

natural reservoir of the trypanosome, is pronounced by Dr. Carpenter to be impracticable.

His descriptions of the sights and sounds of the lake and its islands give a lively idea of the interest of the naturalist's surroundings. "The colouration," he says, "in the bright sunlight during one of the clear days characteristic of the heavy rains is really wonderful in its brilliancy. From high ground one looks over the top of vividly green forest towards distant purple islands set in a sparkling deep blue lake, which is stirred into white-capped waves by the prevailing south-east breeze. So clear is the atmosphere at this time, especially in the evenings, that from Bugalla Island some of the individual houses at Entebbe, on the mainland, twenty-five miles away, could be distinguished with the naked eye."

Some of the voices of the night are thus described: "The thunderous snortings of hippos, the muffled bark of the Situtunga, break in upon the continuous shrill tinkling sound, curiously suggesting sleigh bells, produced by thousands of small frogs along the shore. Crickets chirp all round and in the house, and during the rains one enormous species, sitting just inside the mouth of its burrow, makes the earth resound with a continuous high-pitched buzzing."

The last seven chapters of the book contain a

mass of valuable observations on the fauna, especially of the group of islands south of Entebbe, and of the Sesse archipelago in the north-west portion of the lake. The chapters on the insect life are of especial interest, more particularly the minute account of the wonderful mimic, *Pseud-*



FIG. 2.—The raised beach of Ngamba cleared of vegetation up to the edge of the forest behind. From "A Naturalist on Lake Victoria."

acraea eurytus, in relation to which Dr. Carpenter's criticism of the mutation theory will be read with interest. The book is well illustrated by photographic views and other plates, which are excellently reproduced. F. A. D.

Industrial Research Associations.

IX.—BRITISH BOOT, SHOE, AND ALLIED TRADES RESEARCH ASSOCIATION.

By JOHN BLAKEMAN.

DURING the year 1918 a few prominent Northampton business men felt that it would be advantageous to encourage scientific research in connection with the boot, shoe, and leather industries. The Northampton Boot Manufacturers' Association was approached and promised support, as also did the more prominent leather manufacturers; but at first it was intended that only a local research scheme should be set on foot, conducted jointly by the Northampton boot, shoe, and leather manufacturers. The Research Department was asked for advice, and the secretary, Sir Frank Heath, having attended a conference at Northampton on September 24, 1918, urged strongly that a British Research Association for the boot and shoe industry should be established which should be national in its scope, and should work in co-operation with the Government Department. It was also decided that a separate association should be formed for leather manufacture, but that the Boot

and Shoe Research Association should invite leather manufacturers to membership, as they would have many problems in common.

The Northampton Boot Manufacturers' Association promised an annual subscription of 375*l.* for five years, which has been raised by a levy of 7*d.* each on the average number of employees, while the minimum subscription for any firm is three guineas per annum. The council of the Research Association has undertaken that the total contributions from members shall be not less than 500*l.* per annum for five years, and the Research Department will then contribute a sum equal to that contributed by members up to a limit of 1500*l.* per annum.

The association began in Northampton as a local effort, and its organisation has consequently centred round the Northampton Technical School. The work that has been accomplished so far has been made possible only by having the equipment and staff of the technical school available. The

organisation, however, is such that if at any time the association develops to such an extent that it would be an advantage to separate from the technical school, this could be done without difficulty. In any case, the work that the association has set before itself can be done efficiently only by national effort, and as interest in the work spreads, the question of the relation of the association to other centres of industry and to educational institutions will have to be reconsidered.

The main objects of the association are :

(1) To establish a reference index for the trade by the systematic collecting, filing, and circularising of information, and the building up of a technological museum.

(2) To establish a scientific laboratory for analysing, testing, and standardising materials used in boot and shoe manufacture.

(3) To investigate the applications of science and scientific methods to the industry.

(4) To investigate suggestions for new materials and processes.

(5) To improve scientific and technological teaching in connection with the industry.

