found unconscious on the veldt at Standerton, and he was admitted to hospital there for concussion of the brain. The cause of this disability was never satisfactorily traced. At Middelburg he was under the care of Captain Hanafin, on whom the brunt of the treatment fell.

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Report.

REPORT ON SEVENTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

By Major W. W. O. Beveridge, D.S.O.

Royal Army Medical Corps.

The first meeting of the International Congress of Applied Chemistry was held in Brussels in 1894, and the seventh International Congress was held this year in London, from May 27th to June 2nd, for the first time in this country, under the patronage of His Majesty the King and his Royal Highness the Prince of Wales. Sir Henry Roscoe, F.R.S., acted as Honorary President, with Sir William Ramsay, F.R.S., as Acting-President, and Mr. W. Macnab as Honorary Secretary.

Altogether about 3,000 members and over 600 ladies attended the Congress. Delegates from practically the whole civilised world were present, and all the lectures were well attended daily; a vast amount of work being carried out, as shown by the fact that among the seventeen sections over a thousand papers were presented at the meetings.

Too much praise cannot be bestowed on the Organising Committee and the committees formed in nearly every country for the excellence and the completeness as to detail of the sectional arrangements. Everything that could be done was done to make one's way easy, and the matter under discussion was well selected.

The meetings were held in the buildings of the University of London, the Imperial Institute, and the Imperial College of Science and Technology, which afforded excellent and ample accommodation.

The organising work in connection with the different sections was entrusted to officers and committees, and each section made its own arrangements.

The sectional officers consisted of a president, vice-president, a secretary, and one or more assistant secretaries. At the close of each meeting the members elected an acting-president for the next meeting, but the secretaries elected at the first meeting remained in office during the whole session of the Congress.

One great feature of all the sectional meetings was the distribution of most excellent abstracts, chiefly in English, of the papers to be read.
The seventeen sections and sub-sections were as follows:—

I. Analytical Chemistry.

II. Inorganic Chemistry and Allied Industries.

III. (a) Metallurgy and Mining.
    (b) Explosives.

IV. (a1) Organic Chemistry and Allied Industries.
    (a2) Physiological Chemistry and Pharmacology.
    (b) Colouring matters and their application.

V. Industry and Chemistry of Sugar.

VI. (a) Starch Industry.
    (b) Fermentation.

VII. Agricultural Chemistry.

VIII. (a) Hygiene and Medicinal Chemistry.
    (b) Pharmaceutical Chemistry.
    (c) Bromatology.

IX. Photo-chemistry—Photography.

X. Electro-Chemistry—Physical Chemistry.

XI. Law, Political Economy, and Legislation affecting Chemical Industry.

At the close of the Congress a General Meeting decided on the date and locality of the eighth International Congress. The American Ambassador (Mr. Whitelaw Reid), on behalf of the American delegates and the country he represented, presented an invitation to hold the next meeting in America in the year 1912. The invitation was received and accepted with great enthusiasm.

During the Congress a number of resolutions were put forward and agreed to, amongst which may be mentioned:—

In the Pharmaceutical Section:—

That an international enquiry shall be instituted with a view to securing: (1) A greater uniformity in the commercial supplies of potent drugs and the means for determining the same, and (2) that common standards of activity should be approximated in the pharmacopoeias of the world. It is needless to say much on the importance of such a resolution. As pointed out at the sectional meeting, many medicinal preparations varied in strength, according to the directions of the pharmacopoeias of the countries in which they were prepared.

Variations in the strength of leaves, roots, &c., employed were dealt with, and also the fact that different pharmacopoeias gave directions for medicinal preparations to be made to contain different proportions of a drug. Uniformity in preparation is therefore greatly to be desired, and would result in benefit both to prescriber and compounder.

In Section XI. the Lord Chief Justice, in his opening address, dealt with the right method of legislating upon and dealing with scientific knowledge, and considered that all countries could approximate to an international code in connection with the proper protection of inventions.
The recent Patents Act in Great Britain was in his opinion a step in the wrong direction as tending to discourage inventors and make people revert to secret processes. At the end of the meeting the following resolution was carried: That the committees of the various countries party to the International Convention for the protection of industrial property be requested to consider the advisability of adopting the following provision: "The manufacture in one country of the union protects the patentee against revocation of his patent in all countries of the union."

