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TAMIL EDITION

A TEXT-BOOK OF ARITHMETIC

FOR LOWER SECONDARY OR MIDDLE SCHOOLS

BY

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Prepared on the lines indicated by the syllabus in **Elementary Mathematics** recently prescribed by the Director of Public Instruction, Madras, for Form I.

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AN IMPORTANT NEW TAMIL PUBLICATION.

ஆரம்ப கணிதம்

(சென்னை வித்யா இலாகா அதிகாரிகளால் தொகுக்கப்பட்ட விவரமுத்திரைக்கத் தயாரிக்கப்பட்டது.)

இஃது கும்பகோணம் கவர்ன்மெண்டு காலேஜ் பிரதம ஆசிரியராயிருந்த ராவ்பகதூர் P.V. சேஷு அய்யர், B.A., L.T. அவர்களாலும், சென்னை பச்சையப்பன் கலாசாலை ஹைஸ்கூல் பிரதம ஆசிரியர் V. வெங்கடசுப்பையா, B.A., L.T. அவர்களாலும் ஆங்கிலத்தில் இயற்றப்பெற்ற Elementary Mathematics, Part I இன் மொழி பெயர்ப்பு.

மொழி பெயர்ப்பாசிரியர் :

சேலம் முனிசிபல் காலேஜ் கணித போதகாசிரியர், S. சிவராமன், B.A., L.T.
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(முதல் பாகம்)

பொருளடக்கம்.

I. எண் மாண்பும் எண் குறிப்பும் :—எண்கள் ; இலக்கங்களால் எண்ணிக் குறித்தல் ; எண்களின் பல மதிப்பும் ஸ்தான மதிப்பும் ; கோமன் வழி. II. கோடுகளும் புள்ளிகளும் :—கூழ்ப் ; ஸ்பெஸ்கள் ; கோடுகள் ; புள்ளிகள் ; கோடுகளின் வகைகளும் கோடுகளைப் பிரிக்கும் விதமும் ; புள்ளிகள் குறித்தலும் கோடுகள் இழுத்தலும் ; நீள அளவு ; மூலவட்டங்களின் உபயோகம் ; எண்களை நீளத்தால் குறித்தல். III. கூட்டல் :—கூட்டலின் அர்த்தமும் உபயோகமும் ; கூட்டலைப்பற்றிய ஓர் உண்மை ; கூட்டலைப் படத்தால் காண்பித்தல் ; அடைப்புக் குறிகள் ; கூட்டல் ; பெரிய கணக்குகள் ; கழித்தல் ; கழித்தலைப் படத்தால் காட்டுதல் ; பலவகை கழித்தல் வழிகள் ; கூட்டல் கழித்தலைப்பற்றின சில விதிகள் ; கலப்புக் கூட்டலும் கழித்தலும். IV. பெருக்கல் :—பெருக்கலைப் படத்தால் காண்பித்தல் ; ஒரு ஸ்தான எண்ணால் பெருக்கல் ; பாக்டர்களால் பெருக்கல் ; எந்த எண்களைக் கொண்டும் பெருக்கல் ; பெருக்கலில் குறுக்கு வழிகள். V. வகுத்தல் :—வகுத்தலைப் படத்தால் காட்டுதல் ; ஒரு ஸ்தானத்தால் வகுத்தல் ; பாக்டர்களால் வகுத்தல் ; 10, 100 முதலிய வகைகளால் வகுத்தல் ; நீள வகுத்தல் ; வகுத்தலின் இன்னொரு அர்த்தம் ; சில பெருக்கல் வகுத்தல் விதிகள் ; பெருக்கல் வகுத்தலில் சில குறுக்கு வழிகள் ; ஒன்பதாண்டுகளை நீக்குதல். VI. பலவின வெண்கள் :—அளவை வாய்ப்பாடுகள் : காண்பு அளவுகள் ; நிறை அளவுகள் ; நீள அளவு ; பிடித்தல் அளவு ; கால அளவு ; அடிகை அளவு ; எண்ணிக்கை அளவு ; இனமாற்றத்தல் ; பலவின வெண் கூட்டல் ; கழித்தல் ; பலவினவெண் பெருக்கல் ; பலவின வெண் வகுத்தல். VII. கோணங்களும் அவற்றின் அளவும் :—திசை, திசைமாற்றம் ; கோணம், கோணங்களை ஒப்பிட்டுப் பார்த்தல் ; கோணங்கள் ; சதுரங்களும் செவ்வாக்களும் ; வட்டங்கள் ; கோணங்களின் அளவு ; கோணங்களின் வகைகள் ; ப்ரோட்டாக்டரைக் கொண்டு கோணங்களை வரைதல் ; ஒரு புள்ளியிடத்தில் உள்ள கோணங்கள். VIII. டெஸிமல்கள் :—டெஸிமல்களின் அர்த்தம் ; டெஸிமல் குறியில் ஸ்தான மதிப்பு ; இரண்டாவது டெஸிமல் ஸ்தானம் ; டெஸிமல் குறிப்பு பொது விவரம் ; ஒரு டெஸிமல் ஸ்தானமுள்ள எண்கள் ; டெஸிமல் கூட்டல் ; டெஸிமல் கழித்தல் ; எந்த எண்களையும் கழித்தல் ; 10, 100 முதலியவகைகளால் பெருக்கல் ; ஒரு ஸ்தானமுள்ள முழு எண்ணால் பெருக்கல் ; ஒரு ஸ்தானமுள்ள முழு எண்ணால் வகுத்தல் ; பல ஸ்தான முழு எண்களால் பெருக்கல் ; பல ஸ்தான முழு எண்களால் வகுத்தல். IX. உயர்த்த பொது அளவும் தாழ்த்த பொது மடங்கும் :—அளவும் மடங்கும் ; பொது அளவும் மடங்கும் ; உயர்த்த பொது அளவும் தாழ்த்த பொது மடங்கும் ; பாக்டர்களால் இரண்டு அல்லது இரண்டிற்கு மேற்பட்ட எண்களின் உ. பொ. அ. உம், தா. பொ. ம. உம் கண்டுபிடிக்கும் வழி ; உ. பொ. அளவைக் கண்டுபிடிக்கும் பொது வழியைப் படத்தால் காட்டல் ; உ. பொ. அ. பொது வழி. X. சாதாரண பின்னங்கள் :—பலவின அளவுகளின் பின்னங்கள் ; ஒரு எண்கீழ் அளவை இன்னொரு எண்கீழ் அளவின் பின்னமாகச் சொல்லுதல் ; சமமான பின்னங்கள் ; சமமான பின்னங்களைப் படத்தால் காட்டுதல் ; பின்னங்களின் சமத்துவம் ; தாழ்த்த

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உறப்புடன் ; பின்னங்களை ஒப்பிடுதல் ; பின்னங்களின் கூட்டலும் கழித்தலும். ஒரு முழு எண்ணால் பெருக்கல் ; சாதாரண பின்னத்தை ஒரு முழு எண்ணால் பெருக்கல் ; பின்னத்தின் பின்னம் ; ஒரு பின்னத்தால் வகுத்தல் ; ஒரு எண்ணைப் பின்னப்படி மாற்றல் ; பின்னங்களைச் சுருக்கல். IX. வரலாற்றுக் குறிப்பு :—பரிட்சைக் கேள்விகள். விடைகள்.

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(இரண்டாம் பாகம்)

பொருளடக்கம்.

பரிட்சைக் கேள்விகள். I. டெஸிமல்களின் பெருக்கலும் வகுத்தலும் : ஒரு எண்ணால் பெருக்கல் ; சமமான பரிசோதனை ; எந்த டெஸிமல் எண்ணாலும் பெருக்கல் ; வகுத்தல் ; சமராய்ச் சொல்லல் ; சாதாரண பின்னங்களை டெஸிமல்களாக மாற்றல் ; டெஸிமல் பின்னங்களாக மாற்றல். II. சாதாரண பின்னங்களை முத்தலானவை : சாரசரி ; கோஷியோ ; மாறு கோஷியோவின் உபயோகங்கள் ; ப்ரோபார்ஷன் ; லாப ஷட்டம் ; வருமான வரி ; கடன் மிகுதல் பளவு ; பரப்பளவு ; செவ்வாக்கள் ; இங்கிலிஷ் பரப்பளவுகளும் ப்ரெஞ்சு பரப்பளவுகளும் ; பாட பாடுகள் ; பிளான் வரைதல், அதாவது அமைப்புவும் வரைதல் ; தரையின் பரப்பளவும் நற்சுவ. பளவும் ; கட்டக் காகிதத்தின் உபயோகம். IV. பொது எண் கணக்கு :—சமீகாணங்கள் : அ. பி. கணிதமும் ; சில பெயர் விளக்கங்கள் ; சமீகாணங்கள் ; இன அளவுகள் ; அடைப்புக் குறி. V. முக்கோணங்கள் : அவற்றின் பக்கங்களும் கோணங்களும் ; முக்கோண விரிப்பு ; முக்கோணங்களைப் பக்கங்களுக்குள்ள சம்பந்தங்கள் ; ஒரு புள்ளியிலிருந்து சிபத்தனைக்கிணங்க மற்றொரு புள். இரண்டு புள்ளிகளிலிருந்து சிபத்தனைகளுக்கு இணங்க மற்றொரு புள்ளி குறித்தல் ; கொடுக்கப்பட்ட கொண்டு முக்கோணம் வரைதல் ; வட்டங்களின் சில தன்மைகள் ; முக்கோணங்களின் வகை. னியிலிருந்து ஓர் கோட்டிற்கு பெர்பெண்டிகுலர். VI. கோடுகளையும் கோணங்களையும் இருசு னாக்கல் : இருசு பக்க முக்கோணங்களின் சில தன்மைகள் ; கோடுகளை இருசு பாகங்களாகக் கோணங்களை இருசு பாகங்களாக்குதல் ; காட்டளவும் வட்ட பாகங்களையும் இரண்டு சம பாகங்களாகப் ப்ரெபெண்டிகுலர்கள் இழுத்தல் ; ஸ்மெட்டரி. பலமாதிர்க் கணக்குகள் ; முதல் பாரப் பாடங்களில் கணக்குகள் :—கூட்டல் கழித்தல் ; பெருக்கல் ; வகுத்தல் ; பலவின எண்கள் ; கோணங்களும் வட்டங்களின் தன்மைகள் ; உயர்த்தபொது அளவும் ; தாழ்த்த பொது மடங்கும் ; சாதாரண பின்னங்கள் ; பலவின டாப் பாடங்களில் பலமாதிர்க் கணக்குகள். பரிட்சைக் கேள்விகள். அறுபத்தாம். விடைகள். இரண்டாம் பாகம் 2-வது பாரத்திற்கு, கிரௌன் 208 பக்கங்கள். விலை அணு 10.

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(மூன்றாம் பாகம்)

பொருளடக்கம்.

பரிட்சைக் கேள்விகள் ; அத்தியாயம் I. நூற்றுக்குக் கணக்கிடலும் அதன் பிரயோகங்களும் ; II. ருண எண்களும் பீஜ சமீகைச் சேர்க்கைகளும் ; III. சமாந்தரக் கோடுகளும் அவற்றின் தன்மைகளும் ; IV. படக் குறிப்புகள் ; V. ப்ரோபார்ஷன்—கோணதம் மா. ருணதம் ; VI. முக்கோணங்களின் சர்வ சமத்துவம் ; VII. முக்கோணங்கள், சமாந்தர கோணங்கள், வட்டங்கள் இவற்றின் பரப்புகள் ; VIII. பருமன் அல்லது கன அளவு ; IX. த. சி. சமீகாணங்களும் அவற்றிற்குக் கொண்டுவரும் யோசனைக் கணக்குகளும் ; X. பலவகைக் கணக்குகள் ; பரிட்சைக் கேள்விகள் ; பலமாதிர்க் கணக்குகள் ; விடைகள் ; பலவின அளவு வாய்ப்பாடுகள். Cr. 8vo. 300 pages. விலை அணு 12.

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THE CALCUTTA UNIVERSITY: CONVOCATION ADDRESS.

By HIS EXCELLENCY THE CHANCELLOR.

A PLEASANT episode in the discharge of my public duties is to preside as Chancellor of this University over its annual Convocation and to hear from the Vice-Chancellor the reports of steady progress made year by year. This occasion gives me the opportunity of meeting both those who have devoted their lives to the sacred task of the advancement of knowledge and its propagation, and those who have finished the first part of their education and stand expectant at the portals of active life.

I thank you for your welcome and assure you that I fully appreciate the honour which, being the Chancellor of this University, confers on me and the responsibility it entails. It is my desire to do everything I

can to forward its interest and to secure its progress.

I listened with great pleasure to the Vice-Chancellor's speech and the excellent advice he addressed to those who have just taken their degrees, and I would ask them to accept my congratulations upon their success and my sincere good wishes for their future.

I should like to remind you of a truth, which your own later experience may enforce, that the most important subjects are not included in the curriculum and the most significant lessons are learnt outside the classroom. Your education will not have been to your best advantage, if you have not learnt from the world outside as well as from books, if beyond history or mathematics you have not gained some knowledge of the secrets of self-reliance and the art of living in a community. National prosperity depends among

other things on a sound political system, a strong bond of unity and fellowship, a social order that provides fair opportunities for all and industrial and agricultural development. But the true greatness of a nation comes mainly through the character of its citizens. I trust you will take away from these precincts, as you leave them as students, not only that store of learning which you have gathered by your industry, but also high ideals and resolves and a happy recollection of the days you have spent here.

To the Universities, India must look for leaders—political, social and industrial—and the task of direction demands with a pre-eminence in knowledge, a pre-eminence in character.

It is often said that the future must settle its own problems and we are apt to wonder what the members of the rising generation will do. What they will do depends upon what they are, and that largely depends upon what we of the older generation make them. In some respects we recognise our responsibility. We lavish our resources on educational work with considerable freedom, yet we sometimes seem to be more concerned with the machinery of education than with its main purpose of shaping character. But the whole responsibility cannot be cast upon educational establishments. The effectiveness of home influence in building sound character is one of the greatest needs to-day not only in India, but throughout the world and parents cannot delegate such tasks to others which are so essentially their own.

