



condensation will just take place at p . Z has a shutter at the end nearer X . Fitting into Z also is a light piston of such diameter that as it moves it leaves the adsorbed film undisturbed, and merely prevents the liquid from leaking past. The following cycle is carried out isothermally: (1) Z is first exposed to the vapour in Y , so that the adsorption equilibrium is established at $(p - dp)$, the shutter at X being closed. (2) The piston being in position at the end of Z nearer X , the shutter between X and Z is opened. Capillary condensation thus takes place, the piston being driven back. If Σ is the internal area of the tube (more strictly that of the adsorbed film) the maximum work obtainable from the system by the pressure on the piston is $\Sigma\gamma_B \cos \theta$. (3) Z is shut off from X and (after removing the piston) exposed to Y , permitting the vaporization of the capillary-condensed molecules. According to the capillarity hypothesis based on equation (5), this process is *spontaneous*, so that *no work need be done* on the system. (4) The appropriate number of molecules of B is compressed from $(p - dp)$ to p and transferred back to Y .

The cycle as outlined contravenes the second law of thermodynamics, as indeed must any cycle in which the isothermal transfer of molecules from X to Y is made to yield a finite amount of work. The infringement lies in the assumption (implicit in calculations based on the Kelvin equation (5)) that the capillary-condensed liquid will evaporate spontaneously at $(p - dp)$.

The essential requirement for compliance with the second law is that, if the tube fills at p , the fluid filling the tube should be able, without evaporation, to reduce its free energy by $RT \, d \log f$. This necessarily implies that $\gamma \cos \theta$ is a function of p ; for V_m cannot vary unless $\gamma \cos \theta$ varies. It follows that if we attempt to empty the tube by isothermal evaporation alone (as opposed to pushing the liquid out simultaneously with a piston) we must reduce the pressure in Y by a *finite* amount to $(p - \Delta p)$. In other words, there will be a *hysteresis* loop in the isotherm.

To sum up, it has been established that: (1) where capillary condensation occurs, $\gamma \cos \theta$ is variable and not constant; and (2) capillary condensation cannot occur without hysteresis, though the converse statement does not necessarily hold. It further suggests itself that a quantitative relation must exist between the area within the loop and the work $\Sigma\gamma \cos \theta$. This relation and the more general form of equation (4) required to cope with cases of hysteresis and capillary condensation will be discussed in a later communication.

THE FAILURE OF PATULIN

IN an earlier issue (*Nature*, 152, 619; 1943), some account of patulin was given, and the results of a clinical trial of it for the treatment of the common cold, conducted by Surgeon Commander W. A. Hopkins, R.N., with the aid of Naval personnel, as described in *The Lancet* (ii, 625, Nov. 20, 1943), were outlined. In that trial 57 per cent of the patients recovered completely in 48 hours, while only 9.4 per cent of the controls recovered in this time. Commander Hopkins was, however, wisely cautious about the interpretation of these results and pointed out that the etiology of the common cold is not yet fully understood. Prof. H. Raistrick stated at the time that patulin would not be issued for general use until the results of large-scale trials had been obtained. *The Lancet* now publishes the results of two such trials, which fully justify the earlier caution about the effect of patulin on the common cold.

J. M. Stansfield, A. E. Francis and C. H. Stuart-Harris (*The Lancet*, 370, Sept. 16, 1944) report on their laboratory experiments with patulin and on two clinical trials with it for the treatment of colds in 100 soldiers of an army primary training wing. For the second of these trials the method of administration used was the same as that used by Hopkins. Briefly, their conclusions are that patulin is bacteriostatic against a wide range of both Gram-positive and Gram-negative organisms, although its bacteriostatic action is materially reduced by incubation in broth or by the addition of horse serum. The margin between concentrations which kill mice and those which are bacteriostatic *in vitro* is small. Two experiments with mice indicated that it failed to cure infections with *Bact. typhosum* or with influenza virus A. (Hopkins (*loc. cit.*) found that patulin did not appear to have influenced the course of influenza in five human patients.) Controlled clinical trials for the treatment of the human common cold showed no advantage from the use of patulin as compared with the use of control buffer solutions without patulin, and that patulin did not appear to be useful for the treatment of human conjunctivitis.

