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To cite this article: Georgine Clarsen (2003) 'a fine university for women engineers': a Scottish munitions factory in world war I, *Women's History Review*, 12:3, 333-356, DOI: [10.1080/09612020300200363](https://doi.org/10.1080/09612020300200363)

To link to this article: <https://doi.org/10.1080/09612020300200363>



Published online: 16 Feb 2011.



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'A Fine University for Women Engineers': a Scottish munitions factory in World War I

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ABSTRACT In a tiny village in south-west Scotland, a model factory was established during World War I, not just to produce munitions 'for the duration', but with the expressed intention of continuing as 'a fine university for women engineers'. In an attempt to keep the enterprise going after the War, the factory was converted to the manufacture of motor cars. The Galloway - 'a car made by ladies for others of their sex' - was the result. This article considers the factory as a focal point for a network of material conditions and discursive claims within which the women of the Galloway Engineering Company sought to shape new technologies in their own terms, and so establish a permanent place for themselves in that masculine world.

The tiny village of Tongland in south-west Scotland quite unexpectedly became the site of a munitions factory during the First World War. Unlike most such factories, where existing engineering works were diverted into wartime production to fill an immediate need, the Galloway Engineering Company's plant was purpose-built with the future in mind. Its very appearance, a four-storey glass-skinned factory which used the latest techniques of structural engineering and industrial architecture developed in Detroit automobile plants, was designed to signal and shape its special purpose. But it was not just the ultra-modern plant in a remote rural setting that made the Tongland factory remarkable. The enterprise was presented as a promise, at a time of controversy over women's place in industrial production, of a bright future for women in engineering. It was a declaration in glass and ferro-concrete of permanent social change. In fact, some press articles did not call it a factory, but an 'engineering college for ladies', or 'a fine University for Women Engineers'.^[1]

A beautifully produced and illustrated brochure put out to attract a female workforce to the factory expressed confidence that there were

sufficiently educated women wanting to make a career out of engineering, as opposed to merely working in shell factories for the duration of the War:

Shell making is, as far as engineering circles are concerned, a cul-de-sac, whereas the opportunity afforded to the engineering student by the Galloway Engineering Company is permanent, and leading not only to good emoluments but high positions in the industry ... This booklet has been produced to interest gentlewomen who intend adopting engineering as a profession.[2]

The terms under which this company was established fly in the face of the ways women's industrial work in Britain during the First World War has generally been understood. My intention in telling this story of a contrary enterprise is to complicate what remains a rather globalised narrative of women's wartime work. The study highlights the ways that some women's interest in engineering pre-dated the War and continued long after it, and fleshes out how particular women assembled creative, sometimes collective, responses to the difficulties and opportunities they encountered in their search for meaningful work. It brings greater specificity to accounts of women's war work, which have tended to elide differences between enterprises, localities, phases of the War, and diverse historical actors.

There are two bodies of work on wartime dilutees that, surprisingly, have rarely been brought together. Research in the Labour Studies tradition, such as the numerous 'Red Clydeside' studies, have closely analysed the industrial conflict that centred on changes in production technologies and control over workshop practices since the 1890s. But they tend to consider dilutees of interest only in so far as they presented challenges to the positions of the 'real' actors – skilled craftsmen and their unions. More recently, those studies have been extended to include the Scottish industrialists, their workshop managers, and an emerging interventionist state.[3] However, while providing nuanced analyses in a particularly Scottish context, most say little about the dilutees themselves – working class or middle class, male or female. Studies of women's home front experience, on the other hand, have foregrounded women dilutees within a modernist narrative of female heroines struggling to achieve emancipation against unfair odds.[4] Such a narrative structure, which dates back to contemporary representations, brings with it inevitable limitations. Most importantly, it tends toward a view of women's war work as a 'special case', a discrete period of women's enthusiastic participation in the mainstream of social life, and then thwarted aspirations as they were 'forced back' into the home. It leans towards a construction of women as insulated from larger processes of political, technological, industrial, and economic change. And it works to elide the subtle issues of women's powers, their implication in broader racial, imperial, and class frameworks, and the ways that feminist impulses may be progressive and reactionary in the same

instant. The point here is that bringing together those two bodies of work provides an opportunity to open the material to more complex and productive questions than the ultimately undecidable one of whether the War brought permanent benefit to women. Rather, it can make us sensitive to the ways that at the same time as women were machining munitions they were also 'machining' new versions of the category 'women'.^[5]

The Galloway Engineering Company was set up in 1916 as a subsidiary to Arrol-Johnston, the oldest and largest of the Scottish car manufacturers. Arrol-Johnston's Managing Director was Thomas Charles ('T.C.') Pullinger, a mechanical engineer with thirty years' experience in bicycle and automobile manufacture in Britain and France. He had joined the company five years before the War, and moved the Arrol-Johnston plant out of the Clyde Valley - from a disused Coates thread mill in Paisley to one he had specially built in a greenfields site at Heathhall, near Dumfries. When the War began the plant was converted from automobile to aircraft production under government contract. With his daughter, Dorothée Pullinger, who had started her engineering training in the Arrol-Johnston drawing office before the war, T.C. Pullinger conceived of the Galloway Engineering Company and built the Tongland factory with the financial backing of William Beardmore, the prominent Clydeside industrialist and major shareholder of Arrol-Johnston.^[6] Tonglands was to supply aero-engine components to the Heathhall plant twenty miles distant. In his early enthusiasm for the project, T.C. Pullinger painted an extravagant picture of just what an 'ambitious gentlewoman' might hope to achieve in the profession:

One girl is already in charge of 6,000 women workers in one of the largest munitions works in England. I look forward to our students becoming sub-managers at £1,500 a year, or perhaps inventors of new mechanical devices. There is no finality in engineering, and the trained woman engineer has come to stay.^[7]

The Tongland factory opened in early 1917 with a core of ten women who had four months' special training at the Glasgow Institute of Technology. Nine months later there were some sixty women working under two male engineering instructors, as well as two female supervisors who both had pre-war engineering experience.^[8] In an effort to attract 'the right kind of woman', the company organised press tours of the factory in late 1917. Professional engineering journals and magazines targeted to solidly middle- and upper-class readers published glowing reports on the factory 'somewhere in Scotland', as did local and national newspapers. *Gentlewoman* assured its readers, 'Wonderful was the cleanliness and orderliness of the factory - no dirt, no oil reek, no piles of rubbish. Warmed by electric radiators and perfectly ventilated, it seemed an ideal "shop" indeed for women engineers'.^[9]

It is important to note that British usage at the time allowed for a slippage between the term 'engineering' for both professional and trade employment. It reflected a past when workshop experience had been the route into professional engineering for middle-class men. By the beginning of the First World War, however, university training was increasingly the sole gateway.[10] Stints on the workshop floor were reduced to a *rite de passage* whereby middle-class men demonstrated that they were able to 'manage (working-class) men'. This article will remain with the ambiguous contemporary usage for the moment, but clearly, for women seeking to enter engineering as a profession, their relationship to the possibility of managing men was problematic, and hands-on workshop experience was unlikely to lead to professional recognition, whatever their class privilege.[11]

The Tongland factory, like Arrol-Johnston's larger plant at Heathhall, was reminiscent of Ford's Highland Park works, though on a small scale, and without the assembly-line production, or rational flow of materials from the upper storeys to the ground floor.[12] It was a 'daylight' factory, built under the same Kahn patents used in Detroit, and constructed around a steel reinforced concrete frame, allowing for full-length glass windows on each floor. Offices, assembling, and erecting shops were placed on the first three floors, with the machine shop and foundry housed in an adjoining building. A recreation area on the fourth floor included an 'all-electric' kitchen and dining room, library, and games room. A tennis court was set up on the flat roof. The factory had its own hydroelectric powerhouse when local towns were still twenty years away from electrification. The building has survived, though it is now in a derelict state.

