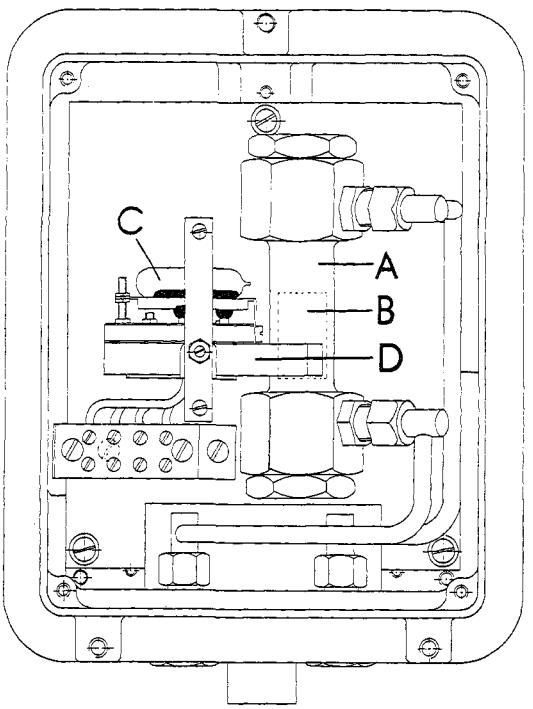
New Instruments, Materials and Tools

The Editor invites manufacturers of instruments and light machine tools to keep him informed of their new or improved products. The Institute of Physics assumes no responsibility for the statements given below, information for these has been taken from literature supplied.

Flow Operated Switches. Negretti and Zambra, 122 Regent Street, London, W. 1.

When a liquid flows through a Venturi or orifice plate a difference in pressure occurs; this is employed to operate this device.

It enables an electrically operated audible or visual warning to be given immediately a change occurs in the rate of flow of liquid in a pipe, and is usually arranged to operate in the event of a decrease in the flow, as in the case of a partial or total failure of cooling water to an internal combustion engine or lubricant to large rolling mill bearings. It is also employed to show an unwanted increase in flow, which might occur through a fractured pipe leading from a system of large capacity where the consequent drop in pressure would be masked by normal fluctuations. The makers emphasize that the device is not affected by change in static pressure, but depends entirely on change in rate of flow and should not be confused with a pressure-operated alarm.

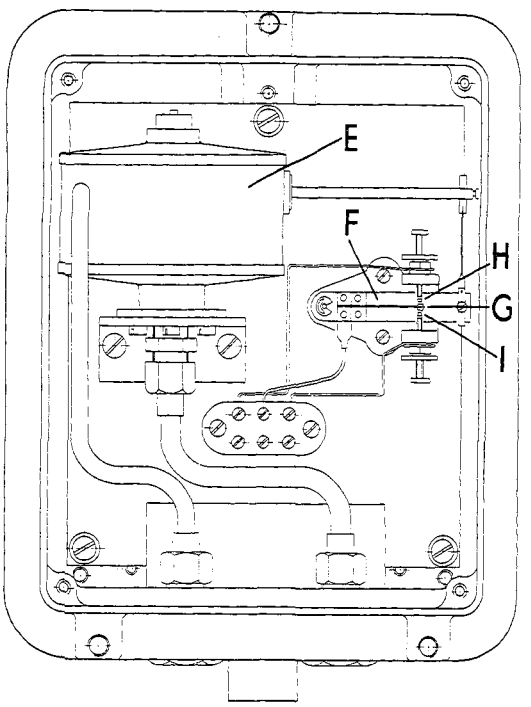


Liquids

Fig. 1. Liquid-flow operated switch

For liquids the construction is shown in Fig. 1. The pressure tappings connect to a non-magnetic cylinder *A*. Within this cylinder is a metal float *B* having an iron core. When flow occurs the float is lifted and attraction between the iron core and magnet *D* causes the mercury switch *C*, carried on the magnet, to tilt and make circuit, the movement being related to the required flow. Two separate switches or a three-electrode type can be fitted. A minimum of 15 in. w.g. pressure difference is required, plus an allowance for pipe friction loss. The cast case is $9\frac{1}{2}$ in. high × $7\frac{1}{4}$ in. wide × $4\frac{1}{2}$ in., is finished black enamel and suitable for wall or flush-panel mounting. The apparatus is suitable for static pressures up to 100 lb. per sq. in. and temperatures up to 200° F. It should be protected by filters.

