

THE WOMAN ENGINEER

THE ORGAN OF THE WOMEN'S ENGINEERING SOCIETY (Incorporated 1920).

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SCOTTISH GIRLS MAKING ARTIFICIAL LIMBS.

THE "WOMAN ENGINEER" IS ISSUED QUARTERLY—PRICE 4d.

The Woman Engineer.

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All correspondence relating to this Paper should be addressed to THE EDITOR.

Items of interest and newspaper cuttings regarding the position of women in the Engineering World will be welcomed by the Editor.

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Notes.

THE OUTLOOK.

THE idea of Engineering as a suitable career for women seems at last to be gaining a foothold. Many parents are realising that a girl with a mechanical and mathematical turn of mind has now a chance of proving her worth. To the few pioneer women who entered the Universities as engineering students when there seemed no prospects ahead, it must be encouraging to know that the road opened up by them is now being followed by a rapidly increasing number of women. Compared with the number of women

entering for other professions, the proportion of engineering students is still exceedingly small, but every encouragement is now being extended by the authorities of Universities and Technical Colleges to the girl student who wishes to take up engineering. Engineering is a very wide term and it is often somewhat confusing to the beginner when she realises the extensive field of activities covered by this term. Specialisation in one branch is necessary, and the widest scope offered to women at the present time is in Electrical Engineering.

The Quarter's Work.—Visits have been paid by the Organising Secretary of the Society to the Midlands, the North of England and to Scotland. Everywhere great interest has been shown in our movement, and amongst a large majority of engineers it appears to be the opinion that there is a great future for the trained woman engineer.

Also a number of Employers stated that, provided no opposition was raised, they would have no hesitation in reinstating a proportion of women mechanics in the Shops.

Among the more broad-minded of the Trade Unionists there is a growing feeling that women should not be restricted in their desire to enter all branches of the Industrial World. This is a hopeful sign.

Within the last two or three months a number of responsible posts have been secured by our members, the salaries ranging from £250 per annum and in each case with excellent prospects.

Quite a unique business has been established in the North of England, where an Engineering Works has two women on its Board of Directors and a woman as assistant manager. We wish the factory every possible success in its pioneer effort.

A small public meeting was held in Aberdeen, on Monday, 6th September, over which Sir James Taggart, K.B.E., kindly presided. Sir James referred to the excellent work done by women during the war in the Engineering Shops, and pointed out the great necessity for utilising this source of trained labour at the present time.

An address was given by the Organising Secretary on "Women and Engineering," in which she emphasized the fact that as women had proved themselves capable of tackling practically every operation in Munitions and other Engineering Shops, they should not now be prevented from taking their share in the vast work of reconstruction.

Atalanta, Ltd.—Under this title a small group of enthusiastic women engineers have decided to form a company for the purpose of carrying on an engineering business. Seeing no scope for their activities, and having the natural road to success barred to them, these women have decided to risk their all and to establish an engineering works where there will be absolute freedom for them to use the ability and skill which they possess. Much thought and careful consideration has been devoted to the way in which the Works shall be conducted. It has been decided to commence on quite a small scale and to extend as and when opportunity arises. Five of the directors are women, two of whom will be responsible for the administrative side of the work, and all the employees will be shareholders in the company.

Realising, as they do, the innumerable difficulties and obstacles to be overcome, we are confident that so fine and courageous an enterprise will meet with the success it deserves.

The Prospectus will be issued in the course of a week or two, copies of which can be had on application to the Secretary, W.E.S., 46, Dover Street, W. 1.

Women, Young Persons and Children (Employment) Bill.—The W.E.S. have been asked to give evidence before the Committee which has been set up by the Home Office in connection with the above Bill, to enquire into the employment of women on the two-shift system. Facts regarding the Women's Employment Bill are given on p. 37, by Miss Selby. The W.E.S.

would be pleased to welcome expressions of opinion on the two-shift system for women, such communications to reach the office not later than the 11th October, 1920.

Lectures.—A series of lectures and debates is being arranged for the Winter Session, to take place in the Club Room at 46, Dover Street, W. Fuller particulars will be announced later.

Correspondence.—It has been suggested that a Correspondence Column should be instituted in the magazine. The Editor will therefore be pleased to welcome letters on Technical, Educational and Industrial questions. The full name and address of the sender to be given in each case.