The Galloway Engineering Company provided accommodation for a number of women in the village of Tongland, but most had to board two miles away at Kirkcudbright, privately or in one of several company hostels. Brochures emphasised the beauty of the area and suggested that in their free time the women would be able to ramble through romantic countryside, paint landscapes, write poetry and study botany. It was assumed that the isolation of the site and its non-industrial setting would be part of its appeal to middle-class women, though it was later acknowledged to be a drawback which tested the enthusiasm of even the most willing 'girl engineer'.

Working conditions at Tongland reflected the somewhat awkward mix of the enterprise's educational and industrial aims. Unlike the brief training programmes offered to munitions workers elsewhere, compulsory theory classes during working hours, as well as ongoing practical training on a variety of machines were planned as a central part of the work.[13] The women were expected to sign up for a three-year apprenticeship, though it did not have the legal structure of a male engineering qualification. Both the hours and rates of pay were less than most other munitions workers, and starting wages did not cover the cost of food and accommodation.[14] At the

same time, it was expected that their output would approximate that of other 'munitionettes' and men in similar forms of work.

Women's Engineering Society records suggest that most of the women were young and single, and many had travelled from England to take up the work, though some came from the surrounding district.[15] No personal accounts have so far emerged, and the best indication of how the women felt about their work is to be found in the four editions of their works magazine, *The Limit*, which were preserved in a local art gallery. The choice of the name is revealing and gestures toward some of the women's hopes and investments in the work. In the first instance, 'limit' is an engineering term for 'a boundary restricting measurement' - that is, the limit of accuracy. But the term suggested many things besides. Women's capacity for accurate measurement had been ridiculed in the press in the first days of women's move into munitions work, and their choice of that name suggests they embraced the controversy with a sense of irony. They were defying restrictions, pushing the limitations of femininity, and making a humorous reference to their audacity: 'Women engineers - that's the limit!'[16]

Beyond that, the name hinted at the way women's engineering work was subjected to unprecedented scrutiny in those war years. Journalists and popular writers with little industrial knowledge appeared hugely impressed by their visits to munitions factories, and produced a great deal of extravagant prose about frail women bravely 'taming mechanical monsters'.[17] In addition, employers instigated systematic programmes of scientific scrutiny of workers, as a new calculus of productivity was devised in those war years. Women were photographed at work, the images reproduced in newspapers, books and in large travelling exhibitions, where the products of their work (and sometimes skilled women workers themselves) were placed on display. Women's physiology, stamina and outputs were measured, recorded and analysed at length, as the War marked a leap in the rationalisation of the capacities of working bodies.[18]

The Limit provided both workers and management at the Galloway Engineering Company with a forum for exploring some of those emerging discourses of women's work. Several articles reveal the women's sense of being 'on trial', of being observed by a sceptical, sometimes hostile, audience. Some declared that in seeking to expand the possibilities of their own lives they were making a wider political point at the same time. In their pleasure at new knowledges, new bodily comportments and competencies, they claimed to be creating a fresh female identity, not just for themselves, but for a broader, national audience. On the first anniversary of the factory, a woman who signed herself as 'Pioneer' wrote with the appropriate gestures of self-effacement:

It is our Works Birthday, and we must stop often to revive memories of a year ago, to compare 'now' and 'then' and to pat each other's back in

congratulatory fashion. Because we, the first girl engineer apprentices, have finished our first twelve months in our effort to prove that 'girls can be boys', as far as mechanics are concerned. We all admit to the feebleness of our results to date, but the spirit is even keener than it was twelve months ago, and we are going to win.[19]

Flight was the glamour technology of the time, and the women's work in aero-engine construction was at the high end of skilled manufacturing. Lightweight, high-revving engine components in aluminium and new alloy steels were being machined to fine limits, with a degree of standardisation not achieved in pre-war British manufacturing.[20] The women at Tongland were justifiably proud, then, of the part they were playing in a strategic wartime enterprise. They were involved in establishing an advanced new industry, which they believed was appropriately staffed by an advanced new workforce. They hoped that their engagement with new work in a model factory might provide a guarantee of post-war continuity, but their presence had a broader context and a contentious history from which they could not easily extract themselves.

One of the major roles of the Ministry of Munitions was to broker a truce between male craft unions and management over the question of workshop control. It forced an agreement that skilled engineers' jobs be broken down into skilled and unskilled components, so an inexperienced operator could quickly learn to perform a single process on a machine that had been set up for her by a skilled operator, who then controlled numerous machines.[21] Dilution, as it was called, benefited those men who remained in the industry, since it upgraded their skills and turned them into supervisors. But they knew it signalled post-war changes to work practices, by permanently reducing the number of men who would be classified as skilled, and by increasing work intensification. In this wartime solution, both sides – labour and management – firmly believed that the other had gained the best of the bargain.

Scottish manufacturers were known for their trenchant anti-unionism and confrontational approach to industrial relations.[22] Right up to the beginning of the War, known unionists had been excluded from many engineering yards, including William Beardmore's Parkhead works. Furthermore, prominent industrialists in the Clyde region deliberately precipitated industrial confrontation in 1915 and early 1916, to the consternation of Ministry of Munitions officials who were not then in a position to impose the new Munitions Act in the face of mass action on the part of workers. Early in 1915, for example, William Weir introduced a number of skilled men from the USA into his Cathcart works on higher rates of pay. And in August of that year the machine-tool manufacturer, Lang's, at Johnstone, began to introduce female labour as part of an open campaign against craft workers and their union. Both were emotive and high profile

test cases, closely watched by all players, including Arrol-Johnston's T.C. Pullinger. When the Ministry of Munitions pressed Lang's to scale down its dilution programme, local industrialists were angered, having expected repression of workplace militancy, rather than moves to draw unions into the planning of wartime production.[23]

By the middle of 1916 most Clydeside industrialists were forced, or perhaps educated, into more reasoned compromise by the pressure of wartime contracts and patriotic sentiments. T.C. Pullinger, however, committed his company to another path. Even though it was set up with some of the latest machine tools then available in Britain, and in spite of its physical echoing of Fordist principles, the Galloway Engineering Company represented a move against the pressure for industrial change epitomised by the assembly line. Rather than being used to break down the broad base of traditional craft skill, the women were being inducted into it. They were learning to read drawings, use micrometers, and to set up and maintain their own machines. Before too long, the initial core of 'Pioneers', as the original ten called themselves, were being taught toolmaking and the manufacture of jigs - the templates needed to adapt general machine tools to specialised repetition work.

