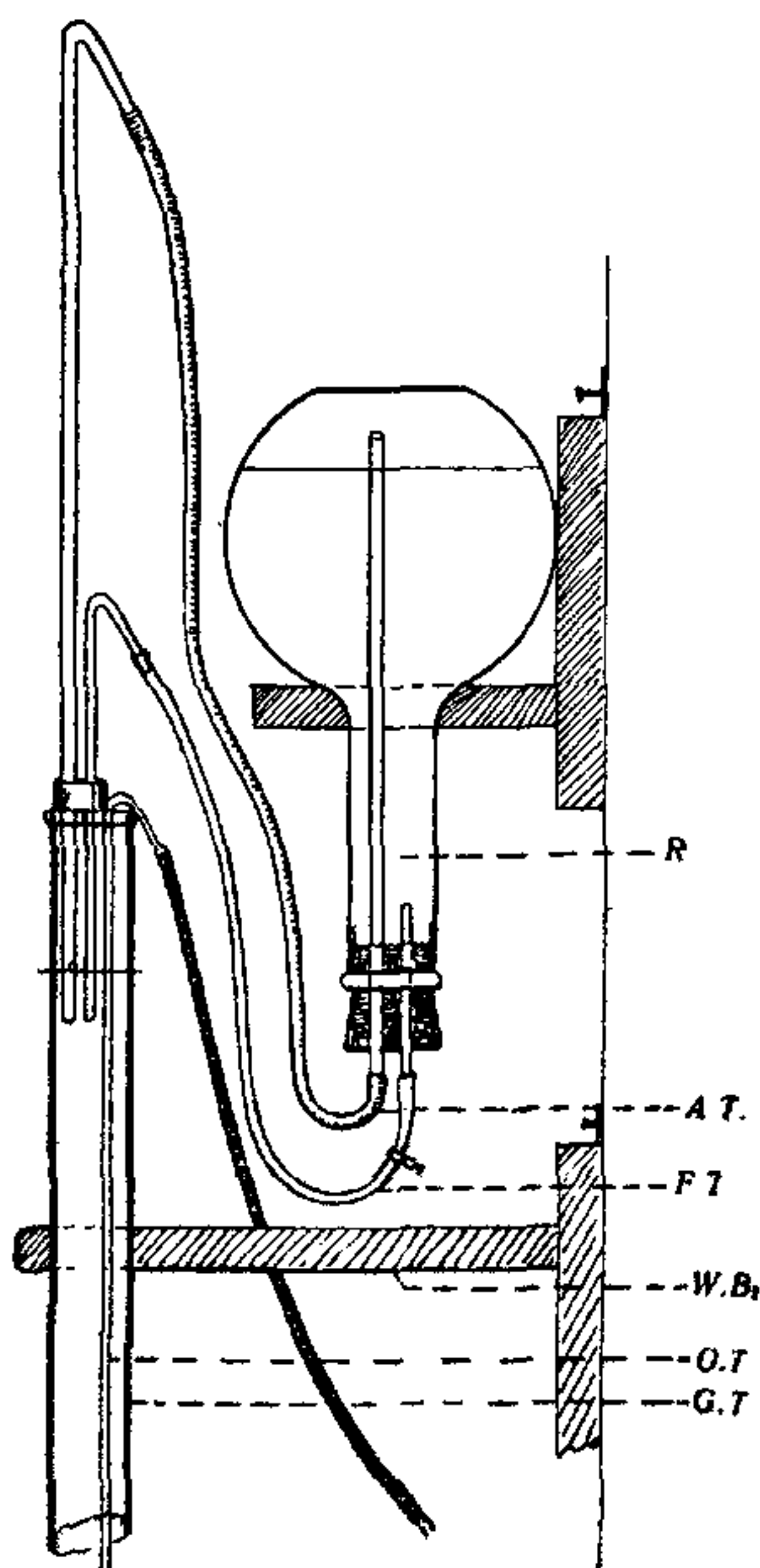
EXPLANATION OF FIG. 1

C., Condenser; G. T., glass tube 40" x 3/4"; O.T., Oxygen tube; S., stand with the screw lift; S.L. screw lift; W.B₁, wooden board carrying the condenser; W.B₂, wooden board holding long glass tube.

The apparatus is assembled on a heavy stand with a screw lift, but can also be mounted on an ordinary stand screwed down to the table. The special screw stand however is very convenient in raising and

lowering the apparatus to take the tracing in any place on the smoked paper on the Kymograph. A wooden board $11" \times 3\frac{1}{2}"$ is attached to the upright by two screws fixed to its back and clamped into two cross-blocks on the stand. On the board is fixed a good double surface condenser, $8" \times 2"$ by a clamp and support. The outlet tube of the condenser is cut short and by its side is fixed a glass T-tube as shown, one of its limbs carrying a thermometer, another connected to the aortic canula and the third to the outlet of the condenser by a rubber tube carrying a pinchcock. The inlet of the condenser is connected to a long glass tube $40"$ long and $\frac{3}{4}"$ internal diameter, by a one-holed rubber cork. This glass tube is held in position by being passed through a hole in a wooden board fixed to the wall at the proper height. The tube fits loosely into this hole.