The function of a University in the State is a large and important one. It involves the provision of opportunities for, and the encouragement of, research and higher scholar-

ship. I was glad to hear from the Vice-Chancellor of the remarkable achievements of Calcutta scholars in these fields and of the reputation they have won by their contributions to different branches of learning. It involves also the duty of training the minds and drawing out the intellectual faculties of the thousands of students under its charge and of equipping them for their several vocations and professions, so that they may readily find for themselves a place in the social order. But more than all else, it involves the forming of the characters of those who by virtue of their opportunities and qualifications should aspire to be the leaders of the community.

I agree with the Vice-Chancellor that these noble and important tasks cannot be properly fulfilled by a University, unless equipped with liberal resources in men and money. In the past, this University has attracted the generosity of wealthy and discriminating benefactors. We all regret and deplore the recent loss of two such benefactors by the death of Maharajadhiraja Sir Rameshwar Singh, of Darbhanga, and Maharaja Sir Manindra Chandra Nandy, of Cassimbazar, and I join with you in your expression of sympathy for their families. But in Bengal, where this University is an object of just pride and affection, there must be many others who have the means to minister to its needs and enable it to extend its claim to the gratitude of its alumni and the province they serve.

The appeal made by the Vice-Chancellor for a generous provision for the needs of the University deserves full and sympathetic consideration. As is well-known, the Government of Bengal dispose of a revenue, most of the items of which are inelastic and which, in relation to the population, is inadequate to

the actual and growing needs of the province. Our resources are comparatively small: they are incapable of large or ready expansion, but from them we have to assume the responsibility for assisting two Universities, a number of High Schools greater than those of any other four provinces together, and nearly 60,000 primary schools. As a result of social and economic conditions, higher education has developed in Bengal more rapidly than primary education and established itself more securely, and it has naturally absorbed a large share of the funds available for education. The interim report of the Committee of the Statutory Commission on Educational Progress points out that while in Madras, of the total educational expenditure in 1927, only 9.7 per cent. was spent on Universities and Colleges, 19.8 on secondary education and 37.7 on primary education, and in Bombay 10.1 on higher education, 19.9 on secondary schools and no less than 52 per cent. on primary schools, the corresponding figures for Bengal were 22.2, 32.3 and 17 per cent. More than half the available money was devoted to mass education in Bombay, while in Bengal we spent more than a fifth on Colleges and Universities and only about a sixth on primary schools. It is true that a large part of the expenditure was met from fees, but this applies equally to primary and higher institutions in this province. In 1929, a little over 25 per cent. of the expenditure of Government on education was spent on Universities and Colleges and only 17 per cent. on primary education.

I do not cite these figures and make these comparisons to suggest that the financial administration of the University is extravagant or that the expenditure on higher education should be reduced. We have heard

from the Vice-Chancellor's Report that a competent and industrious Committee has lately investigated the organisation and staffing of the departments of higher study in the University; and I am sure that they have made their recommendations with due regard to economy consistent with efficiency. But these figures do show that in Bengal we are spending far too little on the education of the masses and that the need of primary education for money presents an incontestable claim. The uplift of the masses is vital to the well-being and development of the country and should be a matter of the deepest interest not only to Government but also to all those who by their education should take an enlightened and liberal view of public affairs.

At the same time, as your Chancellor, I am anxious that the quality of the training imparted by the University should not suffer from lack of funds. Government have to compare and balance the claims of different grades and branches of education; but they will always be responsive to the just demands of an efficient system of higher education. In putting forward our claim to Government, I would suggest that the University will be well advised to go further than present a mere statement that money is required, and to indicate as clearly as possible the activities for which money is required with an explanation of the importance of the claim that each of these activities will have on Government's funds. My experience leads me to believe that this is necessary to compete successfully with the other demands on Government's resources. I would again express the hope that as in the past, the munificence of public-spirited individuals will come to the assistance of an institution of such national importance and usefulness. The Vice-Chancellor has

pointed out that any attempt to increase the income from fees by the admission of large numbers of students must involve a disastrous lowering of standards, and with this view I think there is general agreement. But I should like to suggest for your consideration whether it may not be possible to achieve the same result by raising the rate of fees in the Post-Graduate Department. It is right that elementary education should be cheap so as to be available to all, however poor, but a University education, especially a post-graduate course, cannot be a cheap commodity and those who enjoy it may fairly be asked to contribute a reasonable proportion of its cost.

There is another matter to which I should like to refer once again, namely, the problem of what is termed 'middle class unemployment.' Every year it becomes more acute and affects large numbers, but any effective solution still seems far distant. The Universities in India must be concerned at this difficult problem. A system of higher education cannot justify itself if it takes no account of the social and economic structure of the country for whose benefit it exists, or of what is to become of those whom it has educated. It must be a mistake when the whole atmosphere of a high school is one of preparation for the University. It might be better if there was some discriminatory diversion of boys obviously unfitted for higher work of University life to careers better suited to their capacity.

This is evidently a problem that asks for your most serious consideration. It has been suggested that the establishment of a University Employment Bureau, while it cannot provide a radical cure, may yet mitigate the extent of the evil.

Last year I referred to the importance of the University obtaining a suitable University playing field. I understand a search was made for a pitch on the *maidan*, but one is not available. I suggest that such a place would not be suitable. The University should have a ground of its own which it can enclose. I should like to see this accomplished before I relinquish my position as Chancellor and I should be ready to give all the assistance I can to any scheme which is put up.

The educational difficulties that face us in Bengal are neither few nor simple. The lack of money, the backwardness of women's education, the wastage in primary schools, the scarcity of trained teachers, the low standards and inadequate equipment of many institutions of all grades, the absence of any considered and wide system of vocational training, the obstacles in the way of fostering spirit of friendly activity and corporate fellowship in schools and colleges—these are only some of the more important. But there is no need to despair; a clear appreciation of the nature and magnitude of our difficulties must be an incentive to worry out a solution. We have not inherited perfect institutions or ancient traditions, we have had to create them and fashion them suited to the genius of the country. We must not be daunted by our difficulties: let us take pride in surmounting them. But it will need our wisest thought and by learning even from failures we must ruthlessly discard whatever is ineffective or inferior. It will need courage, patience and good-will, but these will be forthcoming with a determination to consider only the welfare of Bengal and the ability of its educational system to give the best possible to the people.—*The Calcutta Review*, April 1930.

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From this we derive two important consequences:—

(i) The velocities and accelerations of two corresponding points of P and P' have, at corresponding instants, homologous directions resulting from the geometrical similitude of the trajectories; (ii) If l and t are the ratios of geometrical and temporal similitude respectively, the velocities and accelerations in P are to the velocities and accelerations in P' in the ratios lt^{-1} and lt^{-2} respectively.

2. *Mechanical Similitude.* Two systems of material points P and P' are said to be *mechanically similar*, when they are subjected to certain forces, if (a) they are kinematically similar; (b) the masses of corresponding points in P and P' are to one another in a constant ratio m .

Let the fundamental equation of Dynamics, connecting the mass (M) and the acceleration (a) with the force (F) be

$$F = Ma$$

with regard to the system P, and

$$F' = M'a'$$

with respect to the system P'.

Then it can easily be shown that the ratio f of the forces is connected with l , t and m by the equation

$$[f] = lt^{-2}m \quad \dots (1)$$

Equation (1) is substantially due to Newton, who was the first to develop the concept of mechanical similitude.

3. *Models.* Suppose a model o of machine O has been prepared, such that o is geometrically similar to O (ratio l), and all the parts of o are of the same material at the homologous parts in O.

Hence m (the ratio of similitude for the masses) is equal to l^3 .

If in the working of o and O we cannot prescind from the weights of the respective parts in o and O, these weights must be numbered among the forces acting on o and O. Since, however, the ratio l^3 subsists for the homologous weights, the same ratio must subsist for all the homologous forces acting in o and O, otherwise o will not be mechanically similar to O.

Now there are often special forces, like friction, viscosity, etc., which cannot vary from the machine to the model in the ratio l^3 ; consequently it may well happen that, whilst the model works to perfection, the machine is unworkable. Leaving engineers and technical workmen to overcome such difficulties, we shall suppose that

$$m = f = l^3 \quad \dots (2)$$

Clearly then, by combining (1) and (2), we see that the possibility of mechanical similitude demands that the equation

$$t = l^{\frac{1}{2}} \quad \dots (3)$$

should be satisfied.

From (3) we deduce immediately that, in the case of two similar pendulums swinging in vacuo, and exercising no friction at their points of suspension, the times of oscillation are to one another as the square roots of the respective lengths of their homologous parts.

4. *Homogeneity.* Suppose that a certain law regulating a given phenomenon is expressed by a certain relation among the mechanical quantities of the same phenomenon. If one of the quantities

is measured, q , its measure, will be connected with the measures of length ($l_1, l_2, \dots, l_n$), time ($t_1, t_2, \dots, t_n$) and mass ($m_1, m_2, \dots, m_n$) by an equation such as

$$q = \psi(l_1, l_2, \dots; t_1, t_2, \dots; m_1, m_2, \dots) \quad (4)$$

expressing analytically the law of the phenomenon. But the law remains valid, whatever be the system of units we may choose. Now, if the units of length, time and mass are reduced respectively in the ratios $\frac{1}{l}, \frac{1}{t}, \frac{1}{m}$, the measures $l_1, l_2, \dots; t_1, t_2, \dots; m_1, m_2, \dots$ will be multiplied by l, t, m respectively; and if n_1, n_2, n_3 are the dimensions of the mechanical quantity expressed by q , we shall have

$$l^{n_1} t^{n_2} m^{n_3} q = \psi(l_1, l_2, \dots; t_1, t_2, \dots; m_1, m_2, \dots) \quad (5)$$

This means that (4) is a homogeneous equation of the n_1 th degree with respect to the lengths, of the n_2 th degree with respect to the times, and of the n_3 th degree with respect to the masses.

5. *The multiplier x .* The fact that the functioning of o is perfectly determined when the applied forces are assigned, is expressed by the circumstance that q is a well determined (though, perhaps, unknown) function ϕ of the forces (F) and of all the parameters which characterize the geometrical and material nature of o . Hence

$$q = \phi(F_1, F_2, \dots; l_1, l_2, \dots; m_1, m_2, \dots) \quad (6)$$

Now q has a triple homogeneity with respect to length, time and mass according to the degrees n_1, n_2, n_3 respectively. Hence, if in q all the lengths, times and masses are multiplied by l, t, m respectively, q is multiplied by

$$x' = l^{n_1} t^{n_2} m^{n_3}$$

But, in passing from o to O a relation analogous to (6) must hold, where instead of q we shall have Q , and instead of $F_1, F_2, \dots; l_1, l_2, \dots; m_1, m_2, \dots$ we shall have $F_1, f, \dots, l_1, l, \dots, m_1, m$. But the times

in ϕ enter only through the forces; hence, from (3) all the times must be multiplied by $l^{\frac{1}{2}}$. Again remembering (2) and (1), the multiplier x , in the passage from o to O is given by

$$x = l^{n_1 + \frac{1}{2}n_2 + 3n_3} \quad (7)$$

$$\text{Hence } Q = l^{n_1 + \frac{1}{2}n_2 + 3n_3} q. \quad (8)$$

6. (a) *Pendulums swinging in air.* Experiment shows that the resistance is directly proportional to the areas of each element and to their velocities. Now the ratio of similitude for the areas is l^2 , and for the velocities it is $l^{\frac{1}{2}}$, for, in (8) $n_1 = 1, n_2 = -1, n_3 = 0$; therefore

$$V = l^1 - \frac{1}{2} + 0 = l^{\frac{1}{2}} v,$$

Hence the resistances for the two pendulums are to one another as $l^{\frac{5}{2}}:1$. Consequently the theorem contained in equation (2) cannot be applied. The ratio $l^{\frac{1}{2}}$ holds in general for the so called *viscous resistances* which are proportional to the areas and to the first power of the velocities.

(b) *Co-efficient of viscosity (μ).* The dimensions of viscosity are obtained from the fact that here we have to consider (force per unit area) $\div$ (velocity per unit length). Hence $n_1 = -1, n_2 = -1, n_3 = 1$.

In the dynamical theory of gases viscosity can only depend on the mass m of a molecule, the number n of molecules per unit volume, their velocity of mean square v and their effective radius a . But since the mean free path is inversely as the number of molecules per unit volume, the viscosity, which is proportional to these two quantities jointly, must be independent of either.

Therefore we assume,

$$\mu \propto m^\alpha v^\beta a^\gamma$$

$$\text{Hence } [l^{-1}t^{-1}m^1] = [m]^\alpha [l^{-1}t^{-1}]^\beta [l]^\gamma$$

$$\text{which gives } \alpha = 1, \beta = 1, \gamma = -2,$$

$$\therefore \mu \propto m v a^{-2}$$

But the absolute temperature $T \propto m v^2$.

$$\therefore \mu \propto m T^{\frac{1}{2}} m^{-\frac{1}{2}} a^{-2}$$

i.e., the viscosity is proportional to the square root of the mass of the molecule, and the square root of the absolute temperature, and inversely proportional to the square of the effective molecular radius.

7. *Hydraulic Resistances* are proportional to the area and to the square of the velocity. Hence, considering for instance two horse-drawn boats o and O , the ratio of the resistances is given by

$$l^2 (l^{\frac{1}{2}})^2 = l^3,$$

and therefore equation (2) is applicable to them. Consequently we have *Froude's Rule*: If o is the model of a ship O , such that the ratio between the homologous lengths is l , and for a velocity v the model meets with a resistance r , the ship O , for a velocity $v l^{\frac{1}{2}}$, will encounter a resistance

We know that the dimensions of power are $n_1 = 2, n_2 = -3, n_3 = 1$. Hence, if Π is the power for O and π the power for o , we have (8)

$$\Pi = l^{2-3/2+3} \pi = l^{7/2} \pi.$$

8. *Cases when the weights can be neglected* are those of fishes, submarines, balloons, dirigibles, or even ships, where the immersion is so regulated that it nearly compensates the action of gravity. Consider a ship O and its model o , and let l be the geometrical ratio between the two. Since the weights here can be neglected, we cannot say *a priori* that the ratio between homologous forces is l^3 . Hence, to establish the similitude, besides the ratio l , another mechanical ratio is to be fixed upon. We shall choose v , the ratio of the velocities. But

$$v = l t^{-1}; \text{ i.e., } t = l v^{-1} \quad (9)$$

$$\text{Then } \pi = l^{n_1} (l v^{-1})^{n_2} l^{3n_3}$$

$$\therefore Q = l^{n_1 + n_2 + 3n_3} v^{-n_2} q$$

and, since the dimensions of power are

$$n_1 = 2, n_2 = -3, n_3 = 1 \quad \Pi = l^2 v^3 \pi \quad (10)$$

As an application we can take the case of two similar ships O and o , and we shall suppose that the working of the engines is such that in equal times they consume quantities of fuel proportional to the capacities of the furnaces, and having therefore the ratio l^3 .