Pullinger had been an important figure in the introduction of American production methods into the British automobile industry. Before taking over the management of Arrol-Johnston, he had overseen the introduction of a new production system for another automobile manufacturer, Humber, at their Beeston plant. It resulted in an acrimonious dispute during which Humber declared itself a non-union shop and moved to a new plant at Coventry. For Pullinger the confrontation with engineering unions, particularly the Amalgamated Society of Engineers (ASE), was deeply personal:

I have quite made up my mind after the way the ASE has treated me, never to have another one of their men working for me if I can possibly help it, and I shall use every means in my power to keep them out ... I hope shortly to be in a position to know all the ASE men in this district and perhaps I shall be able to keep our shop free from their contamination.[24]

The Arrol-Johnston Company was also in dispute with the ASE in those same years and when Pullinger took over the management part of his agenda was to similarly defeat the unions. The move out of the militant Clyde valley into an area with no strong engineering tradition constituted an attempt to exclude unions from the factory. He refused to rehire striking ASE members from the Paisley plant at Heathhall, and when the ASE attempted to organise in the new works, he called a special meeting of the workforce and forced a show-of-hands ballot to keep the union out. During the War he was obliged to accept union organisation, but as soon as the

War was over, again set about ejecting ASE members from his works.[25] Pullinger's strong anti-union sentiment was more complex than first appears, however, for he did not simply link a non-unionised workforce with the imposition of a Fordist system. Pullinger certainly espoused increased efficiency and greater productivity, and he did acknowledge the links between automatic machines and the increased use of unskilled labour. But, in those years at least, he rejected the direct imposition of the American system into the British context, arguing that it resulted in poor quality, and that there were alternative means to improving labour productivity. As a designer and mechanical engineer, before he was a businessman, Pullinger's interests lay as much in technical perfection and quality of output as in mass production. As a deeply religious man, conscious of the mechanised horror of the battlefields, he sought an alternative to an assembly line that turned skilled workers into the 'servants of machines'. In their studies of the British motor industry, both Saul and Lewchuk have suggested that such an ambivalent and contingent approach to Fordism was characteristic of British employers at the time and for much of the inter-war period as well.[26]

Just at the time the Tongland works was coming into production, Pullinger expressed his views in his President's address to the Institute of Automobile Engineers:

Our operatives must have instilled into them the idea that their work is an art, and that it is a high privilege to be able to operate machine tools, and produce beautifully finished interchangeable parts ... A great deal more interest and efficiency can be obtained from employees if those in charge treat them in a kindly and sympathetic manner, taking interest in their work, pointing out to them the directions in which they can improve, and giving them a word of encouragement.[27]

That vision of industrial relations, which considered manual labour a creative activity, suggested nostalgia for a time of daily face-to-face relations within autonomous factory communities. It called upon an imagined past of commonality of interest between the labour force and management, and worker acceptance of managerial authority.[28] Pullinger's experiment with an all-female workshop was one expression of that belief, but it was a new, modernised version of that agreeable workplace – forward-looking and backward-looking at the same time. From the company's point of view, it had several distinct advantages. It was supported by government policy, it sidestepped the unions, and it tapped into the ultimate greenfields labour force. Even better, it was a workforce who, in the form of women like his daughter Dorothee Pullinger and other founding members of the Women's Engineering Society such as Dorothy Rowbotham, had for some time been pressing for admission to that domain of work. Pullinger confessed he had been a reluctant convert to the idea of women engineers, and was only persuaded by his daughter's persistence. He told a reporter in 1917, 'I just

flatly refused. I told her no woman could be an engineer, and that she had better learn shorthand. Well, she did that to please me - and - well - I had to let her go into the works to please her'.[29]

Even though there were strong feminist overtones to the enterprise, it was rarely spelled out. The women who worked at Tongland were, for the most part, some years younger than pre-war suffrage activists and they were careful not to identify their actions in terms of a war between men and women, as the suffrage movement had been characterised. The very real war across the Channel overturned any such possibility. Knowing that their work was releasing working men to fight in the trenches and providing them with *materiel* made it quite unthinkable to sustain notions of a 'sex war'. Besides, the women were daily dependent on the goodwill of male instructors. Accordingly, like others of their generation, they were inclined to disavow, or distance themselves from, overtly feminist affiliations. They tended to conceive of their future in terms of opportunities to achieve economic and professional equality, which women could quietly enact, rather than publicly demand.[30]

There were, of course, symbolic and personal links at the factory with earlier feminist campaigns, particularly via older women, like factory supervisor Dorothy Rowbotham. They were given little public emphasis, but the signs were clear to those sensitive to them. Suffrage colours, for example, were used to represent the company. During the war years, the cloth badge of the Galloway Engineering Company, which the women wore on their overalls, was worked in the colours of the National Union of Women's Suffrage Societies - red, white and green. After the War, enamelled plaques distributed to agents for Galloway cars produced at the factory were in green and white on a purple background, the colours of the Women's Social and Political Union. And on occasion the press referred to the Tongland plant as 'The Feminist Munition Factory'.[31]

T.C. Pullinger expressed great satisfaction with his 'experiment', describing its success in terms that were to become increasingly familiar in characterising women's industrial skill. As Downs has noted, such employer assessments marked a critical step towards enshrining gender difference within an increasingly fragmented mass production process:

'They are born mechanics, who work with their brains as well as their hands,' said the originator of the scheme, 'and they learn with astonishing rapidity, which is why we are able to make the period of training three years instead of five or seven customary for a boy. And in the finest work ... I have found that a woman's touch is more trustworthy than a man's. She seems to have a special instinct. I am convinced that there is an immense future in engineering for women who really love their work and are keen on it.'[32]

For a time, some of the women at Tongland did seem to experience their work as an art and high privilege, as T.C. Pullinger had hoped. Their pleasure in the work, its new vocabulary, and the physical skills they acquired, are reflected in *The Limit* - so much so that even during the industrial turmoil of the immediate post-war period, and even with the hostility expressed toward them by unions and unemployed veterans, many stayed with the enterprise. They worked short-time building tractor and truck motors for outside contractors while they waited for the Tongland works to reorganise and develop its own commercial product. But it became increasingly obvious that even if the company survived the post-war transition, it would not be in the form of an idealised 'fine university for women engineers' as they had earlier been promised. For in spite of some successes, the Galloway Engineering Company did not take off in the way it was envisaged.

In the first instance, the wartime work was not as lucrative as was hoped. There were design and production faults with some of the aero-engines manufactured by Arrol-Johnston, and other manufacturers were able to snare the best of the contracts.[33] Secondly, a middle-class female workforce did not come forward in the numbers the company projected. Geographical isolation, poor wages, and lack of housing played a part, as did the need to keep machines working to fulfil contracts under threat of having them withdrawn by the Ministry of Munitions.