The nutrient fluid is kept at a constant level in this tube by a simple arrangement the details of which are clearly shown in Fig. 2.



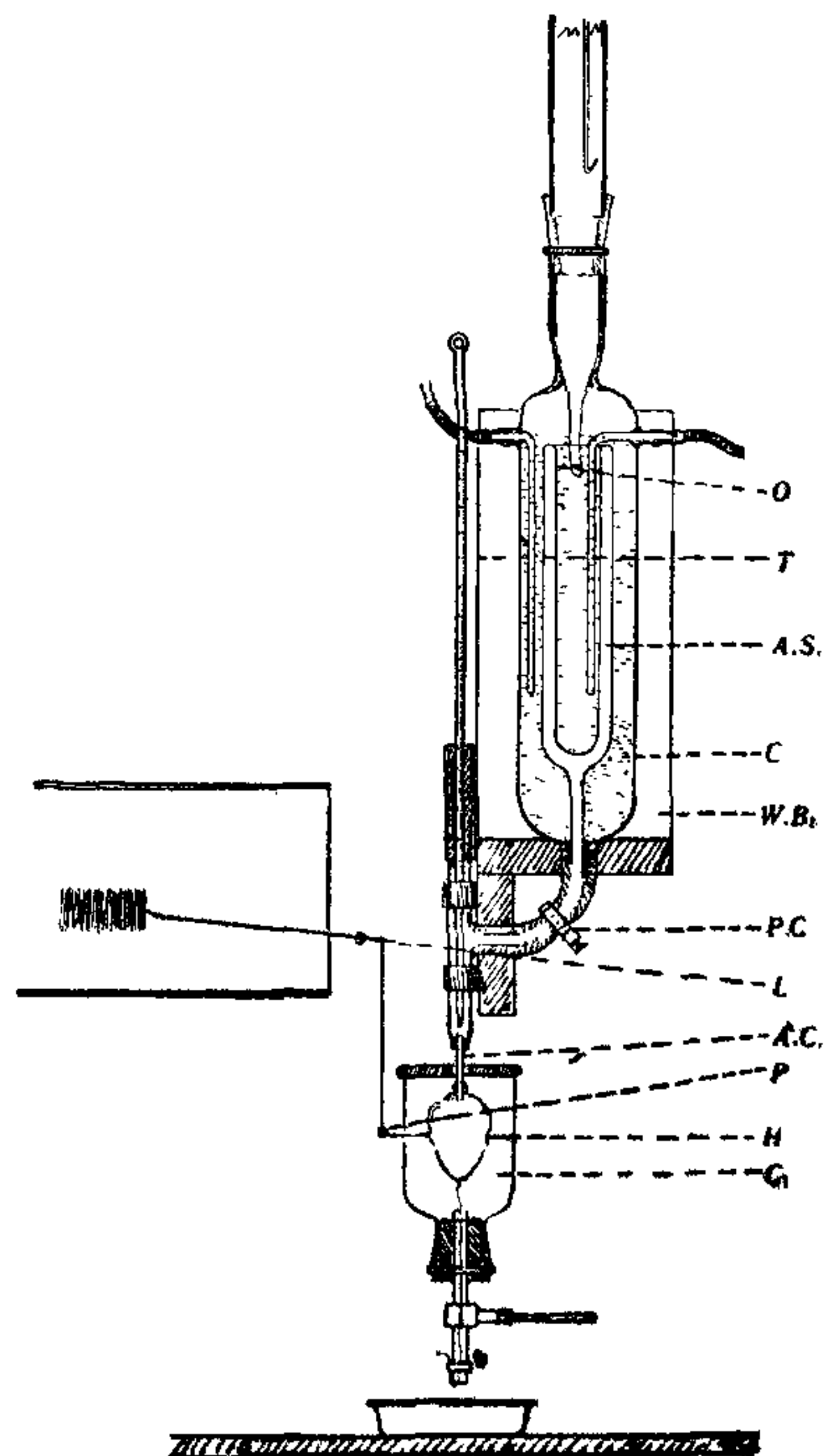
EXPLANATION OF FIG. 2

A.T. Air tube to reservoir; F.T. Fluid tube from reservoir; G.T., glass tube $40" \times \frac{3}{4}"$; O.T., oxygen tube; R. Reservoir (inverted 2 L. flask); W.B., wooden board.

