



**Women Metalworkers During the First World War: The
Material Activism of the Imperial War Museum's
Women's Work Sub Committee, 1917-1920**

Siân Elizabeth Evans

**A thesis submitted in partial fulfilment of the requirements for the degree of
Doctor of Philosophy**

Department of Archaeology
University of Sheffield

November 2024

Abstract

This multidisciplinary research investigates the way in which female smiths and metalworkers are portrayed and understood in the historical narrative and how this influences an understanding of archaeometallurgy. It seeks insights into women's perceptions of their own metalworking skills in a craft often perceived as masculine, examining the portrayals of female metalworkers over the last two hundred years to discover who recorded their work and how.

This thesis uses an assemblage of metal objects in the Imperial War Museum's collection that had originally belonged to the Women's Work Collection and was acquired by the Women's Work Sub Committee from 1917 onwards, as a case study. The research identified the items using archives, exhibition catalogues and minutes of meetings, before locating the surviving objects across two sites. The resulting study reunited orphaned artefacts with their data, enabling questions to be answered about the significance of all-female curation, and how it may constitute a form of activism for women's representation in industry during the early twentieth century. The research also drew on the visual culture relating to metalworking, which was generated and exhibited by the Women's Work Sub Committee. It examines how the gender provenance of a metal object can endure, even if the maker is perceived as atypical by the narrative.

This multidisciplinary research combines archaeology, material culture, social and industrial history, and museum studies with additional metalworking insights from the author's own coppersmithing practice.

Acknowledgements

I would like to thank my supervisor Professor Bob Johnston for all his extraordinary help and guidance throughout the course of my PhD studies. Thank you for your kindness, patience and sage advice. It has been much appreciated over the years and will never be forgotten.

My thanks also go to Professor Caroline Jackson for acting as my second supervisor and to all my friends in the archaeology department, especially those from the Sheffield Archaeomaterials group. I also wish to thank my SpLD tutor Chris Webb who helped me understand myself better.

I am very grateful to the Worshipful Company of Tinsplate Workers alias Wire Workers for their kind bursary and continued support. I am indebted to IWM curators Martin Anthony, Alan Wakefield and Sean Rehling for their help, and especially to IWM librarian Sarah Paterson for sharing her work on the Women's Work Sub Committee.

My heartfelt thanks go to Glyn Robbins, my mentor who just didn't stop mentoring. I really have appreciated your time and kind encouragement. Thanks go to my lovely study buddy Dr Helen Thompson and to my dear friend Dr Yvette Sanderson. We did it!

Outside of university I have been grateful for the support of so many friends. Thank you Verity Stannard for always egging me on, Peajay Morris for years of laughter and Lovely Chums Club and Derek Binns for all your kindness, calmness and constant friendship. And thank you Shahin Butt for the bittersweet promise.

Last but not least, I want to thank my parents Kathleen and Malcolm, and my sisters Rowan and Bronwen, for all their love and support over the last fifty-something years. I want to thank my offspring Mattea, Sullivan, Ursula and Rhys for being wonderful, and for bringing Carl, Evie, Charlie and Ruby into our family. I couldn't love you more.

And Andy Holmes, to whom this thesis is dedicated. Without you none of this exists.

You are the love of my life. Thank you.

Declaration

I, the author, confirm that the Thesis is my own work. I am aware of the University's Guidance on the Use of Unfair Means (www.sheffield.ac.uk/ssid/unfair-means).

This work has not previously been presented for an award at this, or any other, university.

Table of Contents

Abstract	2
Acknowledgements.....	3
Declaration	4
Table of Contents	5
List of Figures	12
List of Tables.....	19
1 Chapter One: Introduction.....	20
1.1 Introduction	20
1.2 Aims and objectives	21
1.3 Methodological overview	22
2 Chapter Two: Narrative review of female metalworking 1880 to 1920	24
2.1 Introduction	24
2.1 Women metalworkers in the 1800s.....	24
2.2 The Cradley Heath chainmakers strike of 1910	34
2.3 Working women in the First World War	46
2.3.1 Engineers, munition workers and ‘substitution’	52
2.3.2 Gendered language, imagery and attitudes	59
2.3.3 Material culture on the home front.....	63
2.4 The Women’s Section at the Imperial War Museum	64
2.5 Discussion.....	66
3 Chapter Three: The Women’s Work Collection.....	69
3.1 Introduction	69
3.2 The founding ideals of the Imperial War Museum	69
3.3 Women’s Work Sub Committee	72
3.4 Acquisition agenda.....	74

3.5	The munitions collection.....	77
3.6	Discussion.....	92
4	Chapter Four: The metal objects	96
4.1	Introduction	96
4.2	Tracing the phased acquisition of the WWSC metalwork collection	96
4.2.1	Metal objects from the Ministry of Munition's dilution exhibitions	97
4.2.2	The WWSC's acquisition of metal munitions objects for the IWM	99
4.2.3	Larger metal objects collected by the WWSC.....	102
4.2.4	Items found in the present-day IWM collection	103
4.3	Reconstructing the collection	104
4.3.1	Materials, making processes and operations	113
4.3.2	Types and sizes of objects represented in the collection	115
4.3.3	Processes and operations represented in the collection.....	115
4.4	Metal objects in the WWC	120
4.4.1	Group A	121
4.4.2	Group B	121
4.4.3	Group E	122
4.4.4	Group H.....	124
4.4.5	Group K	135
4.4.6	Group L.....	137
4.4.7	Group O.....	140
4.4.8	Group P	141
4.5	Appraising the evidence.....	141
4.6	The Cunard shells.....	146
4.7	Discussion.....	152
5	Chapter Five: Visual representation.....	156