As the realities of production schedules began to dominate the life of the factory, educational objectives came to take second place. The company started recruiting process workers, women of the 'industrial type', as one report put it, rather than trainee engineers. They were mainly local women, but some came from Ireland to take up the work.[34] Lectures in engineering became voluntary, were increasingly held outside of working hours, and required the payment of a fee. By the end of the war, Dorothy Rowbotham, who had been the Female Supervisor from the outset, estimated that of the two hundred workers, only about fifty followed the training programme. She confided with palpable disappointment in an interview just after the Armistice with the president of the National Council for Women, 'the force of war conditions has gradually turned the college into a works'. On the future of the business she was pessimistic, stating, 'It remains to be seen whether the educated woman can stand the monotony over the necessary number of years'.[35]

Her assessment revealed the profound class contradictions of the enterprise, which became ever more apparent as the end of the War removed justifications for the higher value of the work. Far from being glamorous engineering, as promised in brochures and magazine articles, most of the work was actually repetitive machining, and no amount of bodily pleasure in the work, pride in new skills, or pioneering zeal could hide for

long the reality of its non-professional status. By 1920, the statements of optimism and determination found in earlier editions of *The Limit* had turned to savage humour at the expense of working-class labour. In ironic reference to some of the first buoyant pronouncements on the future of women in engineering, a woman who called herself 'S. Suds' wrote:

There is a certain factory in Scotland (oh, famous phrase) where girls are generously allowed to train in all branches of Labouring and Scavenging. They are allowed, quite openly, to clean their machines, remove the chips, fill their suds tanks, and to fetch and carry the work to and from their machines ...

Pressure has been brought to bear on the local branch of the Amalgamated Society of Scavengers, and they have at last consented to admit women members. But a society for women exclusively is being formed, its object being to further the aims of Women Scavengers, to enable them to get more technical training, and for its motto it has adopted one of Shakespeare's gems - 'Men must work and women must sweep'.

Very little more need be said to assure the women of today of the desirability of entering such an attractive profession, and to urge the educated and refined gentlewoman to enter the course of training at once ... Knowledge of Hebrew and Botany will be found invaluable.[36]

Many contemporary commentators noted just how quickly the discourse celebrating female technical competence turned against women of all classes when the War was over.[37] As this bitter assessment reveals, it was not only those hostile to women's industrial work but some of the women themselves who came to revise the meaning of their engagements. And the pressures to do so were enormous. The post-war climate of wage cuts, prolonged strikes, ex-servicemen's militancy, inflation, housing shortages, and the effects of the Restoration of Pre-War Practices Act have been well documented at a national level, but they were felt in the most personal, intimate terms in the small town of Kirkcudbright. Local servicemen came home to find a brand new factory, staffed by educated 'girl engineers', but little work available to them. Their dissatisfaction surfaced during the planning of the Kirkcudbright Peace Celebration parade in mid-1919. Only a month earlier, the local newspaper had published a feature article on the success of the Tongland factory, which predicted an important role for those women in post-war reconstruction. But the local chapter of the Comrades of the Great War, with a membership of one hundred and twenty and led by the local priest, were less than ready to celebrate - either the peace, or the part those women aspired to play in it.[38]

The Comrades greatly alarmed the township by threatening not to turn out for the Peace parade. Their dissatisfaction was directed at the 'Tongland girls' and 'the continued employment of women in industries formerly open

to men only'. They were eventually persuaded to march at the head of the parade, with the Tongland floats placed at the rear, but a week later presented the town council with a petition demanding that work be found for them. The focus of their discontent was the Tongland factory, 'a place run for women with a sprinkling of men', and 'the Tongland girls, who were nearly all strangers'. The town council responded, using the same defence that the company itself employed:

[The] works had been specially built for women and it had been distinctly stated that they were for women and women only. Besides the girls were not displacing any of them, none of them having been employed there before the war had started.[39]

The argument did not placate the men, and discussions became even more acrimonious, hinting at the bitter divisions in the town. Councillors suggested that many of the men were not suitable to employers, declaring that some did not want to work, and were even 'refusing work point blank'. One created uproar by claiming that far from being heroes, the men 'went to war at the point of a bayonet', and so did not deserve special consideration.[40] The debate continued in the letters column for a time, but eventually faded from view after a committee was appointed to recommend the employment of ex-servicemen to employers, 'without going to extremes'. But the pressure remained for the women at the Tongland factory. 'From the Ranks', writing in *The Limit*, assumed that the solution lay in their own hands, and that they needed to apply themselves even more to the task they had taken on:

Are we to have a future in engineering? How are we to overcome the almost antagonistic feeling of the men's Unions towards us? Are we mentally and physically capable? Are we trying to prove our capabilities? ... None of us wants to keep a man out of work, but we too must live ... We at Tongland must and will prove to all that there must be a future for us - that we are capable.[41]

Throughout the industrial turbulence of 1919 and 1920, the Women's Engineering Society (WES), which had been formed to work towards women's continued presence in engineering, tried to straddle the class difference between skilled craft work and professional engineering. It attempted to negotiate with the Amalgamated Society of Engineers on the admission of women, but the union refused to meet with them. By 1922 the WES had given up on a cross-class agenda, concentrating exclusively on women's admission to professional engineering societies, where they were having a little more success.[42] Up until then, however, the WES fed the women's press optimistic stories about the Galloway Engineering Company, and referred unemployed women with engineering ambitions to the Tongland works.[43] Privately, they discussed the difficulties both the

women and the business were facing, sought advice from sympathetic industrialists on what kind of work the factory might take on, and pursued various schemes to keep the venture viable.

To provide moral support for women who remained at Tongland, the WES set up a Kirkcudbright branch in early 1919, and signed up ninety-six as associate members. For a time it was an active branch, with social events and professional activities. They sent delegates to WES meetings in London, and scheduled lectures on topics such as 'The Tractor Engine and its Testing', 'The Manufacture of the Magneto' and 'The Position of Women - Past, Present and Future'. By 1920, however, only forty-one Tongland women remained paid-up members, and by 1921 the number was down to twenty-four, with most indicating the uncertainty of their future by paying quarterly subscriptions.[44]

Arrol-Johnston was having its own post-war problems as they rushed to be the first to place a new car on the market. In 1919, their ill-fated Victory model, produced at the Heathhall plant, was capturing all of T.C. Pullinger's attention, leaving little room for the Tongland enterprise. The Victory was a spectacular and embarrassing failure, and Arrol-Johnston quietly dumped it, returning to manufacture a version of their stolid and unexciting pre-war saloon.[45] Once Arrol-Johnston was back into car production, however, T.C. Pullinger opted to use the Tongland plant to manufacture a much more humble version of a post-war car - the Galloway. Unlike the Victory, it was a small, moderately priced car, based on a design largely lifted from the popular Fiat 501, and aimed to meet the increasing demand for light cars. The project brought a rush of optimism to the Tongland works and to the WES. Three two-seater Galloways were hastily built at Tongland for the all-important London motor show at Olympia in November 1920, and early press reports on the car's launch were encouraging.[46] Priced at £550, it was economical, easy to maintain, well finished, and was a car that had a solid 'hand-built' feel, they said, at a time when standardisation and mass production were increasingly the order of the day. One automobile journal made explicit the emerging association between female modernity and new technologies by characterising the Galloway as 'a car made by ladies for others of their sex'.[47]

The factory organisation, perhaps reflecting the enterprise's parlous financial state, was called 'an experiment in social economy', organised as a 'co-partner production', where:

The capital of the Galloway Engineering Company is held entirely by the directors, the operatives and staff of the producing factory in Kirkcudbright, and the retailers who will sell the car. There will be no public shareholders, so that every person concerned with its production and sale will have every incentive to make the project a success. The scheme appears to be calculated to minimize the risks of factory

interruptions from strikes, and to secure a maximum economy in cost of production. Its progress will be keenly watched by other concerns in the motor-car industry anxious to cut out all possible causes of disturbance in the flow of production.[48]