But the engines being exactly of the same type, the quantity of fuel used up in unit time must be proportional to the engine's power. Therefore (from 10),

$$l^3 = l^2 v^3$$

from which we obtain immediately

$$V = l^{\frac{1}{2}} v$$

i.e., when the two engines function in a similar manner, the velocity increases as the cubic root of the geometrical ratio.

Notice that in o and O the tonnage and the fuel expenses have the same ratio, l^3 . Hence, for the same time, the freight expenses per ton must be the same for o and O . But, for the same distance, since the freight expenses are inversely as the velocities, the advantage will be greater for the swifter ship. Hence the cost per ton-knot for O must be $l^{-\frac{1}{2}}$ of the cost per ton-knot for o .

Thus if o 's length is 100 m. and o 's velocity is 20 knots per hour, the velocity of O , when O is 130 m. long, will be

$$20 \sqrt[3]{\frac{130}{100}} = 21.82 \text{ knots per hour.}$$

Hence the cost per ton-knot for O is $(130/100)^{-\frac{1}{2}}$, i.e., 0.916 the cost relative to o ; in other words, not only O gains in time, but it presents also a gain in fuel, greater than 8%.

Again, if we put $v = 1$; then the ratio between Π and π is l^3 . Now, if we assume that the ratio

of the powers is equal to the ratio of the fuel used up, i.e., if we put

$$\frac{S}{s} = l^2$$

and if we remember that the ratio for the tonnage

$\left(\frac{K}{k}\right)$ is equal to l^3 , we shall have

$$\frac{S}{K} = \frac{s}{k} = \frac{1}{l}$$

If S and s represent the expenses in equal times, since the velocities in o and O are the same, the two ratios $\frac{S}{K}$ and $\frac{s}{k}$ are the costs per ton-knot for each ship. Hence the cost relative to O is $\frac{1}{l}$ of that relative to o . But in the previous example $\frac{1}{l} = \frac{100}{130} = 0.769$. Therefore, the velocities being the same, the advantage for the bigger ship is as high as 23%.

These considerations, though rough and inaccurate, justify the modern tendency to build colossal steamers for mercantile purposes.

9. The method of zero dimensions. If

$$A = x^{a_1} y^{b_1} z^{c_1}, B = x^{a_2} y^{b_2} z^{c_2}, \\ C = x^{a_3} y^{b_3} z^{c_3} \quad \dots (11)$$

then A, B, C will be called independent, if the (11) can be solved with reference to x, y, z . It can easily be shown that the necessary and sufficient condition for A, B, C to be independent is

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} \neq 0 \quad \dots (12)$$

Now, we may write

$$A^a B^b C^c = x^{a_1 a + a_2 b + a_3 c} y^{b_1 a + b_2 b + b_3 c} z^{c_1 a + c_2 b + c_3 c}$$

But since (12) is verified, we can always determine a, b, c from the linear system

$$\begin{aligned} a_1 a + a_2 b + a_3 c &= a \\ b_1 a + b_2 b + b_3 c &= b \\ c_1 a + c_2 b + c_3 c &= c \end{aligned}$$

Hence we shall have

$$A^a B^b C^c = x^a y^b z^c.$$

Now, for a generic quantity Q we have the symbolic equation

$$(Q) = l_1^{n_1} l_2^{n_2} m_1^{n_3}$$

and the multiplier x' connecting Q with q is

$$x' = l_1^{n_1} l_2^{n_2} m_1^{n_3}.$$

Three physical quantities Q', Q'', Q''' are said to be independent, if their reduction co-efficients (a') are independent; i.e., if, given that

$$Q' = l_1^{n'_1} l_2^{n'_2} m_1^{n'_3} q'$$

$$Q'' = l_1^{n''_1} l_2^{n''_2} m_1^{n''_3} q''$$

$$Q''' = l_1^{n'''_1} l_2^{n'''_2} m_1^{n'''_3} q'''$$

we have

$$\begin{vmatrix} n'_1 & n'_2 & n'_3 \\ n''_1 & n''_2 & n''_3 \\ n'''_1 & n'''_2 & n'''_3 \end{vmatrix} \neq 0.$$

For instance, it can be shown that velocity, acceleration and energy are independent; whilst velocity, force and power are not independent.

In fact, for this second case we have

$$\begin{vmatrix} 1 & -1 & 0 \\ 1 & -2 & 1 \\ 2 & -3 & 1 \end{vmatrix} = 0.$$

10. Connexion among reduction co-efficients. The following theorem is an immediate application of the principles laid down in § 9; i.e.:

If Q', Q'', Q''' are dimensionally independent, and their reduction coefficients are a', a'', a''' , the reduction co-efficient a of any other physical quantity Q , can be expressed by the equation

$$a = a' a'' a''' \quad \dots (13)$$

But the equation (13) implies that the measure q of Q must have a threefold homogeneity with reference to q', q'' and q''' . Hence to (13) we can substitute

$$(q) = q'^a q''^b q'''^c \quad \dots (13')$$

Example. Since velocity (v), acceleration (a) and energy (e) are dimensionally independent, the measure of a force (f) can be expressed by means of (v), (a) and (e). In fact

$$(f) = v^{-2} a e.$$

11. Reduction to Zero-dimensions. From (13') it appears immediately that the ratio between q and $q'^a q''^b q'''^c$ is a variable of zero dimensions.

Now let the measure q of any physical quantity be expressed by the measures $q_1, q_2, \dots, q_n$ of other physical quantities, and by certain numbers, which may be designated by r ; i.e., let

$$q = f(q_1, q_2, \dots, q_n | r) \quad \dots (14)$$

Suppose that q_1, q_2, q_3 are dimensionally independent. Then the measures of the other $n-3$ q 's can be expressed as products of q_1, q_2, q_3 by pure numbers, i.e., by variables of zero dimensions. If these numbers are denoted by r' , we shall have

$$q = F(q_1, q_2, q_3 | r | r') \quad \dots (15)$$

But q has a three-fold homogeneity with reference to q_1, q_2, q_3 . Hence, if α, β, γ denote its degrees of homogeneity with reference to q_1, q_2, q_3 , we have

$$q = q_1^\alpha q_2^\beta q_3^\gamma F(1, 1, 1, | r | r') \quad \dots (16)$$

This method which leads to (16) is called the *Reduction to zero dimensions*.

12. Applications—(a) A thin rectangular lamina moving within a fluid meets with a certain resistance, due to the pressure of the fluid on its faces. It is reasonable to suppose that the resistance r will depend on the dimensions of the rectangle (a, b), on the angle of inclination of the lamina to the direction of motion (θ), on the velocity v , on the density of the medium (d),

and on the pressure (p); i.e.,

$$r = f(a, b, \theta, v, p, d).$$

Let $k = \frac{a}{b}$, and $\sigma = a \cdot b$. Then, since the

dimensions of k and θ are zero,

$$r = f(\sigma, v, p, d | k, \theta).$$

But $[\sigma] = l^2$, $[v] = l t^{-1}$, $[d] = l^{-3} m$. $\therefore \sigma, v, d$ are dimensionally independent. Hence we can use them to express p , which can easily be shown to be

$$[p] = v^2 d.$$

Therefore $\frac{p}{v^2 d}$ is a pure number, which may be called w^2 . But $\frac{p}{d} = u^2 = \text{square of the velocity of sound in the given fluid}$. Consequently $w = \frac{u}{v}$ has a definite meaning.

Hence $r = F(\sigma, v, d | k, \theta, w)$

But $[r] = l t^{-2} m$

Therefore $[r] = \sigma d v^2$

Hence $r = \sigma d v^2 \phi(k, \theta, w)$.

Newton thought that $\phi(k, \theta, w)$ was a constant; but recent experiments have shown that he was not correct.

(b) *Miniature World*. The Theory of Relativity assumes the absolute constancy of the velocity of light (c). Again the Electronic Theory assumes that, whatever be the system of measures we adopt, an electric charge is always equivalent to the same number of electrons. Hence, if we wish to build a model of the universe, these two suppositions must be respected. In other words we must choose such units of length, time and mass, that the reduction co-efficients for the measures of velocity and electric charges, become equal to 1. In any Treatise of Electricity (cf. Starling *f. i.*), the symbolic equation for an electric charge is shown to be

$$[q] = l^{3/2} t^{-1} m^{1/2}.$$

Therefore $[v] = l t^{-1} = 1$; i.e., $t = l$.

Again $l^{3/2} t^{-1} m^1 = 1$; i.e., $m = l^{-1}$
Hence the multiplier for a quantity Q whose dimensions are n_1, n_2, n_3 , will be

$$l^{n_1} t^{n_2} m^{n_3} = l^{n_1+n_2-n_3}$$

For instance, in the case of a force f , in the real world we have $n_1 = 1, n_2 = -2, n_3 = 1$.

Hence in the Einstein electronic world, the force f' is given by

$$f' = l^{-2} f.$$

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ECONOMICS IN SCHOOLS

By

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II—METHODS OF INSTRUCTION

AT the outset it is necessary to say that the medium of instruction in Economics at schools should be the vernacular. The task of writing suitable text-books in the vernacular is by no means an easy one, since it is very difficult to find ready equivalents for many a technical term such as marginal utility, normal price, etc. But a little effort convinces me that it is by no means an insuperable task and it is delightfully simple to adapt suitable words to convey the meaning of even the most highly intricate terms of the subject. Teaching in the vernacular follows vernacular text-books, and it is indispensable it should be so; for, it would give the boys a certain amount of freedom for expression and discussion and naturalness which is impossible with English as the medium in the earlier stages. Teaching and study through the vernacular medium is the surest way to stimulate thinking and develop the faculties of reasoning so essential to a proper mastery of the subject.

As to the method to be followed, no hard and fast rule need be laid down. For method is not the end and aim of instruction, and further it is impossible to conceive of it apart from the teacher. It is the good teacher who makes a particular method successful and not *vice versa*. But in view of the difficulties of teaching the subject in schools, it may not be out of place to set down the following few suggestions:—

THE TRADITIONAL METHOD.

The traditional method of teaching this and many other subjects in colleges is unfortunately unsuitable for adoption at schools. There is probably some justification for the hurried lectures of the over-worked Professor who has to cover the whole ground required by the syllabus, and the feverish anxiety of the under-graduate to take down 'notes' word for word since he plods his way through without text-books and is constantly under the nightmare of the examination! But the method has many unpleasant repercussions on the whole educational system. "Learning is made not a responsible search and finding but a docile receptivity." All enterprise and initiative in intellectual matters are ruthlessly killed and the boys become unfit for any responsible task in life. Needless to say that this method should be definitely eschewed in the earlier stages; for, the young mind is neither a granary nor a cold storage to be packed with 'information.'

THE HISTORICAL METHOD.

In his admirable little book,* Prof. Charles Gide, the famous French economist, advocates the historical method for the beginners. He observes "the best method to follow is to go back to the earliest origin of these economic ideas.....We could learn more from little children. Child psychology might be extremely useful in throwing light upon certain economic phenomena, and we have made a mistake perhaps in neglecting to study it from this point of view.....Let us try elsewhere. Among (animals) them, we shall find the first rudiments of economic phenomena and even of the economic laws

* *First Principles of Political Economy*—Charles Gide. (George G. Harrap & Co., Ltd., London, 1922.)

by which men are governed; for Political Economy has its roots in biology." (Pp. 10-11.)

From animal life, the learned Professor proceeds to explain with great facility such rudimentary conceptions as wants, labour and capital. Animals like men have wants—food and shelter—but some have aesthetic wants too! "There is a partridge in Asia which decorates its home by hanging on the trees around it any glass beads it can manage to find" (P. 13). They have to satisfy their wants by hard labour, and not very often by "actual skilled industry of a marvellous variety." "We know with what skill and devotion they build their nests and how varied these nests are. But it is above all in the insect world that the diversity of industries is most marvellous. Some are diggers like the mole; some are workers in wood or earth or stones; some like the sexton-beetles are grave-diggers; there is one kind of bee which carpets its nest with the petals of flowers." (P. 15). To explain capital in its simplest form—provision of goods for future use—he cites the example of the dogs and the squirrels. "Squirrels have hiding places where they store the nuts. They even act on the principle adopted by the capitalistic heads of families, of 'not putting all their eggs into one basket,' of not investing all their capital in one business. For the squirrel has several store-houses, so that if one is destroyed, he has others left." (P. 25). The animals possess also fixed capital! "The spider's web is neither clothes nor lodging, but a trap, like the snare of the hunter or the fisherman." (P. 27.)

Interesting as these illustrations may be, they are of only a limited value for the exposition of the economic principles. How abrupt is the leave taking of the author himself of

these animals! "It is a common saying that there is no smoke without fire. It would be still more true to say that there is no fire without man. If ever a group of monkeys is discovered somewhere in Africa seated round a fire they have kindled, on that day will man be able to greet them as his brothers!... This then is the point at which to take leave of the animals, that have served us so far as instructors in these first rudiments of economic science. They get no further initiation into political economy, and we must leave them by the wayside. The human race goes on to become rich, but the beasts remain poor for all time." (Pp. 28-29.)

THE DEDUCTIVE METHOD.

One is naturally led to turn to the deductive method as being the most suitable. This appeals to us as being the most natural also, since most phenomena of economic life come under the everyday observation of the boys and gathering of facts would become a delightful hobby by itself. This method is peculiarly valuable inasmuch as it puts the boys in close touch with real life and helps them to draw conclusions from the given data. To give an illustration:—If the lesson is on 'Economic Activities,' the boys may be called upon to prepare a full list of all the activities of the people whom they see in the streets and in their homes. With these lists before him the teacher can proceed to a classification of the activities according to the following different categories:—growing, making, carrying and helping. The first principles of the economic science can be taught by means of such methods. In making use of the deductive method among the High School boys care must be taken to limit observation and inferences to a narrow field and the emphasis should always be upon the

primary aim of acquainting the boys with the facts of economic life, though plenty of scope should be given at every stage for thinking and reasoning.