A long thin tube ending in a fine curved nozzle reaches to the bottom of the column in the upright tube. A steady stream of small bubbles of oxygen is maintained and this ensures efficient oxygenation of the perfusate.

The temperature of the perfusate is controlled by circulating warm water through the jacket of the condenser. Cold water from the tap is warmed by passing through a copper jacket enclosing a 1000 W. immersion heater. The temperature can be easily controlled by adjusting the flow of water.

The heart after being attached to the canula is enclosed in a cover with a hole at its side, made from a bottle by removing its bottom. The arrangement of the lever, etc., follow the usual lines and the details are shown in Fig. 3.



EXPLANATION OF FIG. 3

A.C. Aortic canula; A.S. Annular space of the condenser; C. condenser; C₁. cover for the heart; H. The heart; L. Lever; O. Opening of the inlet of the condenser into the annular space; P. Pulley (1" vulcnite); P.C. Pinch-cock; T. Thermometer; W.B., Wooden board.

Mention may be made of the following features of this assembly.

1. Hydrostatic pressure in the aorta is kept constant irrespective of the level of the nutrient fluid in the reservoir.

2. The temperature remains steady and can be easily controlled.

3. The effects of various drugs, etc., on the heart can be studied by injecting them into the rubber tube connecting the outlet of the condenser to the T-tube through a thin hypodermic needle without disturbing the heart and introducing any irregularity in the tracing. For continuous perfusion with any solution other than the one in the

reservoir, the reservoir can be quickly replaced by another containing the solution.

An assembly similar to the one described here has been in use in this Department for three years now and has been found to be convenient. This description is published at the instance of the Principal, Sri. S. V. Mudaliar, G.M.V.C., to whom the author is indebted for every encouragement.

1 "Experimental Physiology" D. T. Harris.
2. Catalogue of Messrs. Palmers Co. Ltd., London.

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HONEY HUNTING*

SWARMS of bees pass overhead on any warm day in the Spring like a rapidly-moving smoke cloud that soon disappears into the distant forest. Swarms also form dense clusters two or three feet long on the branches of trees. Where they come from and where they go form a fascinating study.

Bees establish themselves in hollows of tree trunks and branches and continue to nest there for years. Each year when the nest or the hollow becomes too crowded and when there is not enough space for the bees to store a sufficient amount of honey to sustain the colony through the winter months, the bees provide a new queen for themselves by constructing large, more or less cylindrical, "royal cells". The grub that develops from the egg laid in such a cell is provided with "royal jelly", a special food secreted by the worker bees and fed to the bee that is to develop into a queen. When this new queen emerges, the old queen and part of the swarm leave their nest to seek a new home in the cavity of another tree, leaving the old home to the new queen and the brood she will produce.

Wild bee hunting has been a popular autumn sport in some parts of U.S.A. and gives the hunters the same thrill that fishermen derive. Several methods are used in locating the forest homes of wild bees but probably the most popular is the use of the bee-box. This is simply a wooden box approximately the size of a cigar box fitted with a glass top that slides in grooves. A hole about one inch in diameter is made in one end through which the bees can enter and leave. A slide is fashioned so that the hole may be closed if the hunter wishes to imprison the bees for a short time. An old piece of honeycomb about 4×6 inches com-

pletes the outfit. The bait to attract the bees is honey or sugar syrup, which is poured into the cells of the comb. On a warm autumn day when the frosts have stopped the honey flow, and the bees can easily be attracted to the bait, the box is set up on a stump or stand in a field near the woods. Now a piece of comb is burned or a few drops of oil of anise are poured on the stump to attract the bees. A few bees appear in a few minutes and take a drink from the comb, and fly back to their home in a "bee line". Next, the box is moved 200 or 300 yards to one side and another "bee-line" is obtained. The tree which is their home is located where the two lines cross. The home may be a tree, or a farmer's hive. Wild bees make their homes in the most unexpected places. A chimney or pipe of a gas-well derrick, the samson post of an oil well or an abandoned box-trap once used to catch rabbits, will house the bee nest.

Bee-hunters tap from 40-100 pounds of honey from the nests. The quality and type of wild honey vary considerably according to location, climate and the number of years the bees have occupied a tree cavity. The honey is usually strained from the combs, by placing them in a muslin bag and hanging it above the kitchen stove. The heat melts the wax capping of the cells and the honey drips through the bags. The bees wax is also preserved.

The cutting of bee-trees should be discouraged since bees are so essential to the fertilisation of our agricultural and forest, fruit and vegetable crops.

* Abstract of an article on "To Find Wild Honey", by Arthur C. Parsons. Grateful acknowledgements to *Natural History*, 1949, 58, No. 4.