But the Galloway car was not to be the solution for the women at Tongland. A small number, perhaps no more than one or two hundred, were produced under the cooperative system at the Tongland works until March 1922, when the factory was closed, and production transferred to the main Heathhall works. Like Arrol-Johnston's other cars, the marque turned little profit and staggered on until 1929, when production ceased. In all, probably less than four thousand Galloways were produced and very few remain today. Arrol-Johnston's and the Galloway's problems were by no means unique, however, as the once healthy Scottish motor industry, a craft-based industry, was well and truly finished by the end of the 1920s. Pullinger's choice of industrial organisation had proven not to be the way of the future, and his cars could not compete with the lower prices and more exciting designs of English and American models built on assembly-line principles.[49] Well before that, however, the delays and difficulties in fixing a future for the Galloway Engineering Company meant that women had steadily left Tongland. Even Dorothy Rowbotham showed the strain, and in July of 1920 announced that she would leave to start up her own engineering business. She stayed on, however, when plans to produce the Galloway car were revealed.

As with much research into women's histories, there remain many gaps in the material on the Tongland works. Questions cry out to be answered, and perhaps must remain that way. Dominating the pages of *The Limit*, as they did the perception of the Kirkcudbright Comrades of the Great War, were the middle-class, southern women – especially 'The Pioneers'. Broad hints of their assumption of class and imperial superiority are found in the ways they defined themselves against the 'quaint' Scots townfolk, and the Irish 'Colleens' and 'Biddies' who came to work in the factory in later years. Occasionally there were muted protests from a group who called themselves 'The Pygmies', but the voices of other workers and knowledge of the subsequent course of their lives may never emerge. What is clear is that it was not the middle-class women who remained within the factory system in the post-war years. It was working-class women who would continue to work in it, and even came to dominate the new manufacturing sectors. They provided the basis for a new division of labour in which the fragmentation of production processes and the ownership of differential skills were directly mapped onto sexed bodies. In that new order, working-class women and men were defined in terms of 'natural' differences, where women excelled in (low-paid) repetitive tasks, and the earlier 'aristocrats of labour' – skilled craftsmen – did indeed find themselves to be the losers of modernity.

As for the ‘girl engineers’ – just as the story of middle-class women’s engineering ambitions did not begin with the War, neither did it end with it, and the women who worked at the Galloway Engineering company continued to negotiate their way through the opportunities and limitations they faced. By June 1921 Dorothy Rowbotham had made the move from the Tongland works, and was assistant works manager to the Swainson Pump Company in Newcastle. She later studied laundry work, and was employed by various engineering firms for many years, most notably with Margaret Partridge’s electrical contracting firm, which specialised in domestic electricity supply. Dorothy Rowbotham retained her links to the WES all her life. She managed a guesthouse in Eastbourne in her last years, and died in 1978 at the age of ninety-five.[50] Other Tongland women retained ties with the engineering profession, and names from the Kirkcudbright branch of the WES appeared in *The Woman Engineer* as active branch members throughout the United Kingdom. Miss Bridge became the organiser for a new branch of the WES in Bedford; Miss E.F. Bull studied for a Bachelor of Applied Science (Metallurgy) at Glasgow Technical College; Miss Lees followed Dorothy Rowbotham to work at the Saver Clutch Co. and then at Margaret Partridge and Co., Electrical Engineers; and in 1921 Dora Turner and Annette Ashberry were studying for Bachelor of Science (Engineering) degrees at Loughborough Technical College. When six of the most skilled and enthusiastic of the Tongland women left in October 1921 to set up their own small cooperative engineering works in the Midlands, the WES threw their energy behind them. It promoted the company, Atalanta Ltd, in *The Woman Engineer* and in other feminist papers, placed prominent members of the WES on the board of directors, and announced women’s design competitions for inventions that Atalanta would manufacture.[51]

One woman who did continue her involvement with Galloway Motors was Dorothée Pullinger. She returned to Arrol-Johnston after her wartime position as Female Supervisor at the giant Vickers munitions works at Barrow-in-Furness ended, and when the Galloway Engineering Company was transformed into Galloway Motors was appointed to the board of directors. In 1919 she set about learning all aspects of the business, beginning in the foundry of the Tongland factory, where she learnt core-making, moulding and casting. It was a combative, anti-union move, since there were national moulders’ strikes at the time, and one of the conditions for their return to work was that women be ‘let go’.[52] After the Tongland works closed and production was transferred to Heathhall, Dorothée Pullinger remained with the company another four years, though as a sales representative for southern England, not an engineer. She was a successful competitive driver of Galloway cars, and remained an active councillor of the WES, and member until she died in 1986 at the age of ninety-two.[53]

Dorothee Pullinger perhaps best exemplifies the creative approach adopted by such women in their search for meaningful work during those post-war years. Late in her life, in response to an inquiry from a researcher, she wrote, 'I am a member of the Institute of Professional Engineers and also have worked most of the time in Engineering, till I was told I was doing a man out of a job, so I went washing'.^[54] That tongue-in-cheek reply hints at a joke shared between women engineers of her generation. It was a joke about both the class and the sexual division of labour. Immediately after the War, the press elevated laundry work and domestic service into markers of the normalisation of class and gender relations. They depicted the unwillingness of women munitions workers to return to those forms of work as symptomatic of the ways war had upset natural class and sex hierarchies. Laundry work, low paid and arduous as it is, had long been a safety net for women in times of adversity. It was a 'woman's skill' which could be adapted to domestic responsibilities and a shortage of capital more readily than most occupations. Dorothee Pullinger's own grandmother had opened a hand laundry service in Great Portland Street to support herself and her four children after the death of her husband. It was one area of industrialised work where women predominated as workers, and were occasionally placed as owners and managers. In addition, the laundry industry had been the focus of considerable feminist political activity, as the beginnings of its mechanisation at the end of the nineteenth century had coincided with the rise of feminist activism.^[55]

So Dorothee Pullinger did not just 'take in washing', as her joke suggests. As a middle-class woman with technical expertise and access to capital, she was able to approach washing as an engineering enterprise. With her husband, who had been a purser with the P. and O. shipping line, she invested in the latest steam laundry equipment imported from the USA, and set up the White Service Steam Laundry in Croydon. It caught a boom in the commercial laundry industry, and at its height had numerous collection points throughout London. For her, it was an engineering enterprise in disguise as 'woman's work'. Nobody could object to a woman who went washing. As a trespasser onto the male domain of professional engineering, Dorothy Pullinger, and other women like her, were forced to create quiet, personal solutions to a social impasse. Her history forms a part of the larger story whereby women of each generation have been obliged to reinvent, as if for the first time, new relations of female technical competence.