THE METHOD OF PURPOSEFUL ACTIVITY.

The method *par excellence* for the earliest stages is one that the modern educationists describe as "Purposeful Activity." It is based on the maxim that we do not learn what we do not practise. And surely to arouse the interest of the students in their studies, none is more effective than that of making them participate in the various forms of the economic life they study. I take the following account of a real project of this type from a valuable little book.* It was carried out by the fifth standard boys of the London Mission Community Centre Model School, Erode, South India, under the direction of their masters.

By studying the wholesale and retail prices of a private dealer, the boys found out that he was making a profit of 9 pies in the Rupee. This fact encouraged them to run a shop for themselves. They started by putting up a small wooden structure making use of a huge dealwood box which was lying idle in the Middle School. In the course of their work, they studied the various kinds of tools and made a collection of old tools for the Museum. The shop was then tastefully decorated. The boys proceeded next to discuss what articles should be stored by a careful study of the conditions of local demand. Stationery and a few sundries were bought for a small sum of Rupees 5, and when the stock was over, more was bought on credit. The enterprise succeeded well. "The total amount of the sales rose to

* "How We Learn" edited by, Mason Qicott, (Association Press, Calcutta).

Rs. 200.....The realisation of a gain of Rs. 27-8-0 within a month was calculated with great joy and satisfaction."

The project, excellently conceived and ably executed, is one of a few that can be successfully arranged to teach a number of simple economic truths. What wonder—the class-room can be converted into a field—and a living relationship established with the real world outside. The boys are educated not *for* life but *in* life. Every decision carefully taken and worthily carried out takes them a step farther in their experiences of life. The spirit of comradeship and of joint-enterprise is too valuable to be lost upon the young minds. Thinking is not relegated to the background, for at every stage the projects would call forth careful preparations and intelligent decisions. Play becomes study and study becomes play. Here, then, is a wonderful opportunity to relieve the monotony and the tedium of the High School curriculum, while giving at the same time a valuable equipment in life indispensable for every boy and girl.

EXAMINATIONS.

By Mr. C. KRISHNAIYER, B.A., L.T.,
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THE proposal to institute a Preliminary Certificate examination has the sole aim of checking the large number of failures in the S. S. L. C. public examination. All may know that the upper primary and the lower secondary examinations were dispensed with to avoid the evils of extraneous examinations.

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the 1st form to the 6th form but there should be no condonation of term days even in cases of illness. If a boy is not able to attend school for the required number of days, it means he cannot derive the benefits of class teaching, however clever he may be, except in very rare cases where the pupils are born geniuses. They too may require school-training. In all of the eighteen years of trial, the S. S. L. C. system was not satisfactorily worked out and the result is we have an unwieldy S. S. L. C. public examination with its leakage of question papers and other scandals and a reversal to the merciless slaughter of innocents as in pre-S. S. L. C. days.

The foundation is weak and we must take steps to strengthen it. There is no use of making the system top-heavy. Coming to the primary schools there are the elementary schools with the 5th standard as the highest and the primary department of High Schools with the 5th class as the highest.

If the Department should prevent wastage of public funds and sometimes the misuse of the same, a common district examination at the end of the 5th standard must be conducted by each District Educational Council. The Secretary, who will be the executive officer for the conduct of the examination, must be a member of the Educational service.

The examiners must be recruited from among the ranks of the Deputy Inspectors and Headmasters of High and Middle schools in the district. Only those who have passed this examination must be admitted in the sixth standard of first-grade Elementary Schools having 6th, 7th, and 8th standards or the 1st forms of Middle and High schools.

The difference between these elementary schools and middle schools consists only in

one fact, viz., English is the second language in elementary schools, whereas Tamil or Sanskrit or Hindustani or Telugu or any other vernacular is the second language in secondary schools. There should be free admission of boys from the 1st grade elementary schools into middle schools and vice-versa, provided the English is better in the case of boys admitted into middle schools and the second language is better in the case of boys admitted into secondary schools. Admission must be done only when there is a Transfer Certificate. No private students must be admitted into these schools. Admission of boys into secondary schools must be in the class for which the certificate fits them.

Headmasters must base this admission on written tests in English, which must be open for scrutiny by the departmental Inspector. Headmasters of 1st grade elementary schools also must conduct written tests in the vernacular or first language open for inspection which must be by the Deputy Inspectors at the time of their visit. The class promotion in the elementary or the secondary schools may continue as it now exists. At the end of the 3rd form stage, there may be a common District Examination called the Middle School Examination open to both these kinds of schools.

Pupils of the higher elementary schools must get 40 % in the vernacular their first language, and 30 % in other subjects including English, their second language. Middle school pupils must get 40 % in English, their first language, and 30 % in the other subjects including the vernacular. This examination should be conducted by the District Educational Officer who is the Secretary of the Secondary Educational Board. Examiners must be recruited from the ranks of teachers

employed in the first-grade elementary schools and in the middle schools.

must be also the Presidents of S. S. L. C. Boards to be constituted for their respective areas.

As regards the S. S. L. C. public examination, a 35 % minimum in all subjects is enough. But the present S. S. L. C. Board must be split into Andhra, Tamil and Kerala Boards with head-quarters at Vizag, Madras, and Calicut. The Kerala Board should serve for the Malayalam and the Canerese speaking districts. Two more Boards must be constituted with two more Secretaries. The senior most I. E. S. officers must be posted to these places. They must be responsible for education in these linguistic areas. Of course they are subordinate to the D. P. I. They

The fees for the proposed Primary Examination should be Rs. 3, for the Middle School Examination Rs. 6, and for the S. S. L. C. Public Examination Rs. 12. Besides this, I will be glad if the S. S. L. C. book system is continued from the 1st form or sixth standard upwards.

To sum up, I want the old Primary Examination and the old Middle School Examination in a new form, before this present S. S. L. C. Public Examination.

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vide Fort St. George Gazette, Part I-B, p. 547, dated 1-11-1927.

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OUR SECONDARY EDUCATION COURSE

By

Mr. M. S. MAHALINGAYYAR, B.A., L.T.,
Headmaster, The Mahajana School,
Mettupalayam.

IT is a matter of common knowledge that our S.S.L.C. holder is of inferior quality to the old matriculate. True it is that our schools are far better equipped for the S.S.L.C. Examination than they were for the old Matriculation, and much is made of the methods of instruction in the present. The course too covers a long period of eleven years of a man's valuable part of his life-time, and practical work forms a portion of every subject, and yet, judging from the nature of the product obtained, one cannot but regret that all is not well with the present system.

Placed in a particular situation in life, he finds himself considerably handicapped. He feels himself inferior to his compeer of the Matriculation system. He is not able to comprehend things easily. His English too, while being pedantic, is not free from spelling and grammatical errors. He lacks the adaptability which, in spite of defective instruction, a graduate under the old Matriculation system has to a remarkable extent. Naturally therefore a change was considered necessary, and a system like the old Matriculation is coming into operation.

The complaint has often been made that the syllabus for the S. S. L. C. Public Examination is overcrowded much to the detriment of the health of the S.S.L.C. candidates. This has been said to be the result of trying to satisfy each and every idealist and specialist. That the syllabus is overcrowded may be true; but it is not

altogether fair to blame the idealist or the specialist. For each has a merit of his own and the suggestion of each has a real value in the onward progress of our younger generation.

In the old system, the complaint, probably a just one, was that too much stress was laid on the teaching of English and on the teaching of non-language subjects in English and hence pupils could not devote sufficient attention to the nation-building subjects of History, Science, etc. The progress in these latter subjects was not commensurate with the trouble taken by our pupils. So it was declared that non-language subjects might be taught in the pupils' vernaculars without any objection being raised thereto by the educational officers. But how many of our High Schools are taking advantage of this concession is worthy of examination. In the case of those schools which still follow the old system of teaching in English, the reason why the concession has not been availed of may be elicited. In any event it cannot be that books are wanting in the vernaculars; and even assuming it to be true, it cannot redound much to the credit of the teacher, if he cannot teach his subject in his vernacular. Though he may not be successful in teaching through his mother-tongue at the beginning, yet in the long run he is bound to achieve success in this direction; and it is only when many High Schools use this concession to their advantage that books will come to be published in large numbers.

After all, is it well that our pupils do not have a fair knowledge of English, that they adopt the easier course of learning things in their vernaculars, when they want to undergo collegiate course, when they want to do research work, when they want to go to

foreign countries for higher and technical studies? All modern books on sciences are written in English and one who has not got a good grounding in English is sure to be handicapped for want of a full grasp of the true significance of scientific terms and expressions. The countries which are most advanced in Education, Technology, Industry, etc., in the world are the United States of America and Germany. In the realm of Science these come first. So if only we want to progress in Western science and scientific methods, or at least to keep pace with the other countries of the world in their onward march of scientific progress, it is but necessary that, while not neglecting the nation-building subjects up to a certain standard in the Secondary School course, our pupils must have enough knowledge of English to make out scientific treatises and articles. Nay, it may even be said that the teaching of German language should form part of the syllabus for the Matriculation or the S.S.L.C., at least to those who desire to undergo a higher course of study. It is certainly not proper, when we want to become independent, whether within or without the British Empire, that we are lacking in advanced thoughts, methods and instruments. Even the researcher cannot afford to ignore the state of progress already reached in his branch of work. It is only when he studies the methods of experimentation of original men that new channels suggest themselves to him, and that he invents things. For, after all, even invention is a thing of steady progress and the credit of the inventor lies in finding these channels and making inventions. So it is clear that English must, in the interests of our own progress, occupy as high a place as possible

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in the course of instruction in Secondary Schools. Only care has to be taken that non-language subjects do not receive a step-motherly treatment in the curriculum for the sake of a few.

The instruction for the Secondary School course covers a period of eleven years. The cost incurred for receiving the benefits of secondary education is out of all proportion to the average wealth of an Indian; yet the advantage derived is not correspondingly great. One of the aims of secondary education is to prepare man for the battle of life; to make him a true citizen; to make him useful in some way, however little or insignificant it may be, to his country, if not to the world; and to make him realise that he too has his place in the world and that he was not born simply to eat, procreate and die a forlorn being like a rat. Is it not then worth the while of every patriotic educationist to see whether the product of our Secondary School course satisfies these requirements? If our S.S.L.C. holder does not, in what way or ways is he defective? What should be done to remedy the defects? These questions have to be answered.

The first thing that seems to draw our attention is the unusually long period of the course. Eleven years of a man's lifetime, eleven years out of twenty-four, the average age of an Indian, is certainly too long. There must be some drastic attempt to shorten the period. It is imperative. In many instances it seems that the cause of the large number of failures is due to the tediousness of the course. How often is the same portion covered over and over again? Is it not concentric system carried to an absurd length? One of the methods of efficient instruction is said to be to appeal to

the sense of novelty in the pupil. Where can novelty be, when he is sick of a lesson which is sought to be taught? Of course, there are ways in which an air of novelty could be given to any subject however old; as, for example, by altering the method of treatment, by dwelling on the subject from different view-points. But certainly it is no good to attempt to create interest when our pupils are bored over and over again.

In the eighties the Matriculation course seems to have covered only a period of seven years. Pupils had to labour under the disadvantages already referred to. Yet have they been found wanting? Why should not the same period be fixed and non-language subjects taught in the vernaculars? The long course that we have at present cannot be justified as solving the unemployment problem to some extent when large numbers of our young men are affected by this pernicious arrangement. Nor can it be seriously contended that our pupils have become too lazy to become more active after such a long period of miserably slow progress. A three years' period must be enough for the present Lower Elementary instruction; and a period of five years seems more than enough for the Matriculation or the S.S.L.C. Examination. When non-language subjects are taught in the vernaculars, and when suitable methods of instruction are adopted, certainly the portions taught cannot be too much. On the other hand, elementary ideas of politics, domestic and political economy, self-government, sociology, engineering, photography, metallurgy, etc., may with advantage be included as optional subjects. The study of the German language may form part of the instruction in Practical Science. After all, the trouble of our pupils

at present is to express their thoughts precisely and correctly in English. When English is not insisted upon as the means of conveying thought, the volume of portions taught in the different subjects cannot loom large in the eyes of our pupils. Then the understanding and expression of thoughts in non-language subjects will not so much consume the energy of pupils as at present. Both will become easy. No wonder then that our pupils will devise ways and means to digest and assimilate not only the present portions, but also more. Originality will have better scope for showing itself out. Pupils will also find more time to devote their attention to English, to study their prescribed texts, and to take interest in the study of extra books and journals. They will also find time to exercise in the correct use of expressions and idioms.

The teaching of Elementary Science is not what one would wish it to be. All are not and cannot become research students; nor can all be expected to have the benefits of collegiate course. One of the objects of teaching Elementary Science seems to be to enable a man to understand intelligently the common phenomena which he meets with in every-day life. All are not born to go on experimenting with the idea of formulating Laws of Nature. It is left to an infinitesimally small minority. Again there are prodigies whose intuitive power is so great that they are able to propound original ideas without any great experimentation. It is not meant however that the study of scientific principles by experimentation and observation is to be discouraged. Let those who desire to study science to arrive at generalizations of an original nature do so in Practical Science. Anything like an elaborate record

of results may prove a regular infliction to those who have no aptitude for learning by experimentation and observation. The Elementary Science Syllabus should include only those portions which are likely to interest a man in life, and which come within his observation everyday, so that he may, when questioned by an ignorant person, give a satisfactory explanation of what he sees.

Another branch in which improvement has to be effected is in the teaching of Mathematics. Pupils are sadly lacking in a knowledge of mathematical tables. The pial school practice of reciting them almost every-day seems the best. For example, pupils of these days do not see easily that $135 \times 26 = 100 \times 26 + 30 \times 26 + 5 \times 26$. They require a note-book and a pencil to work out the sum. Even then they go through the process of multiplication mechanically and without understanding the rationale. Simple fractional multiplications cause no small uneasiness to our youngsters. In all these the pial school boy of two or three years' training is far better than our High School boys. In most cases mathematics is a bug-bear to our History pupils. Is it not due to the fact that no appeal is made to the imaginative power in teaching the subject, that Practical Mathematics is made a fetish, and that no attempt is made to develop the memory of pupils? It is for our mathematicians to say where the fault lies and suggest the real solution.