The Machine Tool and Engineering Exhibition, Olympia.—This Exhibition, which remains open until the 25th September, should be visited by all women who are interested in Engineering. Many novel demonstrations are being shown, and it is a unique opportunity for gaining up-to-date information of what is happening in the Machine Tool industry. Half-price tickets for admittance can be obtained from the offices of the Society.

Miss G. L. Entwisle is the first woman to be elected as a member of the Society of Technical Engineers.

* * *

In the *Practical Engineer* of August 26th, 1920, a very interesting article by Iris A. Cummins, B.E., B.Sc., appears under the heading of "The Suitability of Women for the Engineering Industries."

NOTE.—The Proprietors of the WOMAN ENGINEER are pleased to publish articles, etc., which come within the scope of the work carried out by the Women's Engineering Society, but they cannot be held responsible for all opinions expressed in these articles.



Views of Distinguished Engineers.

No. 3.

By SIR ALFRED YARROW, BART.

WOMEN AND SCIENCE.

IF our industries are to prosper we must pay more attention than we have hitherto done to Scientific Research, and there is no reason why the brains of women as well as those of men should not be turned to useful account in investigating the mysteries of Nature, upon the study of which progress depends, industries develop, employment is obtained, and the welfare of the community secured. Why should not women follow in the footsteps of a "Faraday" or a "Pasteur"?

Apart from obtaining an increased number of investigators, women often look at things from a different standpoint to men, and just as a stereoscopic picture excels a plain photograph, so women and men working together may obtain results which neither would secure alone.

We owe to the investigations carried out in our Laboratories:

1. The numerous applications of electricity.
2. The conversion of fever-stricken districts into health resorts.
3. The utilising of waterfalls to produce power which can be transmitted to distant parts.
4. The production of energy by the expansion of steam through turbines.
5. The development of the internal combustion engine, owing to which rapid transport by land and by air is rendered possible, etc., etc.

Had it not been for Scientific Research these developments could never have been realised.

There are many industries which, owing to Trade Union rules, women are unable to follow, but there are no such regulations to prevent women from devoting their lives to Scientific Research; consequently in this employment women are free from one of the most foolish obstructions of the age.

Although we despise the German character, we are bound to recognise that their industries have in recent years developed far more rapidly than our own, and this in a great measure is due to the attention they have paid to scientific training, upon which the efficiency of their manufactures depended.

This rapid increase of their industries is proved by the fact that emigration from Germany during the last twenty years had practically ceased; indeed ample employment was found not only for the 800,000 increase per annum of the population, but also it led to immigration into Germany

from surrounding countries. In Great Britain our industries have not kept pace with the increase of our population, and people have been forced to find employment in the United States and other foreign parts; in fact the extent of emigration from a country is a gauge indicating the relation the development of industry bears to the increase of the population.

With regard to women taking up a scientific career, it may be of interest to know that a Research Scholarship has been initiated in connection with Girton College, Cambridge, for women who desire to take up Science and Research as their life work, and one feature of this Scholarship, which I submit might be copied with advantage, is that not only is the Interest on the Fund available for the purpose, but it is stipulated that the Capital also is to be used, the Fund becoming extinct in twenty years.

To put it into figures, it is as follows:

£10,000 was given to form this Trust. Now if the interest only had been available for the students, it would amount to £500 a year, but as the Capital as well as the Interest is to be used then £800 a year is at their disposal during twenty years.

Now the question arises: Is not £800 a year for twenty years spent in Research more advantageous to the country than £500 a year continued until the world comes to an end?

I submit that what we need for the prosperity of Great Britain is to progress with the utmost rapidity during the next few years rather than to provide for the distant future; just in the same way it is far more important to give a helping hand to a young man to take up a career early in life, and make him a productive, happy, and efficient citizen, rather than to provide for his old age.

It has been well said by Canon Barnett that:

"It is difficult to make money honestly, but far more difficult to spend it wisely."

I submit that it is very wise to give financial support to some of our women to enable them to devote their time and their brains to scientific investigation, especially at the present critical period of the world's history when the prosperity of this country stands as it were in the balance with rivals on all sides.

The Magic of Mathematics.

By ELIZABETH H. M. GEORGESON, B.Sc.
(ENGINEERING).

Miss Georgeson is one of the first few women to become an articulated pupil to a Surveyor, with a view to qualifying as a Civil Engineer.