The boot and shoe industry is somewhat peculiar in its character. It does not effect any chemical or physical change in the structure of materials, but simply collects the highly finished products of other industries, assembles them, and converts them into boots. There are a large variety of materials used, the chief one being leather, and little attempt has been made in the past to apply scientific tests to these materials or to standardise them. The materials have to fulfil certain technical conditions, both in manufacture and in wear, and the Research Association will study these materials with the object of expressing their properties in terms of physical and chemical constants, and of seeking the correlation between them and the practical properties required in manufacture and wear.

In the manufacture of boots there are also a very large number of small processes of a highly specialised character, for which a large variety of extremely complex machines are required. The development of these machines comes to-day almost entirely from the engineering side, although they are subject to the criticism of the practical boot and shoe man who operates them. So far there has been little effort to reduce these processes to written descriptions with the object of arriving at an agreement as to the best methods of performing them.

A materials chart and a processes chart have been printed and issued to members (copies of which may be obtained from the secretary, Technical School, Northampton). The objects of these charts are as follows :—

(a) To present in a concise form a survey of the problems which may arise in the working of the association, and of the questions on which information may be desired.

(b) To form a basis for the systematic filing of information.

(c) To secure the co-operation of members of the association in collecting the most useful information.

Specimen entries from these charts are given below :

MATERIALS CHART			a.	b.	c.	d.	e.	f.	g.	h.	i.	k.	l.
Departments			Standardising	Chemical analysis	Testing	Kinds	Composition	Stability	Substances	Cost	Source	Terminology	Literature
3	Lasts	Measurements											
12	Patterns	Geometrical tools											
24	Clicking	Calf (full chrome)											
37	Clicking	Linen linings											
55	Closing	Linen threads											
58	Closing	Rubber adhesives											
86	Bottom stock	Insoles											
111	Lasting	Toe hardeners											
126	Attaching	Welting needles											
153	Finishing	Edge trimmer cutters											
187	Cleaning	Patent abrasives											

PROCESSES CHART			a.	b.	c.	d.	e.	f.	g.	h.	i.	k.	l.
Departments			Methods	Machines	Combinations	Speed	Quality	Organisations	Costing	Comparisons	Physical effects	Terminology	Literature
3	Patterns	Standard cutting											
26	Clicking	Cutting outsides											
42	Closing	Skiving											
92	Bottom stock	Channelling											
120	Lasting	Pulling over											
131	Attaching	Welt sewing											
170	Finishing	Edge setting											
194	Cleaning	Sizing											

Each square in the charts is intended to suggest a field of investigation—e.g. M. 111 *b* would deal with the chemical analysis of toe hardeners, P. 120 *b* with the various machines used for pulling over. The materials chart contains 192, and the processes chart 200, entries.

In the preliminary period to date, the association has investigated problems proposed by members, some minor and some important, and has separated out the problems for immediate investigation. Among those which have been attacked are :—

- (1) Analyses of tanning liquors.
- (2) Detection of adulterants in linings.
- (3) Detection of free acid in insole leathers.
- (4) Tensile strength of threads, waxed and unwaxed.
- (5) Tensile strength of linings, loops, etc.

The most important of the questions demanding prompt investigation are :—

- (1) The suitability of various leathers for welted insoles, the properties required, and the methods of manufacture most likely to yield those results. A special committee is conducting this investigation. A general investigation of sole leathers is to come later.
- (2) The cracking of patent leather.
- (3) Complete analyses of gums and adhesives used in the industry.
- (4) The testing of all threads used in the industry, and the effects of gums and waxes on them.
- (5) Finishing of chrome leather soles.
- (6) The effects of perspiration on leather.

A large amount of experimental work has been done on the mechanical behaviour of leather under tension, repeated bending to test fatigue effects, and abrasion. Some of these results have been given in a printed paper entitled "Experiments on the Wearing of Bottom Stock Leather under Abrasion," copies of which may be obtained from the secretary at the address given above.