Another trial (*The Lancet*, 373, Sept. 16, 1944) was more extensive. It was conducted by the Patulin Trials Committee of the Medical Research Council, the chairman of which was Prof. H. P. Himsworth; the committee included Prof. Raistrick and Dr. C. H. Andrewes. For this trial 668 patients were treated and there were 680 controls, the subjects being personnel of the Post Office, the Ministry of Supply, Haileybury and Rugby Schools and various engineering and electrical firms. The conclusion of this Committee is that "In a large clinical trial of patulin in widely distributed areas of Great Britain and lasting from the beginning of December 1943 to the middle of April 1944 no evidence was found that patulin is effective in the treatment of the common cold."

Thus ends a manful and commendable attempt to control that bugbear of our lives, the cold in the head, the effects of which are so great that it is not surprising that uninstructed people rushed into print to claim for patulin more than it could perform. It should not be forgotten that those who produced it never exceeded the scientific scepticism which awaits proof before it commends, and even then avoids exaggerated claims. Meanwhile, much has been learnt from these trials. All those who have conducted them emphasize the difficulty of assessing the effect

¹ Bangham and Fakhoury, *J. Chem. Soc.*, 1324 (1931). Bangham, Fakhoury and Mohamed, *Proc. Roy. Soc., A*, 127, 152 (1934).

² Gregg, *J. Chem. Soc.*, 696 (1942).

³ Harkins and Jura, *J. Amer. Chem. Soc.*, 66, 1356 (1944).

⁴ Anderson, J. S., *Z. phys. Chem.*, 88, 191 (1914).

⁵ Gregg (*loc. cit.*) explains such cases in terms of a delayed phase-change.

of treatment of a condition like the common cold, in which there are no real objective signs by which the patient's subjective feelings can be checked. All the investigators made provisions for this and endeavoured to eliminate the subjective element. The experience thus gained will be of great value when further remedies are presented for test.

Discussing these trials, *The Lancet* suggests that the good results obtained by Hopkins may have been due to the effects of patulin on the particular organisms responsible for the colds which he treated, or that, in view of patulin's failure in the later Army and Medical Research Council trials, its success in the Navy trials was one of those rare events which do sometimes happen.

Whether patulin may yet have other uses, further work will doubtless show. G. LAPAGE.

THE HEATHER BEETLE

THE British Field Sports Society has recently issued a booklet entitled "Report on the Biology and Control of the Heather Beetle". In view of the damage caused by this insect in the past, this report and its findings will be of very definite interest to those who are concerned with the management and preservation of moorlands. These include not only the moor owner and his shooting tenants, but also the sheep grazier and, to a lesser degree, the bee-keeper. The activities of this beetle deplete the numbers of grouse, impoverish the grazing and decrease the honey-flow. The report under notice is based upon investigations carried out between 1937 and 1940 under the direction and supervision of Dr. A. E. Cameron, of the Department of Agriculture and Forest Zoology, University of Edinburgh.

The beetle in question is *Lochmoea suturalis*, a member of the family Chrysomelidæ. Severe damage to the heather is most prevalent in Scotland; it is also troublesome in Germany and Holland. In July and August, the leaves and stems of heather attacked by the larvæ of the beetle become fox-red where they have been chewed and partially stripped of bark, and especially the ends of young shoots. The most severe damage is done to old heather of twenty years or more. Young heather is also attacked but permanent damage rarely happens. Attacks are most prevalent and the beetles most abundant over flat wet moorlands, but well-drained slopes are not often affected. The eggs of the beetle require humid conditions for their development and are chiefly laid on *Sphagnum* moss. Rainfall in spring and early summer during its breeding season is believed to determine its rate of multiplication. Seasons of very low precipitation seem, on the other hand, to check its activities. There is only one generation in the year. The beetles overwinter in the ground or among moss, etc., and begin to lay eggs in mid-April. Incubation lasts three to four weeks in Nature, and hatching of the larvæ begins early in June when they climb the plants in order to feed on the young shoots and leaves. The adult beetles appear first in the latter half of August but do not become abundant until late in September. Ling heather, *Calluna vulgaris*, is the chief and perhaps the only food plant of this insect. The only natural enemy of any importance was found to be the ladybird *Coccinella hieroglyphida* which, however, did not appear to exert any significant degree of control of the beetle.