One serious defect of our system of education is that it does not create sufficient self-confidence in a man, that he does not feel a sort of pride, an ennobling influence when he reads the history of his country. The idea that he is not the descendant of a barbarous nation, that at least in ancient

times his nation had a glorious past, that it had a fine civilization to give to the other nationalities of the world when they were more or less barbarous, must be developed in our young men that they may face and talk to any man boldly, and that they may progress as well as pupils in any other part of the globe. Incidentally they may be made to examine why we do not maintain the same high place among the nations of the world. If the education that we impart does not achieve this, it is not worth the name 'Education.' A certain amount of thoroughness in a knowledge of things necessary for life can alone create self-confidence. It is only when self-confidence is created that our young men will be free from the shyness which blurs the intelligence of many a young man, that they will be free from the cringing tendency which is the result of years of subordination to foreign nations. Naturally our secondary education has to be modified on these lines. The world is advancing by rapid strides; and if we desire to progress at the same pace even as a subordinate nation, it is our education alone that could save us.

Our energy is almost sapped by summer examinations. The attention we give to physical development is almost negligible. The large number of infectious diseases, such as consumption, typhoid, cholera, small-pox, etc., are no mean enemies to be reckoned with by us. Yet we want to progress materially, morally and intellectually. May God help us in the realization of our desires!

METHOD IN THE CLASS-ROOM

Many teachers have adopted as a class-book Principal Martin's "English Dialogues," and yet there are some who, while they appreciate the merits of the book, still hesitate to use it lest their boys should **cram** some of the dialogues. The fear, of course, is groundless; but, in any case, they need not worry about this, for even if a few boys display so much zeal as to learn by heart even half a dozen dialogues, no harm is likely to result therefrom. This is, however, by the way.

For the present, our object is to direct the attention of all teachers to the varied uses to which Martin's "English Dialogues" can be put.

(1) ESSAY-WRITING.

The boys may be asked to read at home certain dialogues—those containing pros and cons—and next day may be asked to write an **essay** on a subject discussed in one of these dialogues.

(2) LETTER-WRITING.

The boys may be asked to read at home four or five dialogues selected by the teacher, and may then be asked some days afterwards to write a **letter** on a subject having some sort of relation to the subjects of these particular dialogues.

(3) SUMMARIZING.

The boys may be asked to **summarize** a dialogue suitable for the purpose.

(4) STORY-WRITING.

The boys may be asked to **narrate** in their own words a fable or story told in the form of a dialogue, after having it read once in the class.

(5) DIRECT—INDIRECT.

Some of the dialogues may be utilised for exercise in **Indirect Narration**.

(6) IMAGINARY DIALOGUES.

Two boys may be asked to read a dialogue in the class, each boy reading the part assigned to him. Then any other two boys may be asked to carry on conversation on the same subject, the teacher encouraging them to use their own words and ideas. After this preliminary exercise, the class may be asked to write a **dialogue** on the same subject. The result will be found encouraging both to the boys and the teacher.

And all that is said above illustrates the importance of method in the class-room, for no matter how good a text-book may be, half its worth is lost if it is not used in the right way.

COOPER, Publishers, BOMBAY.

SUMMARIES IN MATHEMATICS.

By

Mr. GANTI NARAYANA, B.A., B.ED.,
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It is a matter of common observation that an orator, having spoken at length on any topic, summarises his whole speech in a few sentences at the end. So also a judge, after having considered all the pros and cons of any case in as detailed a manner as it is necessary, puts his whole argument in a few sentences as an *Illiad* in a nut-shell. This method of expressing the sum and substance of any topic, after a long discussion in a few sentences is of great importance. A summary of any speech, argument, judgment or of any other topic, when it is forcibly constructed and systematically arranged is of immense value; for it leaves the desired effect on the mind of an audience in the case of a speech, and on the mind of a reader in the case of any written account; and it thus fixes the material for a considerable time.

A summary in Mathematics is not of less value than a summary in a speech or in any essay or in any written matter of any topic. But what is meant by a summary in Mathematics? Now, a teacher in the course of his teaching deals with many topics one after another in quick succession. He takes up a topic, for instance, 'Problems on Simple Equations' and works out almost all the examples in the text, in some order, which suits him and then takes up another topic. In order that the results under any one topic may fix themselves in the mind, the teacher, when he has finished a topic should either get the summary of all that is taught by questioning or he should give it himself briefly. When a teacher has worked all the different kinds of

problems on simple equations, he must note down at the end, the different types of problems as follows:—

1. Problems on "Ages."
2. "Digits of a number."
3. "Division of profit."
4. "Mensuration."
5. "Angles between the hands of a clock."
6. "General problems in arithmetic."

A similar summary should be given always at the end of every topic in Mathematics in the higher forms of a Secondary School. In every subject, such summaries are necessary; but in Mathematics they are essential. Without the aid of a clear summary and a critical analysis of every topic, the student always finds himself in a state of confusion, without being able to distinguish either the similarity or the difference between any two problems of any topic. On the other hand, when he is provided with a good summary, he better appreciates than he usually does, the proportions of the subject, the relations of its parts and its perspective. A summary also helps one to master the matter of a topic.

The following is a summary on the Statistical Graphs, as an example of a summary in Mathematics:—

SUMMARY OF STATISTICAL GRAPHS.

I. (a) *Axes*:—Two axes (perpendicular) are essential to fix a point on the ground as well as on paper. The horizontal axis is called the *x*-axis (*xox'*) and the vertical axis is called the *y*-axis (*yoy'*). These axes form four quadrants, (*a, b*); (*a, -b*); (*-a, b*); (*-a, -b*); *a* and *b* being positive. The distance measured along the *x*-axis or on a line parallel to *x*-axis is called the *x* co-ordinate.

The distance of a point measured along the y -axis or on a line parallel to y -axis is called the y co-ordinate. So every point has two co-ordinates and a point is always represented thus : (a , b).

(b) *Axes as applied to statistical graphs* :— In every problem on statistical graphs, there will be a table of statics in two rows. The statistics of the first row should invariably be represented on the x -axis and the statistics of the second row should invariably be represented on the y -axis.

II. (a) *Choice of the scale—Principles for choice of scale* :—

(1) *Space*.—The diagram (curve) should occupy the whole page as much as possible.

(2) *Convenient scale*.—The scale should be such that we can read $\frac{1}{10}$ " on both axes very very easily.

(b) *How to obtain the proper scale* :—Note down the maximum and the minimum statistics in one row. In choosing the maximum value, take the nearest integer greater than the actual maximum value found in the row. In choosing the minimum value take the nearest integer less than the actual minimum value. Find the difference between the maximum and the minimum values. Distribute the difference equally on either of the two axes as far as possible. Thus you obtain the proper scale. Then draw the following table :—

Axes.	Quantity in	Scale.	Statistics.
x -axis.	1st row.	1"= ...	
y -axis.	2nd row.	1"= ...	

III. *Plotting the points* :—Starting with the minimum values of the statistics on both the axes, mark succeeding values at convenient intervals. (Not necessarily the actual statics.) The co ordinates of every point are given by the statistics of every column, taken one after another.

IV. *Drawing the curve*—Principle :—A neat, tidy and smooth curve should always be drawn. The following are the most important means to the above end :—

(1) All points should be joined by the hand itself.

(2) When you join the first and the second points look to the direction in which lies the third and so on Thus join all the points lightly for the first time.

(3) Make corrections wherever necessary.

(4) Rub off all unnecessary bendings.

(5) Finally make the curve neat.

V. *Interpolation* :—Either the x -co-ordinate or the y -co-ordinate of a certain point or points being given to find the other co-ordinate of the point.

VI. *Types of Problems* :—

(a) Problems, the graphs of which fall mainly in the 1st quadrant, e.g.,

1. Age and height.
2. Age and weight.
3. Day and time of sunrise and sunset.
4. Time and length of shadow.
5. Time and temperature.
6. Application to Physics.

(b) Problems, the curves of which fall in both of the quadrants (a , b) and (a , $-b$), e.g.,

1. Distance and depth of a river.
2. Calibration curves.

THE HARTOG COMMITTEE REPORT.

By

Mr. C. P. GOVINDAN NAIR, B.A., L.T.,
First Assistant, C. N. N. High School, Trichur.

I. A GENERAL REVIEW.

THE Auxiliary Committee, appointed by the Simon Commission to take stock of educational progress in British India during the last decade, published its report by the middle of October last. The report is signed by Sir P. J. Hartog, Chairman, Sir L. A. Selby-Bigge, Sir Sultan Ahmed, Dr. G. Anderson, Raja Narendranath and Dr. S. Muthulakshmi Reddi. The last two have appended dissenting minutes. Raja Narendranath objects to the proposal of the Committee for reservation of seats in schools for Muhammadans and the introduction of religious education in public schools; while Dr. S. Muthulakshmi Reddi has a separate note on women's education.

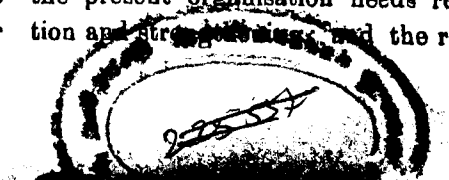
The doleful report records facts for the supposed guidance of the Simon Commission. The facts as disclosed by the Committee make out a strong case to retard Indian Swaraj inasmuch as India is, it would seem, altogether illiterate and so unfitted to exercise the political power she demands. But these facts should at once be taken to indicate the best that is achieved by British rule in India for a period of 150 years, a disclosure which, it seems, has not occurred to these experts. But whatever the political significance of the report be, there are some valuable suggestions among the conclusions arrived at by the Committee, which I propose to examine at some length.

Points of fundamental interest among the Committee's general conclusions demand our

first notice. The increased enrolment in Primary Schools, the expressed demand of the women of India for education and social reform, the rapid progress in the education of Muslims, the earnest efforts to improve the condition of the depressed classes, the greater readiness on the part of the leaders of public opinion to grapple with the complex problems of education form one side of the picture, and the bright side, drawn by the Committee.

But there is another side to it. The Committee views with real concern, the appalling waste and ineffectiveness which pervade throughout the whole educational system. The wastage in the primary system is more disastrous; and in the case of girls it is even more serious than in the case of boys. The Committee notes with some relief the advance made in secondary education, in the increasing capacity of teachers, in their improved conditions of services and training, and in the attempt to widen the general activities of school-life. But it deprecates 'the ideal that every boy who enters a secondary school should prepare himself for the University.' It finds a great waste of effort in the immense number of failures at Matriculation and other examinations. The attempts made to provide vocational and industrial training are, in the opinion of the Committee, "largely infructuous." The Committee records with some satisfaction the improvements in the methods of teaching of some of the Universities, but deplores "the theory that a University exists to pass students through examinations still finding too large an acceptance in India." The Committee thus emphasizes the need of a well-directed policy determined to eliminate waste of all kinds. "At almost every point the present organisation needs reconsideration and strengthening, and the relations of

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the bodies responsible for the organisation need re-adjustment."

The present divorce of the Government of India from education, the Committee concludes, has been unfortunate. It wants the Government of India to serve as a centre of educational information for the whole of India and as a means of co-ordinating the educational experience of the different Provinces. The Central Government should go even beyond this. It should take upon itself

the responsibility for the attainment of universal primary education. The Committee notes that the devolution of powers on the local bodies in the Provinces has met with unfortunate results and puts in a plea for strengthening the hands of the Ministers and the Directors. An increase in the Inspecting Staff, the Committee thinks, should lead to economy and not to extravagance. The Committee concludes urging priority to the claims of girls' education in every scheme of expansion.

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COOPER, Publishers, BOMBAY.

APOSTASY IN RELIGION.

By Mr. N. SIMHADRI RAO,
Dy. Inspector of Schools, Proddatur.

THERE is no word more misunderstood than the word Religion. The connotation of the word seems to differ with men. The specialists, meaning thereby the students of philosophy, give the word a technical significance; the ordinary middle class people with their University passports explain it as something worth having to act as a sort of a moral lever; the last class which may be taken to be the Bhadralog class give it a more utilitarian sense and mix it with the texture of a life of the work-a-day world. But a careful analysis will emphasise the undisputed fact that more often than not the proper significance is lost sight of and the practical conception of all classes of people in the society veers to the view-point of the Bhadrals. Religion is purely an attitude of the mind but it is made a matter of art. One sees the gradual decay of religion and the invasion of scepticism to devastate the community. It is encrusted with meaningless excrescences that we now do not see the wood for the tree. Religion is not merely intellectual or scientific but it is essentially of the heart. It is broad-based upon sincerity and love and not upon logic or cold reasoning. It was Emerson who said that "miracle comes to the miraculous, not to the arithmetician." To many of us the idea of religion brings before us a bundle of rituals and "holy practices." The silken thread that ran through the fundamental conception of religion is snapped and in its place we see to-day something which is the very reverse of it. It has become highly materialistic and intertwined with the things of the world. It is no longer of the spirit. The present religion believes in a "Prov.