THERE was a glamour, was there not, about the sums we did at school, at least when we "got them out right"? In my memory a particular fascination attaches itself to the first quadratic equation I ever worked, and, though I understood the proof, I remember I had a feeling of awed admiration, as if there were some magic beauty in the solution. But, of course, I believe some people see no loveliness in numbers.

Still, even those people who may have no intimate and affectionate admiration for mathematics, must feel awed when they reflect that the wireless telegraph is due to deductions of Maxwell by means of theorems that depend upon the square root of minus one; and that the possibility of the long distance telephone depends upon Pupin's investigations, which were made with the help of theorems bearing directly upon the theory of expansions in fundamental functions.

Some people are eternally trying to condemn the mathematician to after-analysis. They admit that inventions which work well in practice may then be proved mathematically to be possible, and they declare that this is the whole of the practical field of advanced mathematics.

But this is by no means the case.

By a theory closely related to that of the solution of that dear quadratic equation of mine, the mathematician can confidently assure the mineralogist that he will never find more than thirty-two distinct types of crystal; and there are quantities of intuitive and inventive work which could never have been accomplished without the aid of mathematics.

One thing which adds greatly to the glamour of mathematics, for me, at least, is the fact that the stage properties are so slight! In the room of the mathematical research worker there are no telescopes, spectrometers, electrometers or balances; none of all the paraphernalia of modern science such as surround the physical or chemical research worker. The spontaneity of many mathematical discoveries increases one's feeling that there is magic somewhere around.

Then, again, mathematics has an almost magic

effect upon its ardent devotees. Lewis Carroll would never have been able to write the immortal *Alice*, had he not as plain Charles Dodgson been a great mathematician. Mathematics and a faculty for inventing clever nonsense do seem to go together very often. W. M. Rankine, Professor of Civil Engineering and Mechanics in the University of Glasgow, was another mathematical nonsense-provider. His *Songs and Fables* is a book of delightful folly.

It is not difficult to see a connection between mathematics and laughter-making fun. A brain must be in absolutely tip-top condition to invent really clever nonsense, and the study of mathematics does keep brains truly fit.

And the moral of all this, as the Duchess would say, is that we should all work at our maths. It is vitally important to engineers, both directly and indirectly as a brain tonic: and my limited experience of girl engineers leads me to think that we are rather apt to neglect this branch of our craft.

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Embryo Women Engineers.

By HETTY G. GROUSE.

I AM quite convinced that if we are to evolve Women Engineers we must train them early.

It has already been shown that women (as an outcome of war) have, with but little training been able to give very efficient service in professions which were hitherto barred to them, amongst these being certain branches of engineering work for which some of them showed especial aptitude.

Now one of the most conservative of professions with regard to Sex is Engineering, and this is mainly the result of our Educational system.

Look back on your school days. Whilst boys were being crammed with extra lessons in mathematics, physics, chemistry, drawing, etc., whether they liked it or not, girls were taught how to sew, knit, embroider, whether they liked it or not.

Personally I detested these estimable feminine lessons, just because I was compelled to learn them, and I have no doubt that there were many girls like myself. On the other hand, there were many of the boys who had no particular fondness for science and mathematics, and would have preferred painting, designing or modelling in Plasticine.

It appears to me therefore, that this system of one type of Education for boys and another type for girls is all wrong.

What we need is Co-education as I believe it is termed.

Co-education will help us to produce Women Engineers. Our Educationists must allow the girl student to partake of the same mental food as her brother, and if she finds certain courses unpalatable she will show signs of mental indigestion at a very early stage and can then be allowed to train on the lighter educational fare which is usually doled out to girls.

On the other hand, if she has aptitude for Sciences which will help her towards the profession called Engineering, why not let her take a serious interest in them?

How many of the boys who have every facility for learning Subjects which (it is supposed) will later on in life fit them for a scientific or engineering career, actually become Scientists or Engineers? Perhaps seventy-five per cent. of them enter the Commercial world.

There is an accepted idea that to be an Engineer one has only to be a man. In one sense this is so. All the clever engineers I have met have been real men in the true sense of the word, but this is not quite what I mean.

The REAL engineer is born, not made. He or she has to be "discovered" and educated along the right lines. By Education I do not mean book learning wholly, but also ENVIRONMENT which is a most important factor.