5.1	Introduction	156
5.2	Use of photography in dilution exhibitions.....	156
5.3	Use of photography by the WWSC	160
5.4	War art	165
5.5	Dioramas	168
5.6	Studying the surviving models	173
5.6.1	IWM MOD 1058 First Voluntary Works Canteen at Woolwich Arsenal	174
5.6.2	IWM MOD 29 Women Stacking Tank Chains at the Newbury Depot of the Central Stores of the Ministry of Munitions	176
5.6.3	IWM MOD 107 Munition Workers Making Brass Rifle Cartridges	178
5.7	Discussion.....	179
6	Chapter Six: Curation, exhibition and dispersal of metalworking material	187
6.1	Introduction	187
6.2	Defining the Women's Section	188
6.3	The Imperial War Museum at Burlington House	190
6.4	Whitechapel Exhibition 1918	192
6.4.1	Women's war work	193
6.4.2	The shrine.....	195
6.4.3	Metalwork at Whitechapel	197
6.4.4	Plaster models.....	198
6.5	The Imperial War Museum	199
6.6	Discussion.....	208
7	Chapter Seven: Discussion and conclusion	211
7.1	Introduction	211
7.2	How did the Women's Work Sub Committee collect and curate objects, and create imagery of female metalworkers?	212

7.3	How was female activism and politics manifest in the people and actions of the early Imperial War Museum ?	215
7.4	What evidence was there of material activism on behalf of the Women's Work Sub Committee, particularly in relation to the women munition workers and metal objects?	219
7.4.1	Organisation and opportunism	219
7.4.2	Duplication of exhibits and labels	220
7.4.3	Acquiring large exhibits.....	221
7.4.4	Memorialisation	221
7.4.5	Use of exhibition space	224
7.5	How are the surviving objects of the metalwork collection still meaningful?	224
7.6	Conclusions	226
7.7	Further research.....	228
7.8	Afterword	229
8	Appendices.....	230
8.1	Appendix One: Metal Objects from the WWC Examined and Recorded.....	230
8.1.1	EPH 4087	230
8.1.2	EPH 4088.....	232
8.1.3	EPH 4089a & EPH 4089b	235
8.1.4	EPH 4095	238
8.1.5	EPH 4101	240
8.1.6	EPH 4104	242
8.1.7	EPH 4733	244
8.1.8	EPH 4735	246
8.1.9	EPH 4736	248
8.1.10	EPH 4737	250
8.1.11	EPH 4738	252

8.1.12	EPH 4739	254
8.1.13	EPH 4740	256
8.1.14	EPH 4741	258
8.1.15	EPH 4742	260
8.1.16	EPH 4743	262
8.1.17	EPH 4744	264
8.1.18	EPH 4745	266
8.1.19	EPH 4746	268
8.1.20	EPH 4747	270
8.1.21	EPH 4749	272
8.1.22	EPH 4750	274
8.1.23	EPH 4751	277
8.1.24	EPH 4752	279
8.1.25	EPH 4753	281
8.1.26	EPH 4754	283
8.1.27	EPH 4755	285
8.1.28	EPH 8717	287
8.1.29	EPH 8718	289
8.1.30	EPH 8756	291
8.1.31	EPH 8763	293
8.1.32	EPH 8766	295
8.1.33	EPH 8767	297
8.1.34	EPH 8768	299
8.1.35	EPH 8770	301
8.1.36	EPH 8771	303
8.1.37	EPH 8778	305

8.1.38	EPH 8876	307
8.1.39	EPH 8903	309
8.1.40	EPH 8911	311
8.1.41	EPH 8912	313
8.1.42	EPH 8913	315
8.1.43	EPH 10201	317
8.1.44	EPH 10894	319
8.2	Appendix Two: IWM Image Copyright Permissions	321
9	References.....	323
9.1	IWM London Women’s War Work Archive	323
9.1.1	Catalogues.....	323
9.1.2	Correspondence.....	323
9.1.3	Documents	325
9.1.4	Publications.....	325
9.1.5	WWSC Minutes	326
9.2	Women, War and Society, 1914-1918 Archive: Gale Primary Sources online	326
9.2.1	Correspondence: deaths of munition workers	326
9.2.2	Exhibition administration.....	328
9.2.3	Munition factories: reports and administration	331
9.2.4	Pamphlets and leaflets.....	338
9.2.5	Photographs.....	340
9.2.6	Press.....	341
9.2.7	Sheffield University training administration	343
9.2.8	War Cabinet Correspondence.....	345
9.3	Films	345
9.4	Web pages.....	346

10	Bibliography	352
10.1	Books.....	352
10.2	Chapter in an edited book	360
10.3	Journal articles	362
10.4	Doctoral dissertations	368
10.5	Reports.....	369