For gases the device can be employed in a similar way to the instrument already described. The mechanism is, however, modified, and in place of the cylinder, core float and mercury switch there is a metal diaphragm mounted in a pressure-tight box *E* (Fig. 2) and arranged so that its movement is transmitted to a lever *F* carrying a contact *G* and working between high and low adjustable contacts *H* and *I*. The space either side of the diaphragm is connected across the orifice in the air line. The pressure difference required can be as low as 0·1 in. w.g., but it is desirable to have 0·2 in. w.g. if possible. The maximum static pressure should not exceed 20 in. w.g. The orifice dimension can be calculated for a given set of conditions from the standard formula.



Gases

Fig. 2. Gas-flow operated switch

This mechanism is contained in the same case as is used for a liquid flow and has the same external appearance so that a symmetrical arrangement is obtained if they have to be mounted on the same panel.

As the operating forces available are only sufficient for light contacts it is not possible to use mercury-in-glass switches; a relay, housed in a separate case, is therefore employed.

Analytical Balances. J. W. Towers & Co., Ltd., Victoria House, Widnes, Lancashire.

This balance (model 75) has been produced to meet the demand for a first-class quality instrument, with smooth action and robustness. The capacity is 200 g. in each pan, and the sensitivity is given as 0·1 mg., corresponding to $\frac{1}{2}$ a scale division. The beam is of rolled brass $5\frac{1}{2}$ in. long; agate knife edges in adjustable mounts are fitted. A notched and bevelled rider scale is marked in 50 divisions on each side of a centre zero; the rider mechanism is of the direct-lift type. The arrestment is a double-action fall-away type, which releases the hangers before the beam, placing the load on the outer knife edges first; the release handle is in the front. The hangers are of Monel metal with optically flat agate planes, and two-pin alinement; the pans, which are 3 in. in diameter, are of Monel metal as are also the wires supporting them, which are $8\frac{1}{4}$ in. high and $4\frac{3}{4}$ in. apart. The pillar is of lacquered brass. Polished mahogany and glass is used for the case, which has a sliding counterpoised front door, and the usual side doors; it measures $12\frac{1}{2}$ in. × 8 in. × 14 in. high and can be removed for cleaning by unscrewing four screws. The base of the balance is of black glass.

For those who require a similar but more robust balance of simpler construction for routine work or for teaching, the makers have just put their model 55 on the market. Its capacity is 200 g. in each pan and the sensitivity is given as 0·1 mg. or 5 scale divisions/mg. The beam is similar to that in the other model, but the arrestment is of the single parallel fall-away type, arresting the beam and hangers. The rider gear is simple, and there is a scale along the top of the beam. Other features of the balance are identical with those of the model 75 described above. The internal dimensions of the case are 14 in. × 8 in. × 14 in. high.

Analytical balance (model 75)

Binocular Magnifier. Gowllands, Ltd., Morland Road, Croydon, Surrey.

This form of binocular magnifier, known as the Berger Loupe, was designed some years ago to assist surgeons at delicate operations, but it has been found of great assistance to others whose work requires close attention to fine details. It consists of two sphere-prism lenses designed to give binocular vision over a field of some 30 mm. diameter and a threefold magnification. An improved form of construction has recently been introduced. The body of the instrument is now made of black laminated polished Bakelite sheet which combines strength with little weight. The lenses themselves are fixed in a chromium-plated front piece. This, it is stated, ensures accurate alinement and gives very considerable protection to the lenses against accidental damage or misplacement. A broad webbing headband is provided. The lenses are specially designed to suit the sight of normal users, but the instrument may be worn over the user's own glasses.