Acknowledgements

This research has been supported by an Australian Bicentennial Fellowship offered by the Robert Menzies Centre for Australian Studies, Institute of

Commonwealth Studies, the University of London; a Smithsonian Institution Fellowship at the National Museum of American History; and an Australian Academy of the Humanities Travelling Fellowship. I wish to thank Dorothée Pullinger's family, Yvette le Couvey and Lewis Martin of Guernsey, for generously allowing me to read private family papers; Neale Lawson of Dumfries for sharing his extensive research collection with me; and both for their hospitality. I acknowledge the help of Jim Allen, National Trust for Scotland Librarian at Hornel House, Kirkcudbright who discovered copies of *The Limit* for me; David Devereux, Curator of Stewartry Museum, Kirkcudbright who helped to locate private photographs and council records; Ruth Airley, Reference Librarian at the Ewart Library, Dumfries; and Margaret Parker, who introduced me to the nuances of Kirkcudbright history. In addition, staff at the Dumfries and Galloway Museum; British Library; Fawcett Library; Imperial War Museum; Institution of Electrical Engineers Archives Department; Girton College Archives Department; and Smithsonian Institution Libraries have provided invaluable help. I thank Viktoria Lopatkiewicz, Cheryl Ganz, and Sarah Grimes for their helpful comments on this article.

Notes

- [1] Galloway Engineering Co. (n.d.) *A New Profession for Educated Women: Engineering: expert opinions of a notable achievement*, Ewart Library, Dumfries. Also *Kirkcudbright Advertiser*, 29 December 1916, 9 November 1917, 13 June 1919, and 16 December 1921; *Dumfries and Galloway Standard*, 28 September 1918.
- [2] Galloway Engineering Co. (n.d.) *The Works and Its Environment: engineering for educated ladies*. Imperial War Museum (IWM), MUN, 17.3/2. See also Ray Strachey, 'Women and Machines' in *Common Cause*, 17 March 1916.
- [3] See numerous articles in *Journal of the Scottish Labour History Society*; Iain McLean (1983) *The Legend of Red Clydeside* (Edinburgh: John Donald); Jonathon Zeitlin (1983) The Labour Strategies of British Engineering Employers, in Howard F. Gospel & Craig R. Littler (Eds) *Managerial Strategies and Industrial Relations: an historical and comparative study* (London: Heinemann); Joseph Melling (1990) Whatever Happened to Red Clydeside?: industrial conflict and the politics of skill in the First World War, *International Review of Social History*, XXXV, pp. 3-70; John Foster (1990) Strike Action and Working Class Politics in the Clydeside, *International Review of Social History*, 35, pp. 33-70; William Kenefick & Arthur McIvor (Eds) (1996) *The Roots of Red Clydeside 1910-1914? Labour Unrest and Industrial Relations in Scotland* (Edinburgh: John Donald); W.W. Knox (1999) *Industrial Nation: work, culture and society in Scotland 1800-present* (Edinburgh: Edinburgh University Press).

- [4] For studies of women's wartime work, see Deborah Thom (1989) *Nice Girls and Rude Girls: women workers in World War I* (London: I.B. Tauris); Angela Woollacott (1994) *On Her Their Lives Depend: munitions workers in the Great War* (Berkeley: University of California Press); Gail Braybon (1990) *Women Workers in the First World War: the British experience* (London: Routledge). For a study that places women's wartime work within larger changes in the division of labour, see Laura Lee Downs (1995) *Manufacturing Inequality: gender division in the French and British metalworking industries, 1914-1939* (Ithaca: Cornell University Press); also Miriam Glucksmann (1990) *Women Assemble: women workers and the new industries in inter-war Britain* (New York: Routledge).
- [5] Billie Melman (1998), in *Borderlines: genders and identities in war and peace 1870-1930* (New York: Routledge), has nicely identified the major themes in feminist studies of women and war, and the historical shifts between them. This study is located within her call to expand the 'cartography' of gender identity in those years. I seek to emphasise not just the ways that ideologies of gender were being remade in those years, but the materiality of the ways male and female bodies were authorised to perform particular tasks; see Moira Gatens (1999) *Imaginary Bodies: power, ethics and corporeality* (London: Routledge), ch. 5. Feminist studies of technology offer some theoretical tools through which to bring a broad interdisciplinary focus to streams of scholarship that have so far remained separate. See Nina E. Lerman, Arwen Palmer Mohun & Ruth Oldenziel (1997) *The Shoulders We Stand on and the View from Here: historiography and directions for research, Technology and Culture*, 38, pp. 9-30.
- [6] S.B. Saul (1962) *The Motor Industry in Britain to 1914, Business History*, 5(1), December, p. 28; *Auto*, 5 March 1910; *Dumfries Courier*, 21 February 1986; for notes on Dorothee Pullinger (1894-1986), see *Motor*, 9 June 1923; *Beardmore News*, June 1923; and entry in *New Oxford Dictionary of Biography* (forthcoming September 2004). For an account of the Arrol-Johnston works, see *The Arrol-Johnston Factory, Dumfries, The Motor Trader*, 6 August 1913, pp. 370-379; *Arrol-Johnston Motor Works at Dumfries, Dumfries and Galloway Standard*, 30 July 1913. For a former apprentice's assessment, see *Dumfries and Galloway Standard*, 10 September 1977, p. 14.
- [7] *Gentlewomen as Engineers: a new profession for women, Gentlewoman*, 17 November 1917, p. 903. The successful woman referred to was his daughter Dorothee Pullinger, who by 1916 had become supervisor to the female workforce at Vickers Engineering at Barrow-in-Furness.
- [8] Margaret Dorothea Rowbotham (1883-1978), *Girton College Register*, vol. 1, 1869-1944, p. 145; and Miss A. Howard Pinder, who moved to Norway soon after the War.
- [9] 'Gentlewomen as Engineers', p. 902; see also *Lady's Pictorial*, 10 November 1917; *The Lady*, 8 November 1917; *Engineering*, 9 November 1917. In fact, the 'Pioneers' had begun work before the building was completed, in the

bitter cold of the famous 'freezing winter' of the War - the coldest winter for some forty years.

- [10] Robert Angus Buchanan (1989) *The Engineers: a history of the engineering profession in Britain, 1750-1914*, p. 11 (London: Jessica Kingsley); Michael Longridge (1918) President's Address, *Proceedings Institute of Mechanical Engineers*, May 1918, pp. 310ff.
- [11] For an excellent discussion of these issues in the USA, see Ruth Oldenziel (1999) *Making Technology Masculine: men, women and modern machines in America, 1870-1945* (Amsterdam: Amsterdam University Press).
- [12] Charles Pullinger had visited Detroit a number of times and had been introduced to the Kahn construction systems by Henry Ford. See 'Arrol-Johnston Motor Works at Dumfries'; and The Arrol-Johnston Works: mass production in the motor industry, *Dumfries and Galloway Standard*, 1 September 1920; Terry Smith (1993) *Making the Modern: industry, art and design in America*, pp. 57-92 (Chicago: University of Chicago Press); Paul Collins & Michael Stratton (1993) *British Car Factories from 1896: a complete historical, geographical, architectural and technological survey*, pp. 248-251 (Godmanstone, Dorset: Voloce Publishing); Lindy Biggs (1996) *The Rational Factory: architecture, technology, and work in America's age of mass production* (Baltimore: Johns Hopkins).
- [13] The standard training programmes for munitions workers run by the Ministry of Munitions and technical colleges were usually between six and ten weeks long, and paid between 15s and 25s per week. Some technical colleges were converted to 'Instructional Factories for Women', and years later were still advertising engineering courses for ladies, *The Woman Engineer*, December 1921; Woollacott, *On Her Their Lives Depend*, p. 93; Monica Cozens (1916) *Lloyd George's Munitions Girls* (London: Huchinson); Dorothy T. Poole's personal account written in 1919 is reprinted in Arthur Marwick (1977) *Women at War: 1914-1918*, pp. 60-67 (London: Fontana); Technical Training for Women, *Common Cause*, 11 February 1916, p. 582, and 17 March 1917, pp. 650-652.
- [14] Before the War, women who worked in factories earned on average between 10s and 14s per week. By the end of the War some women doing skilled men's work in engineering were earning as much as 60s before overtime and bonuses, though inflation halved its value. Woollacott, *On Her Their Lives Depend*, p. 117. At Tongland there was a forty-four hour working week with a starting wage of 20s per week, which was 5s below the Ministry of Munitions minimum wage at the time. Six monthly increments of 5s were tied to passing through each stage of the curriculum. The company claimed that it was possible for women to earn as much as £3 per week once they were fully trained, but probably few ever approached that figure. Apart from examinations, women would also be graded for attendance, punctuality, conduct, cleanliness of machines and benches, and accuracy of work. Toward the end of 1919 piece-work rates were introduced. Costs were about £1 per week for a hostel, and an additional 9d per day for a canteen lunch.