List of Figures

Figure 2.1 Done to Death. Elizabeth Ryan dead in the Newcastle Workhouse (Sherard, 1897, frontispiece)	35
Figure 2.2 A woman plying her task in a cell-like shed, silent, absorbed and alone (Sherard, 1897, p.221)	36
Figure 2.3 A particular and pitiful sight was that of a sweet little lass - such as Sir John Millais would have liked to paint - dancing on a pair of bellows for threepence a day (Sherard, 1897, p.231)	37
Figure 2.4 Three Farthings Apiece (Sherard, 1897, p.237)	38
Figure 2.5 "The Chainmaker" by Sylvia Parkhurst. Reproduced from Bonhams 'Votes for Women The Lesley Mees Collection' Auction 2023	39
Figure 2.6 Cradley Chain Maker (Mudie-Smith, 1906, p.60)	40
Figure 2.7 A Cradley Chain Maker (Mudie-Smith, 1906, p.57)	41
Figure 2.8 Cradley Heath Chainmakers' Strike (from "Women Chainmakers be hammer or anvil", 2021, p.3)	43
Figure 3.1 Notice of 'Permanent Memorial to Women's Work' on Engineering Munitions (IWM, ENI/1/COM/24/2, 1917)	83
Figure 3.2 "Lady Norman's intention is to exhibit types only" (IWM, ENI/3/COR/1, 1917)	87
Figure 3.3 "This letter drafted by Mr B. H. Morgan" (IWM, ENI/3/COR/1, 1917)	88
Figure 4.1 Instructions for machining a Hispano Suiza camshaft (IWM, LBY 16242, 1918, p.11)	116
Figure 4.2 Objects without operations details (IWM, LBY 16242, 1918, p.116).....	116
Figure 4.3 Note drawing attention to machine operator's previous occupation (IWM, LBY 16242, 1918, p.117)	117
Figure 4.4 A223 (IWM, LBY 16242, 1918, Fig.6).....	121
Figure 4.5 EPH 8778 (IWM Duxford)	121
Figure 4.6 B86 (IWM, LBY 16242, 1918, Fig.18).....	122
Figure 4.7 EPH 4754 (IWM London).....	122
Figure 4.8 E93 (IWM, LBY 16242, 1918, Fig.36)	123
Figure 4.9 EPH 4104 (IWM Duxford)	123
Figure 4.10 E100 (IWM, LBY 16242, 1918, Fig 35)	123

Figure 4.11 EPH 4089a (IWM Duxford)	123
Figure 4.12 E124 (IWM, LBY 16242, 1918, Fig.35)	124
Figure 4.13 EPH 4088 (IWM Duxford)	124
Figure 4.14 H1 (IWM, LBY 16242, 1918, Fig.46)	125
Figure 4.15 EPH 8771 (IWM Duxford)	125
Figure 4.16 H3 (IWM, LBY 16242, 1918, Fig.46)	125
Figure 4.17 EPH 8911 (IWM Duxford)	125
Figure 4.18 H4 (IWM, LBY 16242, 1918, Fig.46)	126
Figure 4.19 EPH 8768 (IWM Duxford)	126
Figure 4.20 IWM, LBY 16242,1918, Fig 46	126
Figure 4.21 H5 (IWM, LBY 16242, 1918, Fig.47)	127
Figure 4.22 EPH 8903 (IWM Duxford)	127
Figure 4.23 H6 (IWM, LBY 16242, 1918, Fig.47)	127
Figure 4.24 EPH 4751 (IWM Duxford)	127
Figure 4.25 H7 (IWM, LBY 16242, 1918, Fig.47)	128
Figure 4.26 EPH 8763 (IWM Duxford)	128
Figure 4.27 H8 (IWM, LBY 16242, 1918, Fig.47)	128
Figure 4.28 EPH 8766 (IWM Duxford)	128
Figure 4.29 H9 (IWM, LBY 16242, 1918, Fig.47)	129
Figure 4.30 EPH 8912 (IWM Duxford)	129
Figure 4.31 IWM, LBY 16242,1918, Fig 47	129
Figure 4.32 H12 (IWM, LBY 16242, 1918, Fig.48)	130
Figure 4.33 EPH 8767 (IWM Duxford)	130
Figure 4.34 H14 (IWM, LBY 16242, 1918, Fig.48)	130
Figure 4.35 EPH 8913 (IWM Duxford)	130
Figure 4.36 H16 (IWM, LBY 16242, 1918, Fig.48)	131
Figure 4.37 EPH 8756 (IWM Duxford)	131
Figure 4.38 H17 (IWM, LBY 16242, 1918, Fig.48)	131
Figure 4.39 EPH 4753 (IWM Duxford)	131
Figure 4.40 H20 (IWM, LBY 16242, 1918, Fig. 48)	132
Figure 4.41 EPH 8770 (IWM Duxford)	132
Figure 4.42 H22 (IWM, LBY 16242, 1918, Fig. 48)	132

Figure 4.43 EPH 4752 (IWM London).....	132
Figure 4.44 IWM, LBY 16242, 1918, Fig 48	133
Figure 4.45 H81 (IWM, LBY 16242, 1918, Fig.50)	134
Figure 4.46 EPH 4750 (IWM Duxford).....	134
Figure 4.47 EPH 4750 (IWM.....	134
Figure 4.48 IWM, LBY 19242, 1918, Fig. 50	135
Figure 4.49 K120 (IWM, LBY 16242, 1918, Fig.53).....	136
Figure 4.50 EPH 8718 (IWM Duxford).....	136
Figure 4.51 IWM, LBY 16242, 1918. Fig 53	136
Figure 4.52 L11 (IWM, LBY 16242, 1918, Fig.54)	137
Figure 4.53 EPH 4746 (IWM London).....	137
Figure 4.54 L52 (IWM, LBY 16242, 1918, Fig.58)	137
Figure 4.55 EPH 4747 (IWM London).....	137
Figure 4.56 L42 (IWM, LBY 16242, 1918, Fig. 57)	138
Figure 4.57 EPH 4095 (IWM London).....	138
Figure 4.58 L70 & L71 (IWM, LBY 16242, 1918, Fig.58).....	139
Figure 4.59 EPH 4735 (IWM London).....	139
Figure 4.60 EPH 4735 (IWM London).....	139
Figure 4.61 EPH 4735 (IWM London).....	139
Figure 4.62 L99 (IWM, LBY 16242, 1918, Fig.62)	140
Figure 4.63 EPH 8717 (IWM Duxford).....	140
Figure 4.64 O32 (IWM, LBY 16242, 1918, Fig.81)	140
Figure 4.65 EPH 4755 (IWM London).....	140
Figure 4.66 P12 (IWM, LBY 16242, 1918, Fig. 90)	141
Figure 4.67 EPH 10201 (IWM Duxford).....	141
Figure 4.68 Example of 'W' code.....	143
Figure 4.69 Letter from Monkhouse to Conway regarding catalogues 10th December 1918 (IWM, ENI/3/MUN/2/2, 1918).....	145
Figure 4.70 Image of Cunard shells referenced in (ENI/3/GEN/4, 1917) ©IWM Q 107141	146
Figure 4.71 Staff Canteen at the Cunard Shell Works 1917. Historic England Archive BL24001/032.....	147
Figure 4.72 (IWM, LBY 2240, 1918, p. 15).....	149