At a joint meeting of the Hygiene and Legal Sections, the Congress was requested to appoint a committee to impress on the Governments of each country represented the importance of adopting a uniform law throughout their respective territories regarding the emission of noxious fumes from chemical and metallurgical works, and of black smoke from works and factories. The Sections recorded their opinion that the dispersal of the pall of smoke over many industrial districts in England and elsewhere would be accompanied by benefit both to the inhabitants and to the manufacturers.

In the Section of Bromatology a resolution was carried: "That brandy is a product of the distillation of wine, and the term is synonymous with eau de vie du vin."

The subjects under discussion covered so much ground that it is impossible to deal with all the seventeen sections and sub-sections seriatim. It will be convenient to limit any review of the work done to sections which were of special interest to sanitarians, and to those which more directly concern the medical department of the Army.

Hygiene Section (VIII.).—Thirty-six papers were presented and twenty-eight were read and discussed. The most important papers were those dealing with the sterilisation of water, disinfectants and sewage disposal.

These were foreshadowed in the Presidential Address given by Sir James Crichton-Browne at the opening of the Section.

After reviewing the history of sewage disposal, he said that the water-carriage system, although inevitable in this country, was at the best a wasteful and thriftless one. Sir William Crookes had said that individually the amount lost in this way is trifling, but when the loss is multiplied by the number of inhabitants, we have the startling fact that in the United Kingdom we are content to hurry down our drains and water-courses into the sea fixed nitrogen to the amount of no less than £16,000,000 per annum. That was in 1898, and the annual loss must be even greater now. The history of sewage treatment up till a recent date was indeed a series of failures involving an enormous expenditure of public money. He considered the bacteriological system was not an empirical or haphazard experiment but an evolutionary growth, and an imitation of Nature which never fails. It is now certain that the sewage of a great city can be effectually and inoffensively disposed of by anaerobic and aerobic bacteria, and reduced to its original inorganic elements.
He then reviewed the question raised by Dr. Barwise, who recently contended that bacterial beds are not correctly so called, but are, in his view, entomological managements stocked not only with bacteria but with many varieties of animal life, such as naïdes and tubificides, which exist there in enormous numbers, and which effect the destruction of organic matter. There are also numerous polychata, large worms, leeches, larvae of gnats and flies, and a small black jumping insect called podura, present in such quantities that they can be wheeled away in barm-load.

He then referred to Dr. Houston's investigations on the disinfection of water. Dr. Houston had succeeded in exploding the old notion that the improvement effected in water by storage was merely mechanical. It was shown that adequate storage of water reduced the number of bacteria of all sorts, the amount of ammoniated nitrogen present and the amount of oxygen absorbed from permanganate. The outcome of it all was that given a sufficient time a "safety change" took place—the contaminated water disinfected itself. Certain devitalising processes involve the extinction of specific bacteria, and what was really going on was a sedimentation of dead bacteria.

Dr. Houston's final conclusion was that river-water should be stored, antecedent to filtration, preferably for thirty days. Apart from the "time factor," natural disinfection was largely carried out by dilution and changes of temperature.

Sir James Crichton-Browne then described a series of experiments on bacteria to test their vital tolerance of low temperature by means of liquid air. He found that bacteria such as Bacillus anthracis, B. diphtheria, B. typhosus, B. coli communis, B. cholera, B. acidi lactici, and many more were able to survive after being exposed to the temperature of liquid air for prolonged periods up to six months. Ova of salmon and several species of lepidoptera were killed after an exposure of twenty-four hours.

Turning to the subject of disinfectants, he said that there was an enormous trade done in them, with a growing demand, and the public were surely entitled to protection against worthless preparations. This protection was to be found in standardisation best effected by the Rideal-Walker method adopted by the War Office. It was imperative, he thought, that the carbolic co-efficient should be set forth on every bottle or packet sold, and that prompt prosecution should follow any infringement of that rule, prosecution undertaken not by the purchaser but by some public authority as under the Food and Drugs Act. He was almost disposed to suggest a Government official.