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idence which does not treat with levity a pound sterling." We do not ask for light or leading but say bluntly "Grant her in health or wealth long to live." This is, I believe, the sum and substance of all our religion, our worship and our existence as we understood it to-day. There is no honest thought among us but some motive to subserve our human interest. That is why we feel the reaction quite disastrous and devastating. India which is reported to be the cradle of all religions and all philosophies has receded to the background and people have become more intellectual and less sincere in their outlook and failed to think that their present existence is only a parenthesis. Mundane existence is considered to be the be-all and end-all of life and the "Almighty Dollar" is enthroned in our hearts. Honesty of thought is given the go-by and our existence is warped by every conceivable artifice. The eternal verities are discarded and attention is pinned to the fleeting moment. The result is a break-down and we find ourselves to-day between the devil and the deep sea. Satan is tempting us and we are getting farther and farther away from all that is holy, all that is great, and all that is spiritual. We have literally become God-less, religion-less and morality-less. We have become dual in nature caring for the nonce. People who are considered orthodox in the popular sense of the word, pass off as great spiritual heroes. These are the worst tyrants in a society and impose their will with the infallibility of Pope's decrees. They are treated as highly religious, though very little has to be said of their character and of their sincerity of purpose. It is the opinion of many that religious attitude or spirituality, call it what you will, is considered to be different from character, morality

and fixity of temper. It is a paradox that a great many of the so-called religious-minded men are highly susceptible and prone to temptation more easily, yet they hold out that they are unsullied and that the life of a voluptuary is easily compatible with that of a religious man. This I take to be the ruling principle amongst a majority of men with the result that in a temple they are religious, God-minded and all the rest of it and that outside they are what the worst infidel is. As a result, God is unseated from the temples and Satan has taken the place. That is why like the devil we are able to quote scriptures in defence of our actions. Religion has come to be something of a cloak to be donned on occasions and to be cast off when the ceremony is over. We have, therefore, become a bundle of contradictions, or shall I say, living "Oxymorons" as Thomas Hardy said somewhere. *Vox populi* is never the *vox dei* in this country and I am forced to think that is always the *vox diabolic*. Religious men must always be straightforward men; they should be men with sterling character, no temporal things should swerve them from the path of rectitude; they can see no compromise with the baser things of life. Truth is their guide. Divinity their beacon light and Nirvana their supreme goal. If this is not our conception, we must say with Coleridge that "if a man is rising upwards to be an angel, depend upon it, he is sinking downwards to be a devil. He cannot stop at the least. The most savage of men are not beasts; they are worse, a great deal worse."

THE EPIC TREATMENT OF 'HENRY IV'

By

Mr. R. KRISHNAMURTI,
Tepfakulam, Trichinopoly.

PROF. MOORMAN has given us a good deal of thought on the subject and by subtle reasonings and logical conclusions he arrives at the decision that the play has received epic treatment at the hands of that dramatic poet, Shakespeare. An epic treats of the life, the adventures and glorious deeds of some national hero. It sings a noble note of praise on the glory and wondrous achievement of great and deified souls like Adam or Hercules. It gives us all about the trials that the hero might have undergone, the point of sword which he might have dared, the glory that he achieved and the success that he won. The overcoming of his own shortcomings and the impression that he creates on people are all described. The glories of nature, the hardships of life, the dread of the field of battle and the achievement of the laurel are nowhere so fully and admirably worked out. Such things supply for the subject matter.

The manner of presenting such details in blank verse and the pursuance of thought without any apparent cogency characterise an epic. Digressions abound in plenty and the whole is a "string of disconnected pearls." It does not care much for the unity of design, of which a dramatist must be scrupulously careful. And lastly, an epic is not often short. It is sufficiently long.

The English language boasts of one perfect epic poem, wrought by a poet of immortal fame who like the blind Cupid kindled love, not that love which the sensuous man feels

but that love which the learned hanker after. He is no other than the revered Milton of the seventeenth century and it is no less a poem than 'Paradise Lost.' This is hailed as the greatest epic poem and it is truly considered as a work of genius.

'Henry IV', though it may not be as good an epic as 'Paradise Lost,' is yet an epic. The difference lies in degree. The theme, the manner and every other point about the play convince us as to its claim for a place among that branch of literature. The matter treats of the Prince or rather the making of King Henry V. The action begins even in Part I of 'Henry IV' and ends only in 'Henry V.' On the whole the matter covers a drama in three acts beginning with 'Part I—Henry IV' and ending in 'Henry V.' The noble work wrought by the Almighty hand of Shakespeare in making the Prince Hal of tavern fame an ideal king of England is indeed vast, laborious and skilfully intelligent.

The verse form of 'Henry IV' is analogous to that of 'Paradise Lost' which we may doubtless call an ideal epic. The ripples of the gentle waves which carry us along the smooth river of Shakespeare's blank verse go on with an undulating movement for ever affording illimitable pleasure to the reader.

The construction of the plot is markedly deficient in unity of plot and design. The crusade of the first scene, the tavern in the next scene and the Henry-Hotspur scene are apparently without any connection and to the illiterate play-goer in the pit it will be sufficiently baffling and highly confounding. This sort of going astray from the main topic and the sudden introduction of incidents of no immediate importance in the furtherance of the action are quite characteristic of an epic and we feel that Shakespeare had originally the intention of presenting the play in an epic form.

The play is, as it were, a descant upon honour. We have here various individuals considering honour from many points of view. According to the learned Moorman, the battlefield of Shrewsbury is a tourney ground where various people meet and fight, their common object being honour. And who are the competitors, nobles, lords, kings and clowns!

Summing up we can say with confidence and 'without fear of derision from any but the supreme and crowning fools among the foolish of mankind,' that, intentionally or unintentionally, Shakespeare has given us a beautiful epic drama. The matter and manner of the play indicate and point to the same conclusion.

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CATECHISM ON HYGIENE FOR USE IN ELEMENTARY SCHOOLS.

By Mr. N. R. SESHACHARI,
Assistant, Govt. Model High School,
Teachers' College, Saidapet.

What is the chief cause of disease?

The chief cause of disease is dirt.

Why is that?

Because most diseases are caused by "germs" which breed in dirt.

What are germs?

Germs are small *poochies*, so small as to be quite invisible and yet capable of doing great harm to the body.

How do they do harm?

Cholera germs breed rapidly in the bowels and intestines and so cause inflammation and colic; malarial germs enter the blood and eat up the red particles, thus poisoning the blood and causing fever; other germs act in other ways, but all cause harm and often death.

Why then does dirt cause disease?

Because these germs hide themselves and breed in dirt and if there is dirt in the house or on the person, they easily find their way into the body and cause disease.

What are the best ways of avoiding dirt?

The clothes and the body should be frequently washed in clean water.

What should be done if clean water is not available?

The water should be boiled and then used.

What is the use of boiling?

Boiling the water kills all germs contained in it.

Is it sufficient to make the water hot?

Certainly not, that is worse than useless.

Why?

Because warming the water is like giving the *poochies* and germs in it a warm bath. This merely makes them more fresh and lively just as a warm bath refreshes a man.

What then is the use of boiling?

Because boiling scalds them to death just as a bath of boiling water would kill a man.

What is the best way to get rid of dirt in the house and backyard?

All dirt which will burn should be burnt, but at a distance from houses so as to avoid giving annoyance to neighbours.

What should be done with the dirt which cannot be burnt?

It should be taken to a piece of dry land at a distance from houses and buried in pits about a foot deep and then covered with earth.

Will not this spoil the dry land?

On the contrary it will make it rich and fertile and it will bear splendid crops.

But will not the earth and the crops it produces be dirty?

Certainly not. The dirt will mix with the soil and improve it and so become good soil.

But how can dirt do any good?

Because dirt after all is only misplaced matter and when it ceases to be misplaced, it ceases to be dirt. Example:—Sand under a boy's nails. Sand in mortar.

CHOLERA.

What is the cause of Cholera?

Cholera is caused by germs which get into the bowels through the food or water we consume and these cause inflammation and colic and death.

How do these germs come?

These germs generally come to us through water, especially during the first freshes and rains.

Why is that?

Because in the dry season the beds of our rivers and tanks have been used for all kinds of dirty purposes and when the rains and freshes come, they bring down this dirt into the water; and in this dirt live the cholera germs.

Then how can we avoid Cholera at these seasons?

By boiling all water before we use it. It is also safer to boil milk and to eat only cooked food.

Why is this?

Because in this way if any germs have got into our milk or our food, they will be killed by the cooking before they enter our stomachs.

What precautions should be taken when Cholera visits the village?

Houses and backyards should be kept clean, all dirt being burnt or buried at a distance. All food should be cooked and all the water should be boiled. If any of us are suffering from looseness of the bowels, some medicine may be taken to stop it.

What medicine?

It is best to take only medicine given by the Hospital Assistant or sent by the Sirkar.

But if that is not available what can we do?

A mouthful of vinegar flavoured with chillies is a good preventive, but it must not be given to young children or invalids.

Why not to them?

Because it might kill them.

Is there anything else to be done at Cholera times?

Yes, it is most important to keep up your spirits and not be afraid. If a man keeps cheerful and goes about his work bravely, the cholera germ rarely catches him.

MALARIA.

What is the cause of Malaria?

Malaria is caused by germs which are introduced into our blood by mosquitoes.

How can this be prevented?

By killing mosquitoes and their larvæ.

What are larvæ?

After a mosquito leaves the egg, it does not become a full-blown mosquito at once, but turns into a sort of caterpillar which lives in water.

How can this be killed?

By draining all stagnant pools and puddles near dwelling houses and keeping all the surroundings of the houses dry and clean.

What good will that do?

The larvæ will have nowhere to live, for they can only exist in stagnant pools and puddles, and the mosquitoes will have no dark dirty places in which to hide, and so they will go away.

What is the best cure for Malaria?

The best cure is Quinine which is sold at all Post Offices.

How should it be taken?

A dose of 5 grains every day may be taken in water until the fever subsides. A smaller dose must be taken by boys.

What is the use of Quinine?

It flavours the blood so that the malarial germ cannot live in it.

STOMACH-ACHE, DIARRHOEA, DYSENTERY, ETC.

What is the chief cause of stomach-ache and such other affections of the bowels?

The chief cause of such disorders is unsuitable food.

What is the cure?

To eat only plain food, such as plain rice and kanji and milk for several days until we feel well again.

May we eat curry or ghee?

Most certainly not. At such times they are little better than poison.

Is any medicine required in such cases?

Better, you consult a qualified doctor.

CUTS, WOUNDS AND SORES.

What is the most important consideration in treating cuts, wounds and sores?

To keep them clean.

Why?

Because such hurts heal of themselves very rapidly if kept clean.

Why then do some wounds foster?

Simply and solely because they have not been kept clean and so germs have got into the body through the open wound and caused trouble.

What then must be seen to in treating cuts and wounds?

They must be washed with clean water and bound up with clean cloths.

How can we get clean water?

By straining it through a clean cloth and then boiling it.

How can we get clean cloths to bind up the wound?

By boiling them in water and hanging them up in the sun to dry.

Is any other treatment necessary?

A little gingelly-oil or cocoanut-oil may be applied to the wound so that the cloth may not cause irritation; but the oil must be pure.

How can we be sure that it is pure?

We can never be sure; but if the oil is first strained and then boiled and allowed to cool in a bottle, it will probably be harmless.

PREVENTION.

What is the best preventive of all diseases? Cleanliness.

Is it sufficient to keep the person clean?

No, it is most important to see that the house and the backyard are equally clean.

If we keep our house and backyard clean, is that enough?

No, there is one thing still more important.

What is that?

Our drinking water-supply.

Why?

Because most diseases are caused by bad water.

What can we do?

We can see that our drinking water tank or well is kept clean; that no one uses it for bathing purposes or to wash clothes, that no one spits or commits nuisance in the neighbourhood.

What is the use of all these precautions?

Well, some 90 years ago, Cholera and Malaria were as common in England as they are now in India. But now, they are practically unknown in England.

What is the reason?

The people of England have learnt to obey sanitary laws, to drain their villages and keep them clean and to purify their water-supply.

May we also hope for the same result?

Yes, certainly, but you must take trouble and not be content with mere talking and the repetition of a catechism.

What must we do?

We must observe the rules given above and especially keep our houses and villages dry and clean and must be careful to preserve a pure supply of drinking water.

ACTIVITIES OF THE INTERNATIONAL LABOUR ORGANISATION DURING 1929.

1929 will be considered as one of the most fruitful years of the International Labour Organisation.

In the first place, it has been marked by notable progress of the eight-hour day towards universality. Not only was no effect given to the proposal for the revision of the Washington Convention on the eight-hour day in industry, but the new British Government has officially announced its intention of taking the necessary steps to ensure ratification as early as possible. The German Government has also introduced a Bill for unconditional ratification. As soon as these two ratifications, British and German, are obtained, the conditional ratification of France takes effect, and others will follow almost automatically. The time now appears to be approaching when the eight-hour day in industry will at last be guaranteed internationally in all the chief industrial countries.

But this is not all. While a change for the better was thus taking place in the prospects of the industrial eight-hour day, the International Labour Conference, in the two Sessions held this year, accomplished in almost un hoped-for conditions, the first stage of the procedure that will make it possible in 1930 to confer the benefits of the eight-hour day, or a scheme based on the eight-hour principle, on two large classes of workers left outside the scope of the Washington Convention—salaried employees and seamen.

This phase of the activities of the International Labour Conference, which met twice—in June and October—is another characteristic feature of the year now drawing to a close. The agenda of both Sessions was exceptionally heavy; in June, the general Session, forced labour (first discussion), the hours of work of salaried employees (first discussion), prevention of industrial accidents (second discussion), protection against accident of workers employed in loading or unloading ships (second discussion); in October, the maritime Session, regulation of hours of work on board ship, protection of seamen in case of sickness or injury, promotion of seamen's welfare in ports, and the establishment by each maritime country of a minimum requirement of professional capacity for mercantile marine officers (first discussion in each case). On all these topics the Conference took positive decisions. It adopted the following Draft Conventions or Recommendations on the questions before it for second discussion, on which questions alone final decisions could be taken: Draft Convention concerning the marking of the weight on heavy packages transported by vessels; Draft Convention concerning the protection against accident of workers employed in loading or unloading ships; Recommendations concerning the prevention of industrial accidents. The Conference also agreed to discuss a second time the questions before it for first discussion, and decided that the Governments should be consulted on them.

Among these questions that of forced labour furnished the occasion for a prolonged discussion, which made a profound impression in overseas countries. The close study of native labour problems has clearly marked

the determination of the International Labour Office not to confine its activities to European and other countries already highly developed, but to fulfil its mission the whole world over as intended by the Treaties of Peace.

This declared intention of the Office to achieve greater universality has also been made manifest in a striking manner by the Director's visit to the Far East—to China, Japan, French Indo-China and the Dutch East Indies. Following upon his visit, China, for the first time, sent complete delegations to the Sessions of the Conference. It may also be observed in this connection that the number of countries represented at the June Session—50—was the highest recorded in the history of the Organisation. Of this number no less than 15 were Latin American countries, as against 7 in 1926, 10 in 1927, and 10 in 1928.