Figure 4.73 Letter to Lady Norman 16th July 1941 regarding Women's Work Collection bomb damage (IWM, Documents.9887, Norman Papers , 1942)	151
Figure 4.74 Cunard Shell Showing Engraving IWM (MUN 3281) © IWM.....	155
Figure 5.1 The Ministry's Exhibition at Manchester (IWM, MUN. VI/17, 1918. Fig. 45)	156
Figure 5.2 View of Gallery in Manchester Exhibition (IWM, MUN. VI/17, 1918, Fig. 46)	157
<i>Figure 5.3 Turning copper band on 9.2-inch H.E. Shell (IWM, MUN. VI/17, 1917, Fig. 5)</i>	<i>158</i>
Figure 5.4 Man being taught Aircraft Cylinder turning by woman operative (IWM, MUN. VI/17, 1917, Fig. 23).....	159
Figure 5.5 Hydraulic riveting boiler flues (IWM, MUN. VI/17, 1918, Fig. 7)	160
Figure 5.6 Munitions production on the home front, Nicholls (IWM, Q30040) ©IWM.....	162
Figure 5.7 Reference to charts showing growth of women's employment (IWM, LBY 2240, 1918, p. 16)	162
Figure 5.8 Chart showing statistical diagrams of women's employment in metal trades (IWM,Q 30610) ©IWM	164
Figure 5.9 The Acetylene Welder 'Britain's Efforts and Ideals'; Making Aircraft Image, (Art.IWM ART 693) ©IWM.....	165
Figure 5.10 On munitions skilled work, (Art.IWM ART 712) ©IWM	166
Figure 5.11 On Munitions; Heavy Work, (Art.IWM ART 714) ©IWM	167
Figure 5.12 List of WWSC models at Imperial War Exhibition (RA, MLPAM C8926 A21429, 1919, p. 67)	173
Figure 5.13 First Voluntary Works Canteen at Woolwich Arsenal by Nicholls, (IWM Q 31417) ©IWM	174
Figure 5.14 IWM MOD 1058	175
Figure 5.15 IWM MOD 29	176
Figure 5.16 IWM MOD 29 detail (a)	177
Figure 5.17 IWM MOD 29 detail (b).....	177
Figure 5.18 IWM MOD 107	178
Figure 5.19 Ursula Carr at Battersea Polytechnic (Hamilton, 1978)	186
Figure 6.1 Catalogue cover for Whitechapel Art Gallery exhibition brochure (IWM, EMP. 26/4, 1918)	193
Figure 6.2 The shrine at Whitechapel Art Gallery exhibition (IWM, Q 31113) ©IWM	195
Figure 6.3 Dorothy Ling IWM WWC M34 © IWM	196

Figure 6.4 Imperial War Museum Galleries At The Crystal Palace, 1920-1924 by Nicholls (IWM, Q31412) © IWM	200
Figure 6.5 Lady Norman riding her Autoped 1916, Paul Thompson/FPG/Archive Photos/Getty Images	203
Figure 7.1 Memo to ffoulkes from Conway (IWM, ENI/3/COR/2/1, Memo to ffoulkes from Conway 6th Jan, 1918)	217
Figure 7.2 A model of female workers in a shell filling factory, Hayes. (IWM, Q 31416) © IWM	223
<i>Figure 8.1 EPH 4087 (IWM Duxford)</i>	230
Figure 8.2 EPH 4087 (IWM Duxford)	230
Figure 8.3 IWM, MUN. VI/43, 1917, p.64	231
Figure 8.4 EPH 4088 (IWM Duxford)	232
Figure 8.5 EPH 4088 (IWM Duxford)	232
Figure 8.6 E124 (IWM, LBY 16242, 1918, Fig.35)	233
Figure 8.7 EPH 4.89a & 4089b (IWM Duxford)	235
Figure 8.8 EPH 4089a (IWM Duxford)	235
Figure 8.9 E100 (IWM, LBY 16242, 1918, Fig. 36)	236
Figure 8.10 EPH 4095 (IWM Duxford)	238
Figure 8.11 EPH 4095 (IWM Duxford)	238
Figure 8.12 L42 (IWM, LBY 16242, 1918, Fig 57)	239
Figure 8.13 EPH 4101 (IWM London)	240
Figure 8.14 EPH 4101 (IWM London)	240
Figure 8.15 EPH 4104 (IWM Duxford)	242
Figure 8.16 EPH 4104 (IWM Duxford)	242
Figure 8.17 EPH 4733 (IWM London)	244
Figure 8.18 IWM (EPH 4733) ©IWM	244
Figure 8.19 EPH 4735 (IWM London)	246
Figure 8.20 EPH 4736 (IWM London)	248
Figure 8.21 EPH 4736 (IWM London)	248
Figure 8.22 EPH 4737 (IWM London)	250
Figure 8.23 EPH 4737 (IWM London)	250
Figure 8.24 EPH 4738 (IWM London)	252