The nature of the problems which are considered likely to be of immediate importance may be illustrated by the questions which have arisen in the work of the special committee on welted insole leather. This committee was set up to consider the properties required in leather to render it satisfactory for welted insoles, to seek the relation between different tannages and the extent to which the desired properties are produced, and to set up a standard for an adulterant-free welted insole.

During the process of manufacture the leather must be such as admits of a satisfactory and durable seam in the process of welt sewing and in wear. It should behave in an ideal manner in

its relation to the perspiration from the feet. Most of the English tanners who produce this kind of leather have submitted samples of their products, and these samples are being submitted to the following kinds of tests:—

- (1) Wearing tests on hot and dry feet.
- (2) Chemical analyses giving percentage of ash, fat, moisture, hide substance, tannin, and water solubles.
- (3) Microscopic examination of fibres.
- (4) Physical and chemical tests, including tension, abrasion, fatigue on repeated bending, water penetration, drying after wetting, and the tearing strength given by the channel cut in a standard manner.

In conclusion, it must be stated that the Boot and Shoe Research Association has been set up on a very modest scale, with some uncertainty as to the extent to which scientific methods can be applied to the industry. Experience to date has shown that definite and important lines of investigation do exist, and it is hoped that the work of the association will extend.

Obituary.

DR. J. C. CAIN.

DR. JOHN CANNELL CAIN, whose death occurred suddenly at his residence in Brondesbury Park on Monday morning, January 31, at the early age of forty-nine, was the eldest son of the Rev. Thomas Cain, of Stubbins, Lancashire, and was born on September 28, 1871, at Edenfield, near Manchester. He received his education at the Victoria University (Owens College) and at the Universities of Tübingen and Heidelberg, obtaining the B.Sc. in the Honours school at Owens in 1892, and the D.Sc. at Tübingen in 1893. It was after he had migrated from Tübingen to Heidelberg in the autumn of 1893 that the writer of this notice first met him. He returned to Owens College for a short time in 1894, where he worked with W. A. Bone, but it is evident that at this period he was already feeling drawn towards that field of organic chemistry to which he ultimately devoted his life, for in 1895 he resisted the lure of research in the rapidly developing organic school at Manchester and entered the works of Messrs. Levinstein, Ltd., of Crumpsal Vale, where he remained until 1901. It was during this period of his career that the writer became intimately acquainted with him, for they lived in the same house at Cheetham Hill, the writer working at research at Owens College, and Cain at Crumpsal. Many were the discussions on colour chemistry which were held during the evenings, and it was here that it was decided to write the book which ultimately appeared under the title of "The Synthetic Dyestuffs" in 1905.

Cain did not, however, remain long at Levinstein's, and in 1901 he became head of the chemistry and physics departments of the Municipal Technical School at Bury, in Lancashire, where

he started, with Frank Nicoll, the important series of researches on the rate of decomposition of diazo-compounds, three parts of which were published during 1902 and 1903. At this stage he also commenced his study of the diphenyl compounds, an investigation which, as will be seen, he continued at a later date elsewhere. As an outcome of his research work, Cain obtained the degree of D.Sc. in the University of Manchester in 1904, being one of the first three to receive the highest degree of the newly created University. Nevertheless, his love for the practical side of his science prompted him in 1904 to leave the Bury Technical School and to take up the post of manager and head chemist to Messrs. Brook, Simpson, and Spiller, of London, a position in which he remained until 1906, when he was appointed editor of the Chemical Society's publications, an office he held at his death.

During the period of his editorship Cain spent much of his spare time at research, and in 1907 published his theory of the constitution of the diazo-compounds, an ingenious attempt to harmonise much conflicting evidence, which, although it has not found general acceptance, yet still affords the simplest means of explaining many of the reactions of these very reactive substances. In 1908 Cain published the first edition of his "Chemistry of the Diazo-Compounds," a book which contains a complete account of these valuable substances. Although during this period he was handicapped by the strenuous work required by his office, and to a certain extent by the lack of laboratory accommodation, he was able to continue his research work on the diphenyl compounds, and in conjunction with Miss Micklethwait, Dr. Brady, and others he published