Up to the present, embryo boy engineers have been allowed to serve apprenticeships in big Workshops. When Engineering is recognised as a suitable profession for women, they also will be permitted to have the same opportunities for learning.

All branches of engineering work may not suit women. From my brief experience Electrical work is the most suitable. It comes most easily to the woman who is intelligent and who has some knowledge of mathematics, physics and chemistry, and, above all, has a genuine desire to become an Electrical Engineer; not because it is fashionable for women to do such work and to make a "craze" of it and then to drop it, as so many women unfortunately do in other spheres of labour.

We women, who through the exigencies of the war, have been permitted to touch on the fringe of Engineering, owe a great deal to the patience and kindness of clever men who have given us the little training we have, and we should be very grateful for the tolerance that has been shown us in our pioneer work.

We have a tremendous lot to learn before we can honestly call ourselves engineers. It is for the future generations of women to prove that we are capable of working on equal terms with men, and that will only come about through the right system of Education, namely Co-education.

Pioneer Birdwomen.

By MARY ABBOTT (Author of "Women and the Conquest of the Air").

ELEVEN years ago last June a royal lady tramped the great plain of Betheny outside Reims, carrying a camera. The subjects of her snapshots were the air pilots at the first Aviation Meeting the world had known.

That royal lady was the present Queen of Belgium, then only the Comtesse de Flandre. She and her husband had gone specially to France to study the possibilities of the heavier-than-air flying machine, and while he talked with the aviators she photographed them. Since then the Belgian King and Queen have definitely adopted flying as the speediest means of getting about, and as recently as this summer flew from their own country to England to attend the wedding of Lady Cynthia Curzon. And within the last month they have

Some Things that Count.

By MARY SELBY, Hon. Secretary W.E.S.

THE last few months fraught with questions of much moment to the Industrial World at large, cannot but cause anxiety to many women workers.

The further stages of the Women, Young Persons and Children Employment Bill will be taken in the Autumn, to allow enquiry into the employment of women on night work; night work under the two-shift system meaning up to 10 p.m. The Bill, as originally framed, provided for legalising the employment of women between the hours of 6 a.m. and 10 p.m.; the measure, as altered, provides that women and young persons shall not be employed after 8 p.m., thus rendering the two-shift system impossible. The power of employing women on the two-shift system (originally an emergency war order) calls for the strongest arguments in its favour, giving women shorter periods of work, and longer and more varied periods of leisure in daylight, to say nothing of the gain to production and the community consequent on the employment of efficient woman labour working under good conditions. That children should be excluded from industry up to the age of 14 is a reform all must welcome, and indeed the age might well have been extended; but why bring women into this Bill at all and class them with young persons and children?

At the Women's International Congress held at Geneva in June, the following resolution was passed establishing the Educational and Economic Rights of Women:

"That all opportunities of education, general, professional and technical, should be open to both sexes.

"That women should have the same opportunity as men for training and for entering industries, professions, civil service, and all administrative functions.

"That women should receive the same pay as men for the same work.

"That the right to work of both married and unmarried women be recognised; that no special regulations for women's work different from regulations for men, should be imposed contrary to the wishes of the women themselves."

The first Conference of the International Federation of University Women is a landmark in the progressive march of educated womanhood. Amongst

become possessors of an aeroplane of their own built in England at the Cricklewood aerodrome.

Men were not the only aviators at Reims in June, 1909. The Baroness de la Roche, the first woman to gain the Aero Club's certificate, and Mademoiselle Dutrieu, who took up a passenger as well as herself, were there helping to make history of a kind that astonished the world. And in the gathering twilight, with Roger Sommer as her pilot, an Englishwoman, Miss Gertrude Bacon, made a flight over the darkening plain in a Farman aeroplane. It was by no means Miss Bacon's first aerial trip, for she had frequently gone skywards in a balloon with her father, the renowned scientist and aeronaut.

Since 1909, many women have tasted the joys of flying. After the English Aviation Meetings at Doncaster and Blackpool "going-up" became a fashionable week-end pastime at Hendon until the war put a stop to it and sent women in their thousands to make aeroplanes, and one woman in particular, the Countess Drogheda, to encourage flying and thrift at the same time, by distributing War Bonds literature from an aeroplane a thousand feet above Trafalgar Square.