Figure 8.25 EPH 4738 (IWM London).....	252
Figure 8.26 EPH 4739 (IWM London).....	254
Figure 8.27 EPH 4739 (IWM London).....	254
Figure 8.28 EPH 4740 (IWM London).....	256
Figure 8.29 EPH 4740 (IWM London).....	256
Figure 8.30 EPH 4741 (IWM London).....	258
Figure 8.31 EPH 4741 (IWM London).....	258
Figure 8.32 EPH 4742 (IWM London).....	260
Figure 8.33 EPH 4742 (IWM London).....	260
Figure 8.34 EPH 4743 (IWM London).....	262
Figure 8.35 EPH 4743 (IWM London).....	262
Figure 8.36 EPH 4744 (IWM London).....	264
Figure 8.37 EPH 4744 (IWM London).....	264
Figure 8.38 EPH 4745 (IWM London).....	266
Figure 8.39 EPH 4745 (IWM London).....	266
Figure 8.40 EPH 4746 (IWM London).....	268
Figure 8.41 EPH 4746 (IWM London).....	268
Figure 8.42 EPH 4747 (IWM London).....	270
Figure 8.43 EPH 4747 (IWM London).....	270
Figure 8.44 EPH 4749 (IWM London).....	272
Figure 8.45 EPH 4749 (IWM London).....	272
Figure 8.46 EPH 4750 (IWM Duxford).....	274
Figure 8.47 EPH 4750 (IWM Duxford).....	274
Figure 8.48 EPH 4751 (IWM Duxford).....	277
Figure 8.49 EPH 4751 (IWM Duxford).....	277
Figure 8.50 EPH 4752 (IWM London).....	279
Figure 8.51 EPH 4752 (IWM London).....	279
Figure 8.52 EPH 4754 (IWM London).....	283
Figure 8.53 EPH 4754 (IWM London).....	283
Figure 8.54 EPH 4755 (IWM London).....	285
Figure 8.55 EPH 4755 (IWM London).....	285
Figure 8.56 EPH 8717 (IWM Duxford).....	287

Figure 8.57 EPH 8717 (IWM Duxford).....	287
Figure 8.58 EPH 8718 (IWM Duxford).....	289
Figure 8.59 EPH 8718 (IWM Duxford).....	289
Figure 8.60 EPH 8756 (IWM Duxford).....	291
Figure 8.61 EPH 8756 (IWM Duxford).....	291
Figure 8.62 EPH 8763 (IWM Duxford).....	293
Figure 8.63 EPH 8763 (IWM Duxford).....	293
Figure 8.64 EPH 8766 (IWM Duxford).....	295
Figure 8.65 EPH 8766 (IWM Duxford).....	295
Figure 8.66 EPH 8767 (IWM Duxford).....	297
Figure 8.67 EPH 8768 (IWM Duxford).....	299
Figure 8.68 EPH 8768 (IWM Duxford).....	299
Figure 8.69 EPH 8770 (IWM Duxford).....	301
Figure 8.70 EPH 8770 (IWM Duxford).....	301
Figure 8.71 EPH 8771 (IWM Duxford).....	303
Figure 8.72 EPH 8771 (IWM Duxford).....	303
Figure 8.73 EPH 8778 (IWM Duxford).....	305
Figure 8.74 EPH 8778 (IWM Duxford).....	305
Figure 8.75 EPH 8876 (IWM Duxford).....	307
Figure 8.76 EPH 8876 (IWM Duxford).....	307
Figure 8.77 EPH 8903 (IWM Duxford).....	309
Figure 8.78 EPH 8903 (IWM Duxford).....	309
Figure 8.79 EPH 8911 (IWM Duxford).....	311
Figure 8.80 EPH 8911 (IWM Duxford).....	311
Figure 8.81 EPH 8912 (IWM Duxford).....	313
Figure 8.82 EPH 8912 (IWM Duxford).....	313
Figure 8.83 EPH 8913 (IWM Duxford).....	315
Figure 8.84 EPH 8913 (IWM Duxford).....	315
Figure 8.85 EPH 10894 (IWM London).....	319
Figure 8.86 EPH 10894 (IWM London).....	319
Figure 8.87 Clearing copyright for material in the IWM Research Room	321
Figure 8.88 Payment made for digital copying IWM	322