M. le Docteur Beunat read an interesting paper on the sterilisation of water by ozone at Nice, in which he described the electrolysis apparatus for producing ozone used at Nice, the action of ozone on water, and its sterilising action. He said that "L'eau ozonée n'a donc pas de propriétés bacterioides; c'est un liquide sterilisé, non stérilisant; son action sur l'organisme ne saurait être celle d'une substance antiseptique."
After giving tables of the results of chemical and bacteriological analysis, he stated that the Otto apparatus worked efficiently at Nice, the production of ozone being regular and constant and the sterilisation of the water giving satisfactory results.

Dr. Thresh thought the process likely to be successful was the use of chlorine or hypochlorites, on which subject he submitted a paper. He stated that with regard to the electrical methods of sterilisation the sight of the complicated appliances necessary for producing the ozone appalls the waterworks authorities, and they are, therefore, waiting for some simpler process whereby the objectionable bacteria in water can be eliminated. In a former article in the *Lancet* he showed that when waters were fairly free from suspended matter and organic matter in solution, exceedingly minute quantities of chlorine sufficed for practical sterilisation, and by the subsequent use of bisulphate of sodium the residual chlorine could be easily removed and the water left as palatable as before. One part of chlorine per million, at a cost of not more than 5 shillings per million gallons, with many waters practically sterilised them.

He had made experiments recently to ascertain whether the residual chlorine could not be removed by filtration of some kind, which would also remove any trace of suspended matter, and found that filtration through a thin layer of iron trimmings, or a thicker layer of scrap aluminium, removes the chlorine, and any iron taken up can be removed by a further filtration through polarite.

Dr. Fowler thought that the ozone process appeared to be a very great advance on anything that had been done before, and likely to be preferred, as nothing was added to the water. In the chlorine method, if the water was pure, a very small amount was required, but it was very easy to add too much. The use of chlorine had also more effect on algae than ozone, which were killed and then decayed in the water. There appeared to be a consensus of opinion that the ozone treatment was excellent in many ways but necessitated electrical power, which must, to be a success, be cheap.

Dr. Klut, of Berlin, reviewed the best methods for the identification and determination of manganese in drinking water. He recommended Volkard's process for testing waters, and for the determination of small quantities in drinking water the colorimetric method of Volkard and Treadvill, and advised oxidation of manganese to permanganic acid with nitric acid and lead peroxide, and comparison of the coloured liquid with nitric acid solutions containing known amounts of permanganate.

On Saturday, May 29th, a joint union of Section VIII. (a) and (b) was held on the important subject of disinfectants, with Professor Armand Gautier in the chair.

Dr. S. B. Schryver and R. Lessing communicated a paper on "Physico-chemical Methods for determining the Antiseptic Value of Disinfectants," of which the following is an abstract:

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"The rate of putrefactive change is measured in the presence of varying quantities of antiseptics by determining the rate of chemical change in the substrate. The latter is not measured directly by chemical methods, but by ascertaining the change in the electrical conductivity. Proteins and carbohydrates, under the influence of putrefaction bacteria, are broken down into simpler substances, which have a higher conductivity (and less resistance) than the original mixture, and the more rapid the putrefaction is the greater is the rate of increase of conductivity. A mixed infection from faeces has been generally employed, and the medium most commonly used has been an aqueous solution of 6 per cent gelatine and 1 to 2 per cent. Witte's peptone. This mixture has been inoculated with faeces and allowed to putrefy till the maximum rate of change is attained, as measured by the conductivity method. This putrefying medium is then used to reinoculate a fresh sterile gelatine peptone mixture in the proportion of 1 cc. of the former to 100 cc. of the latter. Portions of 20 cc. of the infected medium are then mixed with 5 cc. of varying strengths of the antiseptic under investigation, and also with 5 cc. of varying strengths of some disinfectant such as phenol, which can be employed as a standard. A special form of apparatus is employed for making these mixtures. The mixtures of antiseptic and putrefying medium are then incubated, and after a certain interval (three, four, or five days) the electrical resistances are determined with the use of specially devised electrodes. The results obtained can be conveniently plotted on curves, with the strength of solution as the ordinates and the resistances as abscissæ. For a numerical standard the reciprocal of the ratios of the amount of the antiseptic under investigation to that of the standard antiseptic just necessary to entirely stop putrefaction within a given time, is suggested. The influence of the age of cultures, when these are employed for making subinfections, has been investigated, and it has been found that when a subculture is made from a medium at the period of the maximum rate of change, its rate of putrefaction is practically independent of the amount of the putrefying medium used for the inoculation."