- [15] Records of the WES are held in the Institution of Electrical Engineers Archives Department, London.
- [16] On the question of whether women were able to grasp the idea of accuracy of measurement, see L.K. Yates (1918) *The Women's Part: a record of munitions work*, p. 15 (New York: George H. Doran). Four editions of *The Limit* came out in 1919, and are held at Hornel House, Kirkcudbright. Women workers at the White and Poppe works and also at the Loughborough Technical College used the same name for their journals.
- [17] See, for example, Arthur Conan Doyle (1916) Eastriggs and Gretna: the miracle towns, *Annandale Observer*, 1 December; Hall Caine (1917) *Our Girls: their work for the War* (London: Hutchinson); Helen Fraser (1918) *Women and War Work* (New York: G. Arnold Shaw); Claire A. Cullerton (1988) Gender-charged Munitions: the language of World War I munitions reports, *Women's Studies International Forum*, 11(2), pp. 109-116.
- [18] Anson Rabinbach (1990) *The Human Motor: energy, fatigue and the origins of modernity*, pp. 259ff. (New York: Basic Books); Downs, *Manufacturing Inequality*, pp. 46ff.; Ben H. Morgan (1918) The Efficient Utilisation of Labour in Engineering Factories: with special reference to women's work, *Proceedings of the Institute of Mechanical Engineers*, March, pp. 239ff.: *Engineering*, 1 June 1917, p. 526, 13 July 1917, pp. 43-44, 10 May 1918, pp. 531-534; Scientific Management and the Woman Worker, *Common Cause*, 28 March 1919, p. 617. The interest extended to the capacities of war-damaged male bodies as well.
- [19] *The Spanner: A Monthly Journal for the Control of the 'Nuts'*, 1(2), (February 1918), pp. 24-26. Privately held. This was the combined Heathhall and Tongland works journal before *The Limit* was published.
- [20] *Engineering*, 5 October 1917, p. 364, 7 December 1917, p. 604. One reporter wrote optimistically of the Tongland works, 'Today there are sixty gentlewomen there, engaged in work of the utmost national importance, producing components for high powered aeroplane engines, now the most urgent of all needs for war purposes, with magnificent plant, the "last word" in machine tools, capable of producing motor work of all descriptions, for which there will necessarily be an overwhelming demand when the long war is over at last. Therefore so far as these works are concerned, there is no fear of a "peace slump"'. A New Profession for Women, *The Lady*, 8 November 1917, p. 40; Yates, *The Woman's Part*, p. 28; J.D. Scott (1962) *Vickers: a history*, pp. 116-125 (London: Weidenfeld & Nicholson); Robert Wohl (1994) *A Passion for Wings: aviation and the western imagination* (New Haven: Yale University Press).
- [21] The Employment of Women in Engineering Workshops, *The Engineer*, 20 August 1915, pp. 181-182; The Employment of Women as Machinists, *The Engineer*, 3 September 1915, pp. 218-228; Women in the Workshops, *The Engineer*, 11 February 1916, pp. 123-133; Women in Industry, *The Engineer*, 1 June 1917, p. 502; Downs, *Manufacturing Inequality*, pp. 79ff.

- [22] Arthur McIvor (1996) Were the Clydeside Employers More Autocratic? Labour Management and the 'Labour Unrest': 1910-1914, in Kenefick & McIvor, *Roots of Red Clydeside*, pp. 41-65.
- [23] McLean, *Legend of Red Clydeside*, pp. 28-40; Sir William Beardmore on output, *Engineering Review*, 5 May 1916, p. 1.
- [24] Engineering Employee's Federation File E(1)14. Quoted in Steven Tolliday (1986) Management and Labour in Britain, 1896-1939, in Steven Tolliday & Jonathan Zeitlin (Eds) *The Automobile Industry and its Workers: between Fordism and flexibility*, p. 42 (Cambridge: Polity Press).
- [25] *Dumfries and Galloway Standard*, 30 July 1913; 29 October 1913; 6 December 1913; 13 November 1920; 10 May 1922; *Dumfries Courier*, 21 February 1986, p. 8.
- [26] Saul, 'Motor Industry in Britain'; Wayne Lewchuk (1987) *American Technology and the British Motor Industry* (Cambridge: Cambridge University Press); Wayne A. Lewchuk (1995) Men and Mass Production: the role of gender in managerial strategies in the British and American automobile industries, in Haruhito Shiomi & Kazuo Wada (Eds) *Fordism Transformed: the development of production methods in the automobile industry*, pp. 219-242 (Oxford: Oxford University Press).
- [27] Opening Address, *Proceedings of the Institute of Automobile Engineers*, 12, 1917/1918, p. 432. Quoted in Lewchuck (1987) *American Technology and the British Vehicle Industry*, p. 159 (Cambridge: Cambridge University Press). There is evidence that as Arrol-Johnston began to fail in the early 1920s, Pullinger changed his views.
- [28] Of his move to Heathhall three years earlier, it was reported, 'It would seem that he has ambitions to found a colony, or at least a group about himself and his successors, a staff of employees reared, so to speak, in an atmosphere of closest intimacy between managers and men'. *The Motor Trader*, 6 August 1913, p. 373.
- [29] The Girl Engineer, *Kirkcudbright Advertiser*, 9 November 1917.
- [30] Barbara Caine (1995) Women's Studies: feminist traditions and the problem of history, in Barbara Caine & Rosemary Pringle (Eds) *Transitions: new Australian feminisms*, pp. 1-14 (Sydney: Allen & Unwin); Susan Kingsley Kent (1993), in *Making Peace: the reconstruction of gender in inter-war Britain* (Princeton: Princeton University Press), presents an extended argument for the ways the War, conceived in gendered terms, shaped new understandings of gender in the inter-war period. Her study emphasises the turn to feminist mobilisations around motherhood, while I suggest that middle-class women's attempts to secure professional work remained a significant strand of feminist activity in the post-war period. For the American context, see Susan Ware (1993) *Still Missing: Amelia Earhart and the search for modern feminism* (New York: Norton & Co.)
- [31] Cloth badge held in IWM, MUN.17.3/3; plaque held at Car Museum, Banton-on-Water; on suffrage colours, see Elizabeth Crawford (1999) *The Women's Suffrage Movement: a reference guide*, p. 136 (London: University College