List of Tables

Table 3.1 Exhibitions showing metal samples collected by the Ministry of Munitions.....	80
Table 3.2 Category groupings (verbatim), Draft Scheme of Women's Work on Munitions, (IWM, EN1/3/MUN/2/2, 1917)	80
Table 3.3 Requests sent to companies (verbatim) (IWM, ENI/1/COM/24/2 Draft letter to firms on list, 1917)	83
Table 3.4 'Technical Papers' contacted by the WWSC (IWM, ENI/COM/24/2, 1917)	85
Table 4.1 Collection rate of munitions objects for dilution exhibitions	98
Table 4.2 Comparison of number of metal objects displayed between Nov 1917 and May 1918	100
Table 4.3 Details of objects shown in dilution exhibitions between May 1917 and July 1918 ..	104
Table 4.4 Number of objects exhibited between May 1917 and July 1918 showing acquisition rate	108
Table 4.5 Listed objects and categories found in the Ministry of Munitions catalogue (shown verbatim) (IWM, LBY 16242, 1918)	108
Table 4.6 Surviving metalwork from the IWM's Women's Section discovered in the present day collection through this research	112
Table 4.7 Material found in the reconstructed assemblage	114
Table 4.8 Explanations of the machining processes found in catalogue (IWM, LBY 16242, 1918)	117
Table 4.9 Number of references to specific operations found in catalogue (IWM, LBY 16242, 1918)	119
Table 4.10 Objects found in catalogue to have undergone more than one process (IWM, LBY 16242, 1918)	119
Table 4.11 Metal objects identified from 1917 catalogue images.....	142
Table 4.12 Metal objects bearing 'W' codes	143
Table 5.1 Proposed subjects for WWSC models (verbatim) (IWM, EN1/3/GEN/10 WWC Minutes 9th Oct, 1918)	170
Table 5.2 Further subjects for WWSC models (verbatim) (IWM, EN1/3/GEN/10 WWC Minutes 14th Dec, 1918).....	171
Table 6.1 Estimated allocated floor space for IWM	189

1 Chapter One: Introduction

1.1 Introduction

The seeds of this research were sown at the start of my four year coppersmithing apprenticeship in 1991, when I was asked if I had really made the bowl that I was about to sell. This question would be asked again over the following years, when my presence in the forge and my capability as a smith was met with surprise. I understood that female smiths were less common than male smiths, but I began to wonder if metalworking had always been inextricably entwined with masculinity. In 2011 I travelled to France, Greece and India as a Churchill Fellow to research the origins of my craft (Evans, 2012). When I returned, I thought more about the ancient metal artefacts I had seen, and how their gender provenance might have been assumed rather than proven. How often is a woman's participation in metalworking concealed or overlooked?

Five years later in 2016, the Women of Steel statue was unveiled in Sheffield, in commemoration of the war service of female metalworkers in the city. Four hundred commemorative medallions were also made to be presented to individuals as a token of the city's gratitude. An appeal went out for the women steel workers of the Second World War (or their surviving families) to come forward and accept this recognition. The organisers were then surprised when families of women metalworkers who had served in the same way during the First World War came forward, asking for the same acknowledgment. In response to this oversight, not only were four hundred more medallions struck, but the statue was redesigned to show women in the uniforms of both conflicts.

This story was of interest, not only because of the number of decades that had to elapse before the women of steel received such recognition, but because of the magnitude of the response to this opportunity to be seen. The proven capability of the women who worked in the metal industries during the First World War and the extent of their contribution had faded in the collective memory, yet the women themselves still identified as having been part of this industry.

It illustrated for me the problem of how a wider narrative about metalsmithing can underrepresent or even question the contribution and ability of female metalworkers, even when their skills are accepted during atypical instances such as war.

On occasion, misattribution of my own work as a coppersmith has needed to be challenged, and this insight has undoubtedly influenced my interaction with metalwork in the archaeological record and the way I find it described and understood in academic and museum settings. The provenance of an object's geographic and temporal location, and an understanding of the making techniques and materials involved, require good data for analysis, yet the gender of the maker can seem less interrogated, particularly in archaeometallurgy where the culture of smithing is traditionally understood as being masculine. How metal objects retain their gender provenance is a source of constant fascination to me as a smith and inspired my journey into academia and this research.

1.2 Aims and objectives

Early ideas about how this investigation might look, imagined a project where key metal objects in the archaeological record could be reexamined to analyse the mechanisms by which the gender of their makers had been decided upon. Whilst this clearly would have been a complex approach and difficult to scope, it would have been interesting to develop some kind of Bechdel-Wallace test through which to consider the narrative of archaeometallurgy (Gardiner, 2011). Sørensen had already touched on some of the difficulties of this kind of investigation, particularly in terms of the limitations of focussing on female visibility per se.

An emphasis upon visibility would make a 'traditional' feminist investigation of this topic want to argue that women were metalworkers. The aim would be to make women visible in a part of the archaeological record that has hitherto been denied them. This, despite its immediate appeal, is nonetheless an analysis phrased in terms of sexist views of labour organization that may be both andro- and ethnocentric.

(Sørensen, 2013, p.39).

Sørensen suggests that even if metalwork emerged from such analysis defined as either male or female made, it would lack a social context. In many ways, my research is a response to her statement that a "more ambitious approach would consist of considering women *and* the particular sphere of production and involved activities" (Sørensen, 2013, p.39).

In fact, this research became scoped by societal upheavals and constraints of our own time, namely the Covid-19 restrictions between 2020 and 2022. Rather than embarking upon any kind

of wide archaeological investigation into older metal artefacts and the gender of their makers, the reverse became necessary. It became important to find a case study that could provide remotely accessible and irrefutable evidence of women metalworkers, which had good quality data connected to any surviving artefacts. Such a change in tactics brought the focus of the research into much more recent times, by using a case study from the First World War.

This thesis looks in depth at the case of the Women's Work Sub Committee, formed to collect a range of examples of women's work as part of the founding of the Imperial War Museum in 1917. It draws on a study of the objects and visual culture relating specifically to the metalwork collected and exhibited between 1917 to 1920, asking the following questions:

- How did the Women's Work Sub Committee create and curate the objects and imagery of female metalworkers?
- How was gender provenance determined and represented within the Committee's approach to collection and curation?
- How was female activism and politics manifest in the people and actions of the Women's Work Sub Committee?
- What is the present and future for the metalwork in the Women's Work Collection?