Furthermore, ratification of International Conventions has proceeded uninterruptedly: more than 50 new ratifications were registered in 1929. The control of the application of Conventions by means of the procedure for the examination of the reports that Article 408 of the Treaty of Versailles requires countries to furnish has been still further improved.

Again, the technical work, on the basis of which the International Labour Office initiates and extends its legislative work, has not ceased to develop. The procedure for the important enquiry on conditions of work in the textile industry has been drawn up. The results of investigations into migration phenomena and the legislation and international agreements by which these mass movements of human beings are regulated

throughout the world, have been published in volumes that undoubtedly constitute a unique source of information on the subject. Reference may also be made to the enquiries on social charges (insurance and relief) in various countries, on the safety of motor transport drivers, on working conditions in cinematograph studios, on the finding of employment for theatrical artistes, on unemployment among professional workers, on the conditions of employment of musicians and the effects of the spread of mechanical music, on the protection of the salaried inventor and on the termination of employment of journalists on grounds of conscience.

Among requests for information, every day more numerous, from public administrations, workers and employers' organisations, scientific institutions, industrial concerns, etc., that of the Ford Motor Company has thrown into relief the value of the results already achieved by the Office in its periodical enquiries on the purchasing power of wages in different towns and, what is more, has furnished an occasion for extending these enquiries.

Finally, it is the very exhaustive enquiries carried out by the Office since 1925 on hours of work, wages, and working conditions, in mines, that have made it possible to give effect so promptly to the Resolution of the League of Nations Assembly on the coal problem, and to convene on 6th January 1930 a preparatory technical Conference of the European coal-producing countries.

RATIFICATION OF CONVENTIONS.

On 1st January 1929, the number of ratifications registered officially amounted to 333; now, at the end of December, it is 383, an increase of 50.

The Conventions ratified by the largest number of countries up to the present are: the Convention concerning equality of treatment for national and foreign workers as regards workmen's compensation for accidents, ratified by 25 countries; the Convention concerning unemployment, ratified by 23 countries; the Convention concerning minimum age for admission of children to employment at sea, ratified by 22 countries; the Convention concerning night work of young persons, the Convention concerning the minimum age for admission of young persons to employment as trimmers and stokers, and the Convention concerning compulsory medical examination of children and young persons employed at sea, each ratified by 21 countries; the Convention concerning the rights of association and combination of agricultural workers, ratified by 20 countries; the Convention concerning employment of women during the night, the Convention concerning the use of white lead in painting, and the Convention concerning workmen's compensation for occupational diseases, each ratified by 19 countries.

APPLICATION OF CONVENTIONS.

In 1929 was put into operation for the third time the procedure instituted as a result of a resolution adopted at the Eighth Session of the Conference to enable the Conference to make the fullest use of the information contained in the reports that Governments are required by Article 408 of the Treaty to furnish on the steps they have taken to apply the Conventions ratified by them. It has been found that in this field, beset with difficulties as it is, each year has yielded more valuable results, so that the information now available on the application

of ratified Conventions in the various countries is much more complete and precise than ever before. The most satisfactory feature of the experience of the last three years is, perhaps, the good-will with which Governments have furnished supplementary information concerning the position in their countries, in reply to observations formulated by the Committee of Experts which examines the reports before the Session of the Conference or while the Conference is sitting. In 1929, for the first time, the Conference had before it all the reports, on this occasion 241 in number and relating to 20 Conventions. It was possible to make a detailed examination of the measures taken to apply each Convention.

PROCEDURE FOR THE REVISION OF CONVENTIONS.

It will be remembered how the question of the revision of International Labour Conventions was brought before the Organisation. In each Convention adopted by the Conference during the eleven Sessions held from 1919 to 1928 is a standard article laying down that "at least once in ten years, the Governing Body of the International Labour Office shall present to the General Conference a report on the working of this Convention and shall consider the desirability of placing on the agenda of the Conference the question of its revision or modification." Since Part XIII of the Treaty of Peace contains no other provision relating to procedure for the revision or modification of a Convention, it was desirable to lay down in the Standing Orders of the Governing Body and the Conference respectively, the procedure for giving effect to this Article of the Conventions. The Governing Body forthwith inserted in its Standing Orders the new

provisions laying down the procedure for placing on the agenda of the Conference the question of the revision or the modification of a Convention. These provisions governed the first phases of the revision procedure, which are entirely within the competence of the Governing Body. It was for the Conference to incorporate in its own Standing Orders regulations governing those phases of the procedure that follow the inclusion of a revision proposal in the agenda of one of its Sessions. The Conference took a decision on the subject in the course of its general Session held in May and June 1929. The provisions that it adopted and inserted in its Standing Orders may be summarised as follows:

When the Governing Body has decided to place on the agenda of a Session of the Conference, the question of the total or partial revision of a Convention the International Labour Office shall submit to the Conference draft amendments drawn up in accordance with the conclusions of the report of the Governing Body recommending the total or partial revision of the Convention. These draft amendments should correspond to the question or questions in respect of which a proposal for revision has been placed on the agenda.

The freedom of the Conference to discuss and decide is thus limited to the questions placed by the Governing Body on the agenda of the Session.

This procedure is the natural complement of that for the Governing Body adopted by it in 1928, and seems to guarantee the stability essential to international labour legislation.

THE TWELFTH SESSION OF THE INTERNATIONAL LABOUR CONFERENCE.

The Twelfth Session of the International Labour Conference was held at Geneva from 30th May to 21st June under the presidency of Dr. Heinrich Brauns, German Government delegate and formerly Federal Minister of Labour. 50 countries were represented, a number that has never before been reached. 27 were European and 23 non-European countries, of which 3 were British Dominions, 15 Latin American, 4 Asiatic, and one African, countries. In addition, Turkey, although not a Member of the Organisation, sent an observer, as in 1927 and 1928.

The agenda consisted of four questions: (1) the prevention of industrial accidents; (2) the protection against accidents of workers employed in loading or unloading ships; (3) forced labour; (4) hours of work of salaried employees. Only the first two questions, which had already been discussed the preceding year, led to definite decisions at this Session; the other two were merely before the Conference for a first discussion in accordance with the double discussion procedure in force.

On the first question the Conference adopted four instruments for the organisation of what Mr. Albert Thomas has called "the international Red Cross on the battlefields of labour." These instruments are: a Recommendation concerning the general principles of accident prevention; a Draft Convention concerning the marking of the weight on heavy packages transported by vessels; a recommendation concerning responsibility for the protection of power-driven machinery; a resolution concerning accident statistics.

The general recommendation on accident prevention was adopted by 100 votes to 12.

the Draft Convention on the marking of the weight on packages by 98 votes to 24, and the recommendation on the responsibility for the protection of power-driven machinery by 87 votes to 28. The resolution concerning accident statistics was carried unanimously.

With regard to the protection against accidents of workers employed in loading or unloading ships, the Conference adopted by 84 votes to 22 a Draft Convention drawn up with particular care and perhaps more comprehensive from the technical standpoint than any other Convention. This Draft Convention was accompanied by two recommendations: one, adopted by 101 votes to 0, drawing the attention of the Governments to the importance of concluding reciprocal agreements; and the other, adopted by 88 votes to 0, concerning the consultation of workers and employers' organisations in the drawing up of regulations dealing with the safety of workers employed in loading or unloading ships. Furthermore, a resolution adopted unanimously invites the Governing Body of the International Labour Office to set up an International Technical Committee to work out a model set of regulations.

In considering forced labour, the Conference entered upon a new subject affecting the lives of millions of human beings, as well as approached a great colonial problem. After exhaustive discussions it decided by 101 votes to 15 to place the question on the agenda of the 1930 Session; and adopted by 83 votes to 17 a questionnaire addressed to Governments, covering all the aspects of the problem as well as possible solutions of it, and contemplating in the first place the adoption of a Draft Convention for the abolition of forced labour, or at least its limitation and regulation with a

view to the suppression of abuses. Further, by 64 votes to 21 the Conference adopted a resolution requesting the International Labour Office to continue its studies, with a view to action at a later stage, of various problems related to that of forced labour, and, in particular, penalties in connection with long-term labour contracts.

As to hours of work of salaried employees, the Conference decided by 103 votes to 17 to place the question on the agenda of the 1930 Session; and adopted by 92 votes to 15 a questionnaire that will enable the amplest possible material to be obtained from the Governments, with a view to the decision to be taken at that Session, in the form either of a Draft Convention or a Recommendation. The questionnaire contemplates the general limitation of hours to 48 per week and 8 per day for all persons employed in the undertakings covered.

Although not placed on the agenda of the Twelfth Session for a decision, the problem of unemployment also occupied the attention of the Conference. The question was before the Conference in the form of a general report by the International Labour Office, mainly devoted to an analysis of the possible influence on unemployment during the last few years of certain predominant international factors.

After considering this report the Conference adopted an important resolution covering the various aspects of the unemployment problem.

The Conference adopted several other resolutions presented by delegates, a certain number of which directly concern workers in overseas countries.

As usual, it examined the reports submitted by Governments on the application of Conventions.

It fixed the procedure to be followed for the revision, total or partial, of an existing Convention.

It further endeavoured to remedy certain inconvenient features in the double discussion procedure employed for the adoption of Conventions. With this end in view, it decided that the procedure in question should henceforth be as follows:

The International Labour Office, subject to the approval of the Governing Body or of a Committee of the Governing Body appointed for this purpose, will draw up a report on the question on the agenda. This report will not necessarily contain a questionnaire but will determine as far as possible the points on which the Governments are to be consulted. After discussing this report the Conference will determine, by adopting conclusions or resolutions, the points on which the Governments are to be consulted. On this basis the International Labour Office will draw up the questionnaire to be addressed to the Governments. The Conference will thus be relieved of the task of drafting the questionnaire itself in the course of the first discussion.

Finally, the Conference at its Twelfth Session, as at the preceding Sessions, devoted several sittings to the discussion of the Director's Report. On this occasion a large number of questions of general social policy and kindred matters were raised, as well as problems of interest to the Organisation as a whole. The speakers, in a particularly striking manner, gave first place to general international interests, leaving various national problems in the background. Here, again, was an expression of unwavering determination to attain to real universality and to improve working conditions throughout the world.

It was in the course of this discussion that the British Government representative announced his Government's intention of taking the necessary steps to ensure the earliest possible ratification of the Washington Convention on hours of work. In his speech in reply to the delegates who had spoken on his Report, the Director emphasised the outstanding importance of this declaration, which makes it possible to look forward more calmly and more confidently to the generalisation of the eight-hour day, the keystone of international social legislation.

THE THIRTEENTH SESSION OF THE INTERNATIONAL LABOUR CONFERENCE.

The Thirteenth Session of the International Labour Conference, which was held at Geneva from 10th to 26th October under the presidency of Mr. Edward Aunos Perez, Spanish Minister of Labour and Social Welfare, was devoted exclusively to maritime labour questions. Two such sessions had already been held—at Genoa in 1920 and at Geneva in 1926. The Session under consideration was thus the third of the maritime series. After encountering serious difficulties at the outset owing to objections raised by the employers' group to its composition, the Conference achieved particularly encouraging results, so much so that at the closing sitting the spokesman of the workers' group could say that for the first time, perhaps, since seamen had been called upon to take part in the work of the Organisation, whether in the Conference or the Joint Maritime Commission, they could return to their ports with some satisfaction and large hopes.

There were four questions on the agenda: (i) regulation of hours of work on board ship; (ii) protection of seamen in case of sickness

(including the treatment of seamen injured on board ship), *i.e.*:—(a) the individual liability of the shipowner towards sick or injured seamen, (b) sickness insurance for seamen; (iii) promotion of seamen's welfare in ports; (iv) establishment by each maritime country of a minimum requirement of professional capacity in the case of captains, navigating and engineer officers in charge of watches on board merchant ships.

The Conference had not to take a final decision on any of these questions: it had only to hold a first discussion with a view to drawing up, no longer questionnaires (in this respect it was following for the first time the amended procedure laid down by the Twelfth Session), but conclusions fixing the points on which the Governments were to be consulted. It is the International Labour Office that draws up, in accordance with these conclusions, the questionnaire to be addressed to Governments for the purpose of obtaining their views; and subsequently, on the basis of the replies received, prepares for the second discussion either Draft Conventions or Draft Recommendations upon which the Conference then has to take a definite decision.

Thus in the case of the four questions before the Thirteenth Session, the Conference could only accomplish the first stage; but however limited it may be, the significance of its decisions is still considerable. The draft conclusions submitted by the four Committees concerned were adopted in plenary sittings without appreciable amendments, and the four questions were placed on the agenda of the next maritime Session with a view to a second discussion.

By 71 votes to 20, the Conference adopted the conclusions of the report of its Committee

on hours of work on board ship; and by 76 votes to 17 decided to place the question of the regulation of hours of work on board ship on the agenda of the next maritime Session.

The two reports on the protection of seamen in case of sickness or injury were both adopted; one, on the individual liability of the shipowner, by 65 votes to 16; the other, on sickness insurance for seamen, by 68 votes to 14. The inclusion of the whole question in the agenda of the next maritime Session was carried by 72 votes to 17.

The question of the promotion of seamen's welfare in ports was likewise placed on the agenda by 89 votes to 0, after the report of the competent Committee had been unanimously adopted by show of hands.

Finally the conclusions of the report of the Committee on the minimum requirement of professional capacity in the case of mercantile marine officers were adopted by 65 votes to 0; and the inclusion of the question in the agenda of the next maritime Session was carried by 73 votes to 2.

The Conference also adopted several resolutions, and a discussion of that part of the Director's Report to the Twelfth Session which concerned maritime questions furnished an occasion for focussing attention on the work accomplished by the Organisation in favour of seamen.

THE SESSIONS OF THE GOVERNING BODY.

The Governing Body of the International Labour Office as usual held four sessions; the first two consecutively in March, and the remaining two in May-June and in October. The work of the Governing Body during these four sessions, all of which were held at

Geneva, covered every aspect of the activities of the Organisation.

The first Session was marked by an important discussion, in which the Ministers of Labour of France, Germany and Great Britain took part on the eight-hour day in industry. At the conclusion of this discussion the Governing Body decided not to give effect to the proposal of the British Government for the revision of the Washington Convention of 1919 on hours of work. It will be remembered that three months later, in the course of the general Session of the Conference, the representative of the new British Government announced his Government's intention of taking the necessary steps to ensure the earliest possible ratification of this Convention.