- London); 'The Feminist Munition Factory', *Autocar*, 10 November 1917, pp. 454-456; 468.
- [32] Unmarked newspaper clipping in Pullinger family papers. Downs, *Manufacturing Inequality*, p. 2.
- [33] John R. Hume & Michael S. Moss (1979) *Beardmore: the history of a Scottish industrial giant*, 127-128 (London: Heinemann).
- [34] Record of Work and Conditions at the Factory of the Galloway Engineering Company, Tongland, IWM, MUN 17.3/6.
- [35] Report of an Interview with Ms Rowbotham, Galloway Engineering College, December 31 1918, IWM MUN 17.3/11. The Kirkcudbright Academy offered Tongland women, at a fee, mathematics and machine drawing courses two nights per week.
- [36] A New Profession for Women, *The Limit*, Xmas 1919, pp. 8-9. Soap suds in water were used to cool and lubricate metals during machining.
- [37] See letter from Caroline Haslett, secretary of the WES to *London Daily Mail*, 10 February 1921, held in WES Correspondence file, Institution of Electrical Engineers Archives Department, NAEST 92/4.1; also Mrs Elliot-Lynn, Engineering and Aviation, *Woman Engineer*, March 1927, pp. 198-202; Adelaide Mary Anderson (1922) *Women in the Factory: an administrative adventure: 1893-1921*, pp. 224-225 (New York: E.P. Dutton); 'Are Women Wanted', in *Common Cause*, 5 September 1919, p. 256; Margaret Heitland, 'Public Work and Women's Employment', in *Queen*, 22 February 1919.
- [38] *Kirkcudbright Advertiser*, 13 June 1919; 18 July 1919; and 25 July 1919. Journalist J. Robison, whose daughter was one of the local women who worked at the factory, seems to have written the articles. For an overview of feminist concerns, see the *Common Cause* for 1918 and 1919.
- [39] *Kirkcudbright Advertiser*, 1 August 1919; Minute Book, Kirkcudbright Town Council held in Stewartry Museum.
- [40] *Kirkcudbright Advertiser*, 29 August 1919. See also Letters, 5 September 1919 and 19 September 1919. Robert Graves & Alan Hodge (1963) *The Long Weekend: a social history of Great Britain, 1918-1939*, p. 27 (New York: W.W. Norton).
- [41] From the Ranks, *The Limit*, September 1919, p. 8.
- [42] Caroll Pursell (1993) 'Am I a Lady or an Engineer?' The Origins of the Women's Engineering Society in Britain, 1918-1940, *Technology and Culture*, 34, pp. 78-97; *The Engineer*, 6 December 1918, p. 642.
- [43] See Caroline Haslett's notebook for 1919, WES papers NEAST 92/10.2; *The Woman Engineer*, December 1920, for Sir William Beardmore's article on the difficulties women in the post-war period faced; WES Minute Books, Book 1 1919, NAEST 92/1.1.1-4; *The Vote*, January 1920; *The Queen*, 25 October 1920, p. 492.

- [44] WES papers, Membership Lists. Associate Subscriptions for 1919 were 2s 6d, and 5s for 1920. I do not know what proportion of the overall Tongland workforce these figures represent.
- [45] Lord Montagu of Beaulieu (1969) *Lost Causes of Motoring*, pp. 16-25 (London: Cassell); The Victory, *Autocar*, 5 April 1919, p. 474; A Model for a Day, *Autocar*, 27 October 1943, pp. 219-220. See also Arrol-Johnson, *Victory Model Brochure*, 1919, copy in author's possession.
- [46] Reviews in *The Light Car and Cyclecar*, 13 November 1920; *Autocar*, 16 October 1920, p. 659, 30 October 1920, pp. 786-788, 5 November 1921, p. 927, 18 February 1922, p. 298, 1 April 1922, p. 553; *Motor*, October 1920; *Auto*, 16 November 1922; *Autocar*, 9 November 1923; *Dumfries and Galloway Standard*, 30 October 1920, 4 March 1922; *Kirkcudbright Advertiser*, 3 March 1922; see also Arrol-Johnston scrapbook of press clippings held in the Dumfries and Galloway Museum; Nick Baldwin (1995) *The Galloway Story, The Automobile*, August, pp. 71-75.
- [47] Self-contained Works for a Self-contained Car, *The Light Car and Cyclecar*, 5 February 1921, p. 232.
- [48] Motor Notes: Olympia and the White City Motor Show, *The Graphic*, 30 October 1920, p. 660. That ambition to develop a cooperative system of production in an enlightened factory placed in ideal surroundings was articulated in the promotional brochure for the earlier Victory model; see *Victory Model Brochure*, 1919.
- [49] The Galloway coupé sold for £550 in 1920, while an Arrol-Johnston tourer cost £750. Even though Galloway prices fell during the 1920s, they were still overpriced. In 1919, Ford, for example, was advertising a touring car at £275, and in 1923 the Austin Seven was being advertised at £165. Nick Baldwin (1994) *A-Z of Cars of the 1920s* (Bideford, Devon: Bay View Books); Michael Worthington-Williams (1989) *The Scottish Motor Industry*, pp. 5-12 (Aylesbury: Shire Publications); George Oliver (1993) *Motor Trials and Tribulations: a history of Scottish vehicle manufacture* (Edinburgh: Glasgow Museums/HMSO). The Paces of the Austin Seven, *Autocar*, 27 July 1923, pp. 142-144.
- [50] *Woman Engineer*, 8 September 1921; 15 June 1923; September 1923; March 1921.
- [51] *Woman Engineer*, September 1920, notes that Atalanta Ltd is about to be formed, and prospectus to be issued: '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'. Also article by two of the 'Tongland Pioneers', Dora Turner and Annette Ashberry, in *The Vote*, 8 October 1920, p. 221. Annette Ashberry won the WES design competition with an automatic dish-washing machine, which could wash dishes as well as plates, *The Vote*, 2 June 1922.

- [52] See WES papers NAEST92/4.2 Assorted Correspondence. Letters between WES and Miss Margaret A. Batchelor of Arbroath, Scotland; 'A Pre-War Practices Case in Glasgow', in *Common Cause*, 2 January 1920, p. 494.
- [53] A Prominent Lady Engineer, *Beardmore News*, June 1923, p. 93. See WES Papers, NAEST 92/1.1.1-4 Minute Books, 25 October 1921. On Dorothee Pullinger's request the WES lobby the Scottish Light Car Trials committee to allow female competitors; Lady Drivers and the Scottish Trial, *Autocar*, 11 March 1922, p. 419 and 18 March 1922, p. 641.
- [54] Letter to auto historian, Tim Aymes, 11 September 1982. My thanks to Tim Aymes for making his research material available to me.
- [55] Patricia E. Malcolmsen (1986) *English Laundresses: a social history: 1850-1930* (Urbana: University of Illinois Press); Arewn P. Mohun (1999) *Steam Laundries: gender, technology and work in the United States and Great Britain, 1880-1940* (Baltimore: Johns Hopkins University Press); Anderson, *Women in the Factory*, pp. 141-146.

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