A paper by Mr. Wynter-Blyth (in the absence of the author taken as read) on "The Chemical Control of Disinfectants," dealt with the fact that bacteriologists differ very greatly as to their results in testing by the Rideal-Walker method. He said it has further been assumed that a test with naked organisms, such as the Rideal-Walker test, has at least the virtue of unmasking worthless disinfectants. The author, on the contrary, asserted that it may, and does, cover up some of the grossest frauds in the matter of disinfectants, and gave some examples to support his views. He ventured to state that a disinfectant will not be effective in the presence of organic matter unless it contains a high percentage of active material—that is, tar acids. A Privy Council Order of June, 1900, limits the amount of carbolic acid and its homologues to 3 per cent., unless the
disinfectant be labelled as poisonous. He thought the point was, that while bacteriological tests are useful within limits, and are indispensable as a guide to the materials to use for the manufacture of disinfectants, the results have not the mathematical accuracy which is desirable for a standard method under which legal proceedings could be taken. Further, naked organism tests alone may be gravely misleading. On the other hand, chemical analysis, combined with bacteriological tests, appears to be quite adequate to meet all requirements. Practically the only difficulty to be faced was the determination of the composition of emulsions.

The author gives a new method for the analysis of emulsions, and as this is of considerable importance, his method, although somewhat complicated, is here given.

THE ACETONE METHOD.

Emulsions, according to their nature, may be de-emulsified by many substances in addition to mineral acids. Thus salt, alcohols, oils, ether, &c., may cause partial or complete de-emulsification; for the purpose of analyses none of these substances are so effective or so convenient as acetone. Resin is soluble in acetone; it is precipitated by water. Petroleum ether dissolves the precipitate. Resin soap in water is precipitated by an excess of acetone and soluble on the addition of more water. Resin soap in petroleum ether may be completely washed out of the ether by a mixture of acetone and water. Albumin and gelatine are soluble in a mixture of acetone and water. Hydrocarbons, phenol, cresylic acid, and higher phenols are soluble in acetone and readily extracted from acetone and water by petroleum ether.

The following method is based on the above facts:

Soap Disinfectants.—Take 200 cc. of a soap disinfectant in a large separating tube, add 200 cc. of pure acetone, then 200 cc. of petroleum ether (boiling below 70° C.); shake with 200 cc. of water, allow to stand, run off acetone-water into 1,000 cc. flask, shake the contents of the tube with 200 cc. of 1 to 1 acetone and water, stand and separate. Repeat this treatment until the washings measure about 800 to 900 cc. Run washings into a separating tube, add 100 cc. of petroleum ether, shake, stand, and separate; add this ether to the ether from the first treatment. Make the washings up to 1,000 cc. exactly, and take 10 to 20 cc. for determination of the amount of emulsifying agent. The alkali-free and combined resin, fatty acids, &c., may be determined in these washings by the ordinary methods. A portion may also be steam-distilled to ascertain if any tar acids or hydrocarbons are still present. This, with the practically neutral disinfectants at present on the market, will not as a rule be necessary.

Ether Solution.—Run into a large distilling flask, wash out the separating tubes with ether, and add to contents of the flask. Distil until all the ether and water have come over. This will be indicated by
the thermometer mounting rapidly from 100° C. (I know of no disinfectant containing oils boiling near 100° C.) Pour into a measuring tube, allow for the oil left in the flask (determined by previous experiment), cool, and measure. The result equals total oil and any free resin. Return the oil to the distillation flask, distil, noting the temperatures; in the absence of any quantity of resin the distillation may be carried on until only one or two grammes of residue are left, when coking will occur.

Example:

| Total oil | measured 118 | 192 cc | 60 |
| Distilled 180° to 340° C. | 117 | 58.5 |
| Residue | 3 | 1.5 |

Now extract the distilled oils three times with an equal volume of pure sodium hydroxide solution, specific gravity 1.2, adding to the oil first one half its volume of petroleum ether. Extract the soda washings once with half its volume of petroleum ether. Mix the two ethers and with the usual precautions distil off the petroleum ether, measure the hydrocarbons.