1.3 Methodological overview

This multidisciplinary research combines elements of archaeology and material culture, social and industrial history, and to a lesser extent, museum studies. It begins with a literature review designed to provide an understanding of where women metalworkers are found within historical narratives, who reports upon their lives and experiences, and how this is done. When this stage of the research lengthened during the Covid-19 restrictions that prevented physical access to collections and institutions, it enabled a deeper insight into how the lives of women metalworkers prior to the First World War were defined, by both contemporary reports and later historians. This research attempted to build on an understanding of that narrated social history using first person accounts by women metalworkers, but these were harder to locate. Therefore, information about how women metalworkers felt about their own identities and skills could not be developed in this particular study, although insights from my own practice as a smith did, at times, inform the research.

In order to assess the special context of female metalworking during the First World War, a review of the academic literature concerning the lives of women from this era was undertaken, particularly studies relating to the home front and its material culture. Social issues concerning women in munitions, highlighted by female historians of the 1980s and 1990s, were also considered (Beddoe, 1989), (Braybon & Summerfield, 2013), (Downs, 1995), (Woollacott, 1994).

Aspects of archaeological research took the form of locating and analysing any surviving metal artefacts from the original Imperial War Museum (IWM) collection. Initial examinations of the archives at the IWM suggested that certain objects from an early assemblage of female-made metalwork may still exist. Further research, using IWM records, catalogues and minutes of meetings, made it possible to identify metal objects in the present day collections that appeared to be connected to this assemblage. With the kind help of IWM curators Sarah Paterson, Martin Anthony, Alan Wakefield, and Sean Rehling, they were located and eventually examined at IWM London and IWM Duxford as part of this study. Again, pandemic restrictions prevented any detailed metallurgical analysis to take place, and so all information was gathered rapidly through photography. Further research into the IWM 'Women's Work Collection' and 'Norman Papers' archives was undertaken with the aim of identifying these metal items and reconnecting them to their original data, defining their place in home front archaeology and in the material culture of female metalworking. The findings offered new insights into the understanding of the gender provenance of metal objects and the mechanisms required to keep such data in place.

It also asked questions about the *modus operandi* of the Women's Work Sub Committee (WWSC), and the material activism of its members. By considering how the WWSC collected and curated items for the Women's Section, this research also touches on aspects of museology that explore how representations of groups are formed and become fixed. To develop these ideas, this research also looked at the artwork and visual culture commissioned by the WWSC that related to metalworking, and how images of female metalworkers were then viewed in exhibitions. It examined how the WWSC had influenced this, and if their curation represented any form of activism for women's rights and representation during the early twentieth century.

2 Chapter Two: Narrative review of female metalworking 1880 to 1920

2.1 Introduction

To contextualise the approach of the Women's Work Sub Committee (WWSC) (Section 1.2) and understand their representation of women metalworkers, it has been necessary to research the literature about the female metalworking that preceded the conflict. This review mainly considers the early 1900s, but also acknowledges accounts from 1750 onwards referenced by researchers. Much of the research carried out about women metalworkers is connected to documentation of social welfare campaigns concerning health, pay, living conditions, and sweated labour. The chapter also reviews the literature concerning the First World War in general, covering appraisals of gendered roles and material culture. It shows the work done by historians to analyse changes to industrial practices during the 1880s, and how factory settings increased women metalworkers' visibility. It looks at appraisals of trade union campaigns on behalf of the female smiths who worked in the home, and the representation of these women by reformers. This chapter also looks at how the social changes brought about by the war are viewed in hindsight, including the way researchers interact with accounts of lived experiences and the emerging area of material culture studies of the home front. This research also examines how other historians have engaged with the archive that was created by the WWSC, housed at the Imperial War Museum.

2.1 Women metalworkers in the 1800s

To better understand the women metalworkers of the First World War, it is appropriate to investigate how academics have described the manufacturing world which predated it. Insights into the female contribution to metalworking can be found in the research that investigated lifestyle shifts, generated by the advent of industrialisation (Pinchbeck, 1969), (Nicholas and Oxley, 1993), (Tilly, 1994). Such changes, beginning in the 1750s, set in motion the move from rural living and working, to lives in towns and factories that would give women workers a greater visibility (Berg, 1994). Women who smithed in whatever capacity prior to this time have been harder to spot in the historical record, as businesses and guild memberships were routinely registered in a man's name, even if the smithy was being worked by all family members (Honeyman, 2007, p. 478). Towns involved in high metalwork production such as Sheffield and

Birmingham tended to be the exception (Berg, 1993, p. 245). Literature concerning the development and mechanisation of metalworking practice during the 1800s gives some insights into the changes and challenges facing workers within the industry (Evans, 1998), but women rarely took centre stage as subjects in their own right and tend to be referenced only as case studies within larger overarching historical themes, or as incidental elements of metalworking *per se*. If the visibility of women increased as their work moved into more public factory settings throughout the 1800s, it does not mean that they were not involved in metalworking before.