The problem of dealing with the insect is a question of moorland economics. Treatment of the heather with derris and pyrethrum dusts serves to check the larvæ. General adoption of this method over wide areas of moorland is out of the question owing to the costs of material and labour. Muir-burning in Scotland is not permissible at the time it would be most efficacious. There is no practice of moorland management that should be more encouraged than a ten-year rotational system of burning, since it induces young growth which recovers more quickly from beetle attack than does old heather. Dusting and burning, however, are of secondary importance to drainage. The elimination of excessive moisture by a proper system of surface drains is the only known means by which permanent control of the pest may be achieved.

This report, it may be added, can only be obtained direct from the British Field Sports Society, Petworth, Sussex, price 1s. post paid. It is well printed and, with thirteen full-page half-tone plates, is remarkably cheap.

FORTHCOMING EVENTS

Monday, January 1

ROYAL GEOGRAPHICAL SOCIETY (at Kensington Gore, South Kensington, London, S.W.7), at 2.30 p.m.—Mrs. Harold Ingrams: "Young People of the Hadhramaut" (with films) (Christmas Lecture for Young People).

Tuesday, January 2

ROYAL INSTITUTION (at 21 Albemarle Street, London, W.1), at 2.30 p.m.—Sir Harold Spencer Jones, F.R.S.: "Astronomy in our Daily Life", 3: "How we get our Time" (Christmas Lectures).

INSTITUTION OF CIVIL ENGINEERS (WORKS CONSTRUCTION DIVISION) (at Great George Street, Westminster, London, S.W.1), at 5.30 p.m.—Lieut.-Colonel C. M. Norrie: "The Organization of Civil Engineering Work".

Wednesday, January 3

ROYAL SOCIETY OF ARTS (at John Adam Street, Adelphi, London, W.C.2), at 1.45 p.m.—Lieut.-Commander Rupert T. Gould: "The Art of Measuring Time" (Dr. Mann Juvenile Lecture).

Thursday, January 4

ROYAL INSTITUTION (at 21 Albemarle Street, London, W.1), at 2.30 p.m.—Sir Harold Spencer Jones, F.R.S.: "Astronomy in our Daily Life", 4: "Finding the Longitude" (Christmas Lectures).

Friday, January 5

ROYAL GEOGRAPHICAL SOCIETY (at Kensington Gore, South Kensington, London, S.W.7), at 2.30 p.m.—Surgeon-Commander Bingham: "Sledging with Dog Teams in the Antarctic" (with films) (Christmas Lecture for Young People).

Saturday, January 6

ROYAL INSTITUTION (at 21 Albemarle Street, London, W.1), at 2.30 p.m.—Sir Harold Spencer Jones, F.R.S.: "Astronomy in our Daily Life", 5: "Clocks and Time Keeping" (Christmas Lectures).

APPOINTMENTS VACANT

APPLICATIONS are invited for the following appointments on or before the dates mentioned:

IRRIGATION ENGINEER, Soils Mechanics Laboratory, Irrigation Department, Ceylon—The Ministry of Labour and National Service, Central (T. and S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2 (quoting Reference No. E.1258.A) (January 1).

INSPECTOR OF AGRICULTURE, Sudan Government—The Ministry of Labour and National Service, Central (T. and S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2 (quoting Reference No. F.3285.XA) (January 2).

EXECUTIVE ENGINEER by the Government of Trinidad—The Ministry of Labour and National Service, Central (T. and S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2 (quoting Reference No. E.1266.A) (January 3).

ANALYTICAL CHEMIST for manufacturers engaged on high priority work, S.E. London area—The Ministry of Labour and National Service, Central (T. and S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2 (quoting Reference No. F.3292.XA) (January 4).

EXPERIENCED ENGINEERS, QUANTITY SURVEYORS and ARCHITECTS at the Building Research Station, Garston, Watford, for work in connexion with the preparation of codes of practice—The Ministry of