The Soda Solution.—Place in a separating tube; make acid with one part of sulphuric acid in three parts of water, allow to cool, add an equal bulk of petroleum ether, separate, wash the ether and oil well with distilled water. Transfer in the usual way to a distilling flask, distil off the ether and the water; note the amount of oil, if any, coming over with the water. Measure the oil left in the flask. Example:

| Total oil 58.5 | By difference | Mean |
| Hydrocarbons | 23.5 | 24.5 | 25.2 | 25.4 | 24.85 |
| In flask | 1.0 | 1.0 | 1.0 | | |
| Phenoloids | 32.3 | 33.3 | 34.0 | 33.6 | 33.65 |
| In flask | 1.0 | 1.0 | | | |

The phenoloids should now be distilled with a good fractionating column, noting the temperatures, the quantities, and taking the specific gravities of the different fractions.

WATER.

The difference between the dry emulsifying agent and the total oil represents the water. The results must be checked by distilling off and measuring the water from at least 100 cc. of the disinfectant—the results of direct distillation are always about 1 per cent. too low.

ALBUMIN EMULSIONS.

These are not so easy to de-emulsify as are soap emulsions: 200 cc. of the sample are mixed with 200 cc. of acetone and boiled under an inverted condenser until a homogeneous solution is obtained. The liquid is cooled and placed in a separating tube, 200 cc. of petroleum ether are
added. The rest of the process is exactly the same as with soap emulsions.

The following are a few typical results obtained with disinfectants, the composition of which was known:

<table>
<thead>
<tr>
<th>SAMPLE A</th>
<th>SAMPLE B</th>
<th>SAMPLE C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Found</td>
<td>Theoretical</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Total oil...</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Oil distilled</td>
<td>68</td>
<td>—</td>
</tr>
<tr>
<td>Residue</td>
<td>9</td>
<td>—</td>
</tr>
<tr>
<td>Hydrocarbon oils</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>Phenoloid oils</td>
<td>28</td>
<td>40</td>
</tr>
<tr>
<td>Emulsifying agent</td>
<td>23.4</td>
<td>29</td>
</tr>
<tr>
<td>Water (by difference)</td>
<td>6.3</td>
<td>—</td>
</tr>
</tbody>
</table>

The following table gives the composition of some commercial disinfectants:

<table>
<thead>
<tr>
<th>No. 4</th>
<th>No. 5</th>
<th>No. 6</th>
<th>No. 7</th>
<th>No. 8*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total oils and resin</td>
<td>64.5</td>
<td>67.5</td>
<td>62.0</td>
<td>45.0</td>
</tr>
<tr>
<td>Hydrocarbon oils</td>
<td>41.5</td>
<td>23.0</td>
<td>2.4</td>
<td>2.3</td>
</tr>
<tr>
<td>Phenoloid oils</td>
<td>12.5</td>
<td>35.5</td>
<td>48.0</td>
<td>42.0</td>
</tr>
<tr>
<td>Emulsifying agent</td>
<td>25.0</td>
<td>15.0</td>
<td>7.5</td>
<td>12.5</td>
</tr>
<tr>
<td>Water (by difference)</td>
<td>10.5</td>
<td>14.5</td>
<td>39.0</td>
<td>42.7</td>
</tr>
<tr>
<td>Water direct</td>
<td>9.3</td>
<td>14.0</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* These figures were obtained by Spalteholz method.

See also samples No. 1, No. 2, and No. 3 already quoted.

Rideal-Walker figures. Samples No. 1, No. 2, No. 3 and No. A have carbolic acid coefficients of under 4. Samples B, C, D have carbolic coefficients of over 10.

Dr. Rideal and Mr. Orchard read a paper on suggested improvements in disinfectant testing. They considered the suggested modification of the Lister Institute test, which requires the adoption of one definite time of contact for valuation. The majority of disinfectants show increasing carbolic coefficients with longer times of contact, but between two and a half and fifteen minutes lies within the limits of experimental error.

Dr. Croner, of Berlin, read a paper on the disinfectant action of peroxide of hydrogen, and said that it was more active in acid or alkaline than in neutral solution. He concluded that peroxide was not suitable for water disinfection or for sewage, but was very suitable for use as a sterilising agent in surgical practice.

Dr. Thevenaz and H. Cade followed with a paper on "The Standardising of Disinfectants," and the discussion was opened by Professor Kenwood, and replied to by Dr. Rideal.

(To be continued.)