Among the other important decisions taken by the Governing Body during the year, mention should be made of the following: the appointment of the members of the Committee on automatic couplings; the organisation of a Conference on silicosis at Johannesburg in 1930 in collaboration with the Transvaal Chamber of Mines; the Convocation in 1931 of a Conference on industrial accident statistics; the acceptance of Mr. Filene's offer of \$ 25,000 for the extension of the investigations carried out by the Office into real wages in a certain number of towns; and, above all, the Convocation of a preparatory technical Conference on conditions of labour in the coal-mining industry.

It was in consequence of a resolution adopted by the Assembly of the League of Nations that the Governing Body decided to convene this Conference at Geneva on 6th January 1930. The Conference will be composed of representatives of the Govern-

ments, employers and workers of the chief European coal-producing countries, its purpose being to inform the Governing Body of the International Labour Office which of the questions relating to working conditions in coal-mines could, in its opinion, most usefully be included in the agenda of the 1930 Session of the International Labour Conference with a view to the conclusion of a practical international agreement. In the light of the conclusions of this preparatory technical Conference the Governing Body will examine the measures which it may be desirable to take.

The Governing Body has fixed for 9th June 1930 the opening of the Fourteenth Session of the International Labour Conference, the agenda of which will be composed of the second discussion of the questions of forced labour and hours of work of salaried employees, and possibly a question or questions relating to working conditions in coal-mines.

COMMITTEE MEETINGS.

Several Committees met during 1929: namely, the Committee of Experts on Article 408, from 21st to 23rd March at Geneva; the Joint Maritime Commission, from 18th to 20th April at Paris; the Committee on conditions of labour in the coal-mining industry, on 22nd May at Geneva; the Committee on social charges, on 24th and 25th May at Geneva; the Safety Sub-Committee of the Correspondence Committee on industrial hygiene on 30th September and 1st October at Berlin; the Advisory Committee on professional workers on 6th and 7th December at Geneva.

The new Committee on conditions of work in the textile industry held its first two

sessions in 1929 at Geneva, *viz.*, on 24th and 25th June, and on 9th and 10th December.

THE TECHNICAL WORK OF THE INTERNATIONAL LABOUR OFFICE.

It is hardly necessary to say that the preparation of these committee meetings and the sessions of the Governing Body and the Conference entailed considerable research and compilation of material. The special activities of each of these different bodies in the course of the year has necessarily been paralleled by technical activities on the part of the International Labour Office.

The reports presented to the two Sessions of the Conference on the prevention of industrial accidents, the protection against accidents of workers employed in loading or unloading ships, forced labour, hours of work of salaried employees, unemployment, the regulation of hours of work on board ship, the protection of seamen in case of sickness including the treatment of seamen injured on board ship, the promotion of seamen's welfare in ports, and the establishment of a minimum requirement of professional capacity in the case of mercantile marine officers—these reports alone represent a considerable task of compilation.

The reports on hours of work of salaried employees and forced labour mark a characteristic expansion of the technical activities of the Office.

Moreover, if the Governing Body has been able to give effect so promptly to the resolution on the coal problem adopted in September 1929 by the Assembly of the League of Nations, and if it has been possible to convene a preparatory technical Conference of the principal European coal-producing countries on 6th January 1930,

the reason is that the International Labour Office, by constantly improving its methods in carrying out its enquiries on hours of work and wages in European coal mines, had assembled abundant and reliable material.

With a view to the consideration of questions suitable to be included by the Governing Body in the agenda of the 1931 Session of the International Labour Conference, the Office has prepared reports on the maximum weight of loads to be carried, the age of admission of children to commercial employment, paid holidays, and the organisation of shifts in mechanical glass works.

It has continued its investigations into the cost of insurance systems and relief in various industrial countries.

It has extended the periodical compilation and publication of comparable data on wages and the cost of living, by increasing both the number of industries and the number of towns covered by the enquiry. Hence, when the Ford Motor Company was in need of information of this kind, it was to the Office that it turned for scientifically compiled figures. The sum placed at the disposal of the International Labour Office by Mr. Filene will make it possible to extend researches still further in this field.

The preliminary researches carried out by the Office in view of the first two sessions of the Textile Committee enabled the Committee to draw up a scheme for an enquiry on conditions of work in the textile industry. This scheme will be laid before the Governing Body at its next session.

In 1929 appeared the fourth volume of the considerable work on "Freedom of Association," a fifth and last volume of which will shortly be issued. Extending its

researches in the field of labour law, the Office has undertaken new enquiries on conciliation and arbitration, which, at a later stage, will lead to the investigation of the general principles of collective agreements.

This year also saw the publication of the third volume of "Migration Laws and Treaties" and a report on "Migration Movements, 1925-27." To the work entailed by these volumes must be added that of preparing for the Conference on Migration Statistics.

As regards labour legislation, additions have been made to the "Legislative Series," the publication of which in three languages (English, French and German) dates from the Organisation's earliest days; and the "International Survey of Legal Decisions on Labour Law," which was begun three years ago, and gives an account of the most typical labour cases before the courts in various countries. The Office has also published in the course of the present year the second volume of its report on "Social Legislation in Latin America."

In conjunction with the Scientific Management Institute, the Office has energetically continued its enquiries into rationalisation in relation to working conditions. It was able to present to the Congress of the Scientific Management Organisation a whole series of provisional reports on rationalisation and unemployment, rationalisation and wages, rationalisation and health, rationalisation and accident prevention, rationalisation and agricultural work.

In the sphere of industrial hygiene the Office has proceeded with the publication of the important "Encyclopædia of Industrial Hygiene" which will be completed in 1930.

It will be remembered that the aim of this considerable undertaking is not to publish original discoveries by the International Labour Office, but to synthesise, as it were, in a comparable manner, information accumulated in the various countries on hygienic conditions and pathological factors in different industries.

The "Industrial Safety Survey," concerned with problems of accident prevention, is compiled on similar lines; an article in a recent issue on the safety of motor transport drivers may be mentioned by way of example.

In this same sphere of industrial safety the Office published in 1929 a report on "Hydro-Extractors: their safe construction and equipment"; and is now investigating, in conjunction with the International Institute of Educational Cinematography at Rome, the question of accident prevention films.

With regard to agriculture it may be recalled that the Office took part in the work of the Joint Agricultural Committee which met at Rome in November. In the very near future a report by the Office on vocational guidance in agriculture will be published. Other reports are being compiled on two particularly important problems, namely, the effect on agricultural work of agrarian reforms in Eastern and Central Europe, and the effect of the rural exodus.

The Office has compiled a new edition, now in the press, of the "International Directory of Co-operative Organisations." It is continuing its investigations into the problem of the handicraftsman.

With regard to matters of concern to professional workers, mention may be made

of the numerous reports concerning the termination of employment of journalists on the ground of conscience, a subject which has been expanded so as to cover the whole question of journalists' contracts of employment; the radius clause in contracts of employment; the salaried inventor; the finding of employment for theatrical artistes; the working conditions of musicians with special reference to the situation created by the introduction of mechanical music; and working conditions in cinematograph studios. The whole constitutes a vast enquiry on unemployment among professional workers.

Naturally the Office has endeavoured to amplify its sources of information. Its Documents Service receives 3,500 newspapers and periodicals. Between 1st January and 1st December 1929 the Library added more than 33,000 new books to its collection, as against 10,200 in 1923, 13,000 in 1924, 14,000 in 1925, 20,000 in 1926, 24,000 in 1927 and 29,000 in 1928. The annual increment is thus constantly increasing. At the present time the Library comprises 280,000 volumes.

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see Boswell's misinterpretation of a playful jest. Two years later Goldsmith and Burke went together to see a performance of puppets or Marionettes. Burke was especially delighted by the life-like precision with which a military puppet appeared to manage its pike. 'Psst!' said Goldsmith, 'I can do it better myself.' The stupidity of Boswell, in adducing the story as a proof of Goldsmith's envious disposition, is astonishing. The ironical thing is that it was Boswell's envy that made him think Goldsmith envious, and not his lack of humour; for Boswell could record his own follies with a delightful appreciation of their absurdity.

Goldsmith was always talking about himself nonsensically, and I suppose was always being misunderstood. He used to say he 'disputed best when no one was by, and always got the better when he argued alone'. 'When I write anything,' he once complained, 'the public makes a point to know nothing about it.' He would preface one of his artless confessions with the words: 'Now I'll tell you a story of myself which some people laugh at and some do not.'

Where others jested, certainly, but always jested with dignity, Goldsmith was apt to offend the company's sense of decency.

(4)

Another quality in Goldsmith for which he was despised by many of his grand acquaintances was his simplicity and unworldliness. He once gave a guinea to a coachman in mistake for a shilling. Some of Goldsmith's friends heard of this, and the next evening one of them disguised himself as a coachman, came to Goldsmith, pretending to be the man who had profited by the mistake, and returned him a counterfeit guinea, really a gilt

shilling. Goldsmith accepted it with profuse thanks and gave him a large tip. Then the joke was revealed—for it was a great joke that Goldsmith should think a poor coachman capable of such honesty.

Sir John Hawkins records that the Earl of Northumberland (afterwards the Duke of the story about Bath) was delighted by 'The Traveller', and when he was going to Ireland as Lord Lieutenant invited Goldsmith to come and see him, and asked whether he could do him any kindness. Goldsmith answered that he had nothing to ask for himself, but that he had a brother in Ireland, a clergyman, who stood in need of help. 'Thus', says Hawkins, scandalized, 'did this idiot in the affairs of the world trifle with his fortunes!' Hawkins would have been still more indignant if he had known that a few days earlier Goldsmith had had to borrow the sum of fifteen shillings and sixpence.

A story of the same kind, equally honourable to Goldsmith, is told by a reverend Doctor of Divinity called Scott, who was private chaplain to Lord Sandwich and had the task of hiring writers to defend the Government. His story is brief and contemptuous. 'I found him in a miserable set of chambers in the Temple. I told him my authority; I told him that I was empowered to pay most liberally for his exertions; and, would you believe it, he was so absurd as to say, "I can earn as much as will supply my wants without writing for any party; the assistance you offer is therefore unnecessary to me." And so I left him in his garret.'

(5)

Goldsmith's virtues, as well as his undeniable failings, seem to have told against him. His unworldliness, his belief in human nature,

his simplicity, his child-like love of fun, were laughed at almost as much as his vanity, clumsiness, and improvidence. He was the butt of the Club to the end, in spite of the defence of Johnson and Reynolds. Someone suggested to Johnson that Goldsmith's poems were unduly admired because people were fond of the poet. 'Nay, Sir,' answered Johnson, 'the partiality of his friends was always against him. It was with difficulty we could give him a hearing.' People admitted his literary genius a little grudgingly, because they despised the man. To Hawkins, Goldsmith was 'an inspired idiot,' and many agreed with Hawkins.

And I think the same attitude is quite common still, even among well-read admirers. Their attitude is a little patronising. His literary excellence is taken as a perfectly natural thing and put on one side, and then the man is judged. He is pronounced very likeable, certainly, but the sentence is passed with some condescension, as if he were like a child to whom the ordinary standards of judgment need not be applied rigorously. There are many who speak of him very much as Boswell did: 'For my part, I like very well to hear honest Goldsmith talk away carelessly.'

In dealing with this kind of criticism, it is not enough to insist that Goldsmith's literary excellence should not be forgotten. Goldsmith was not just a fool who happened to write very agreeably; he was an extraordinarily wise man. All his works, even some of his airiest trifles, show an admirable sense of the relative importance of things, a lofty but generous morality, and a most penetrating knowledge of character. It will be enough to cite one example of his wisdom, which happens to be also a pretty example of dramatic irony. Gold-

smith belonged in his last years to a Club which met regularly for dinner; it was not the famous Literary Club, though many people were members of both. Here, as everywhere almost, Goldsmith was an accepted butt: 'his country, dialect, and person' were regular themes of wit. At one meeting someone conceived the notion of writing an imaginary epitaph on Goldsmith, and many others joined in the game. The epitaphs were almost all humorous and uncomplimentary; the only one which is preserved is Garrick's famous couplet. They were read aloud to Goldsmith. He said nothing at the time; but the following months, which were the last of his life, were partly spent (when he could spare time from his compilations) in writing epitaphs on the epitaph-writers. His 'Retaliation,' which was only published after his death, is one of the most brilliant satires in the language. In faultless verse, good-tempered, friendly, and genial, it shows how much better Goldsmith knew his railing acquaintances than they knew him. Without a trace of bitterness or uncharity, he lays bare their characters to the roots. The lines on Burke, written in the bright morning of Burke's career in Parliament, fasten with unerring insight on those very faults of temper and judgment which cast so many shadows on his later years; and the masterly portrait of Garrick must have made Garrick sorry he ever spoke. The various parts of the poem were handed about in manuscript as they were written; and Goldsmith's friends were just learning to respect as well as to like him, when he was taken from them.

Many of the best things in Boswell were said by the man who 'talked like poor Poll.' He said (adapting, if Boswell is right, from Cibber), 'There is no arguing with Johnson;

theorems in the syllabus. Rev. Feroli, S. J., Professor of Mathematics, St. Aloysius' College, deserves to be congratulated on the distinct success achieved in re-editing the work of Bézout 'by enriching it with many examples,' for most of which solutions and hints are given. Emphasis has rightly been laid on the signs of segments of lines and of areas, and on the full import of the term *Locus*. The notable features of the book are the Introduction dealing with Geometrical Methods and the Appendix containing Constructions and Harder Miscellaneous Examples. These will be much appreciated by intelligent students.

The Appendix on Constructions will be the richer if it has a larger number of numerical examples (besides those taken from University papers) suitable for practical work. The use of the term *Conjugate points* as meaning *Inverse points* in p. 91 will be confusing to the students especially when it is used in the ordinary accepted sense in the book itself in p. 97 and p. 110. The definition given in p. 21 for figures *similar and similarly situated* does not bring out the essential fact that the corresponding sides are parallel. It will conduce to clearness if the new terms *Orthogonal Circles*, *Circle of Similitude* and *Polar Circle* are defined.

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