Binocular magnifier

New Books

The following new books have been received, and unless otherwise stated have been presented by the publishers to the library of the Institute of Physics, where they may be inspected. The Institute assumes no responsibility for the statements given below, information for which has been taken from the book itself.

Time and the Universe. By F. L. Arnot, B.Sc., Ph.D., Sc.D., F.R.S.E. Pp. 76. (Sydney: Australasian Medical Publishing Co. Ltd.) Price 6*s*. (Australian).

The theory developed in this book is based on the plausible assumption that the time variable τ occurring in our equations of motion and in general relativity is such that in τ-time the universe has been in existence for an infinite time. τ-time is measured by our ordinary clocks regulated by a pendulum or by a rotating planet. The author then chooses another time, called t-time, which is connected with τ-time by a logarithmic relation. It is then shown (not assumed) from the resulting theory that an atomic clock keeps this particular t-time, and that the age of the universe in t-time is finite. The theory adopts atomic standards of length and mass which have the same value on both time-scales. The red-shift of nebular spectra is found to be due to a decrease in the velocity of light in t-time, and the formula obtained for the degree of red-shift as a function of the distance of the nebula is in excellent agreement with the experimental observations. There is no recession of the nebulae, for the theory gives a static universe having a constant radius of 2×10^9 light-years, a mass of $2{\cdot}55 \times 10^{55}$ g. and a present mean density of $1{\cdot}9 \times 10^{-28}$ g./cm.^{3} The number of elementary particles in the universe is found to be $2{\cdot}31 \times 10^{79}$, and the present age of the universe is given by the red-shift formula as 2×10^9 years. Finally, the theory leads to the uncertainty relation and thus links quantum theory with cosmological theory. The theory, which in no way conflicts with the results of any physical experiment, is developed without any appeal being made to the general theory of relativity, but general relativity still, of course, holds in our ordinary τ-time, as do also our usual laws of mechanics and equations of motion.

Most of this work was carried out while the author was Lecturer in Natural Philosophy in the University of St Andrews. The work was continued until his death in Australia where he was for a short time Lecturer in Physics at the University of Sydney. The present volume has been edited by Prof. O. U. Vonwiller, and its publication has been made possible by a grant from the Scientific Publications Committee of the Commonwealth of Australia.

Analytical Experimental Physics. By H. B. Lemon and M. Ference Jr. Pp. xvi + 584. (Chicago: University Press; London: Cambridge University Press.) Price 42*s*. net.

For reasons set out in detail in their preface, the authors of this book (which measures 9½ in. × 12 in. and is copiously illustrated) claim that its basic idea is entirely different from any other text-book of physics that has ever been put forward.

By means of enlarged reproductions of strips of cinema film a large number of experiments in action and under observation are presented. The illustrations of phenomena are made parenthetical to the story told by the text. Each plate attempts to be quite complete in itself, thus avoiding tedious and time-consuming descriptions of apparatus. These are left to the pictures, where fewer words need be used.

'Such a book', the authors write, 'to be complete, must be long and detailed, especially if it is to cover all the aspects of physics. It may be more than usually difficult; the general physics course usually has been one of the hardest courses at its level in the curriculum.' The extreme simplicity of the apparatus in many cases and the wide variety of equipment which the authors fortunately possess for more precise observations and which has been fully used in the illustrative material will, they hope, make this book free from that sad comment that so often bars from use an otherwise desirable text-book: 'You know this book does not fit our apparatus very well.' Here they have tried 'to place the tools in their proper relation to the intellect, as servants, not as tyrants'.

The book is divided into four main sections: Mechanics; Heat; Electricity and Magnetism; Wave Motion, Sound and Light; and there is a Mathematical appendix (Analytic Geometry, Trigonometry, Algebra and Determinants, Calculus).

The senior author (Lemon) is Professor of Physics and the junior author Assistant Professor in the University of Chicago.