But before August, 1914, flying as distinct from just "flipping" above an aerodrome had appealed to many women rich enough to indulge in a pleasure much more expensive than it is now, when the return fare between London and Paris is only eighteen guineas and in a short time is likely to be even less. Miss Trehawke Davies bought herself an aeroplane and more than once crossed the Channel with Gustav Hamel as her pilot. Mrs. Cody, Miss Harriet Quimby, and Mrs. Maurice Hewlett, wife of the distinguished novelist, were all pioneer birdwomen. Mrs. Hewlett, who went to France to learn flying, helped the cause of aviation still further by subsequently starting a business for the manufacture of aeroplanes and not long ago went to Australia to teach flying. One woman there is who has actually been a carrier of mails between Paris and Brussels. She, Mademoiselle Hervieu, is also now teaching flying in another continent, but it is to America, not Australia, that she has gone.

Meanwhile English women-would-be air pilots are being trained at Eastbourne, leading women's clubs are having lectures on flying as a Career for Women, and, more significant still, a recent novel has had a woman aviator for heroine.

We seem to be quickly overtaking the prophecy which H. G. Wells made in *Joan and Peter*—"There must be girls in the world who could fly as well as any man and better."

other things, the Federation hopes by an exchange of lecturers to co-operate with the National Bureaux of Education in all countries, and so help to promote a better understanding between the nations.

It is interesting to note, in passing, that the National Federation of Women Workers have amalgamated with the National Union of General Workers. Also that the Amalgamated Society of Engineers has now ceased to exist as such and has become part of a new Union under the title of the Amalgamated Engineering Union.

The reorganisation of the Factory Inspection Department of the Home Office is a welcome and much-needed reform. The women inspectors are to be placed on terms of absolute equality with their male colleagues, and the number of women inspectors will be largely increased.

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An Interesting Review.

The following Review appeared in "Khancrete Engineering," July-August, 1920, and is reprinted by kind permission of the Editor.

"THE WOMAN ENGINEER."

The Organ of the Women's Engineering Society, (Incorporated 1920), Quarterly, 4d., 46, Dover Street, London.

"Maidens, like moths, are ever caught by glare,
And Mammon wins his way, where Seraphs
might despair!"

HAD Byron been living in these times, and had he been a student of our technical and general Press, he could hardly have imposed a less apt stricture on Woman. In his days she devoted herself and her leisure very largely to the decorative side of life. Many of that type survive to-day, but by far the most important majority have waded into the serious stream of life and left their past history and tendencies on the banks. Deeper and deeper they go into the stream of our national life, leaving the shallows of mere *coquetterie* for the strong-running currents of national enterprise. The idea of a Woman Engineer no longer takes our breath away—she may soon exhaust our breath in the effort to keep up with her! And how shall we adjust our mental outlook to sane proportions in dealing with her? With her broader human sympathies, and her greater capacity for sinking self-interest, surely our old "eye-for-an-eye" principles must pass away! Only experience can make the adjustment—for it is the bar before which every new development must reveal its falsity or truth. Therefore, from being the motto of an ancient chivalry, *place aux dames* must become a business attitude. In helping us to become accustomed to this attitude we extend a hearty greeting and welcome to THE WOMAN ENGINEER.

B. W. E.

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The Women's Engineering Society

(INCORPORATED 1920).

President—MISS R. M. PARSONS, A.I.N.A.

Secretary—MISS C. HASLETT.

The Women's Engineering Society is established in the Interests of Women engaged in Engineering and Allied Trades. The Aims and Objects of the Society are as follows :—

1. To promote the training and employment of women in Engineering and Allied Trades.
2. To work for the admission of women to all Schools of Engineering and Technical Colleges and in Engineering Workshops.
3. To give special attention to the future of women who have attained some degree of skill in the Engineering and Allied Trades and Professions, and who wish to continue their work.
4. To work for the admission of women to membership of all suitable Institutes of Engineers.
5. To enable technical women to meet and to correspond, and to facilitate the interchange of ideas respecting openings in the various branches of technical and mechanical science by the circulating of information on such subjects.
6. To use every constitutional means to promote the objects of the Society, and invite the support of persons of all shades of opinion.

If you agree that the above objects are worth working for, join the Women's Engineering Society. Full particulars regarding membership (for men and women) can be had on application to the Secretary, 46, Dover Street, W. 1.