In *Women in Modern Industry* (Hutchins, 1915), B. L. Hutchins (also known as Elizabeth Leigh Hutchins) recognised the problem of identifying female metalworkers from an earlier time, pushing against the notion that women working with metal were byproducts of an emerging factory system, only able to arrive into the trade when machinery had made the metalwork easy enough for them to do so. Writing in 1915 about the preceding century, she shared proof of female smiths prior to the manufacturing expansion of the 1800s. The earliest example Hutchins found was from an ironworks in the 1400s, from which she cited an account from a 'Mr Lapsley' who reported that "... two women, wives of the smith and foreman respectively, performed miscellaneous tasks, from breaking up the iron-stone to blowing the bellows" (Hutchins, 1915, p. 29). Although this refers to mining and smelting rather than smithing the metals, the text still supports the idea that metal and women were no strangers this far back in the historical record. In fact, most of Hutchins's early examples of evidence for female metalworking came from records and enquiries into mining practices, commissioned to investigate welfare concerns for workers. These include the findings from a 1652 Parliamentary report, describing how many of the surface workers employed in dressing ore in mines were women and children (Hutchins, 1915, p. 29). Later, in referencing Arthur Young's 1770 account of rural life, Hutchins found women working in lead mines by researching records of their earnings (Young, 1770; cited by Hutchins, 1915, p. 29). Although not direct evidence of smithing, it still places women within much earlier metalworking practices.

Fifty years later, Ivy Pinchbeck (1969) arrived at the same problem in *Women Workers and the Industrial Revolution 1750 – 1850*. This study looked into the lives of women working in all kinds of paid labour, such as agriculture, textile industries, and to a lesser extent, mining and metal trades. She found evidence of female smiths in a petition from iron manufacturers in The Journal of the House of Commons, March 21, 1737, showing how women and children were employed

in “making nails and Scythes, etc., for Exportation” (Pinchbeck, 1969, p. 278). Despite lacking descriptive insights, references such as these do give a fellow smith an idea of the work involved; in this particular case, highly skilled forge-based techniques, using hammers and anvils. They also give a sense of the scale of smithing taking place in rural settings. Pinchbeck made this point when referencing the work of William Hutton, commenting on his surprise at encountering women nailmakers in Birmingham in the 1830s:

When I first approached Birmingham, from Walsall, in 1741, I was surprised at the prodigious number of blacksmith shops on the road; and could not conceive how a country, though populous, could support so many people of the same occupation. In some of these shops I observed one or more females, stripped of their upper garments, and not overcharged with their lower, wielding the hammer with all the grace of the sex. The beauties of their faces were rather eclipsed by the smut of the anvil ... Struck with the novelty, I enquired, “Whether the ladies in this country shod horses?” And was answered with a smile, “They are nailers.”

(Hutton, 1836, p. 192)

Hutton here (quoted by Pinchbeck) highlighted the apparent paradox between the beauty of these women’s faces and the smut of the dirty work. Interestingly he commented on their hammering style, using the ambiguous term “with all the grace of the sex”. It is unclear if he is reporting on a style of smithing distinctly different to a man’s, or possibly defending their femininity in the face of hard manual labour.

Although the sight of a female metalworker is still greeted with surprise, both Hutchins (1915) and Pinchbeck (1969) described in their work an industrial evolution, rather than revolution, where women were always present. Such writers give a sense of the longer history of female smithing, seeing gendered roles in metalwork as more a product of the industrial system than the work itself. If factory spaces are perceived as predominately male environments, Hutchins was keen to show the increasing number of women and children being employed there, as mass-production and mechanised processes accelerated. The kind of handmade work (such as the production of pen nibs) previously carried out by women and children in a domestic setting was, by the end of the 1800s, being mass-produced on machines in factories by the very same people. Hutchins (1915) referred to evidence from a report published in 1903 by the Committee of the

Economic Section of the British Association, to identify these trends and to give an insight into the types of metal objects being made by women. They included:

Machine-tending, press-work, stamp-work, metal-cutting, printing, various processes of brass work, pen-making, machine ironing in laundries, the making of “hollow ware” or tin pots and buckets of various kinds

(Hutchins, 1915, p. 66).

Later accounts gave insights into the range of metalwork undertaken by women and girls in Bristol and Gloucester, employed in melting copper ore and making pins and pans, that involved skilled smithing tasks such as casting, forming, and forging (Hutchins, 1915, p. 66). Mechanisation became more commonplace in Coventry in bicycle production and watchmaking industries, and Hutchins also noted how, within cutlery production in Sheffield for example, hand filing was being replaced by the use of machines. Also of note is the mention of engineering. In relation to the foundry process of making up cores for the moulds required for hollow casting, “Women are even employed in some processes subsidiary to engineering, such as core-making” (Hutchins, 1915, p. 64). From her position as a social reformer and campaigner, Hutchins’ writing drew attention to the pay inequalities, welfare and hardships of a large number of the workers in these factory settings.

In certain cases, the opportunity for regular work, and to a certain extent, a financial autonomy, benefitted some women coming into these growing industries. Laura Bracey (2016) reviewed the scale and nature of female participation in Sheffield’s factory systems in her PhD thesis *Women Workers in Sheffield’s Metal Trades, c.1742 – 1867*. She recognised the many barriers women metalworkers faced in comparison to men; the general discourse against them, the lack of training, and poor support by the Cutler’s Company, but she noted too that there were some advantages compared to other paid work offered to women. In Sheffield, particularly in the 1800s, there was an abundance of available work around the finishing processes of the metal goods, much of which was rewarded with relatively high wages. Bracey noted how domestic and working spaces, and therefore the male and female spaces, were fairly interchangeable, in contrast to the larger workshops outside Sheffield which had become increasingly gender separated. By focusing on one city, Bracey (2016) was able to make closer comparisons with other industries, assessing whether there were larger or smaller numbers of paid female

metalworkers found in Sheffield than, for example, Birmingham. In keeping with other scholars, she argued that the dynamics of mechanised industry have largely been understood by focusing on the changes in working men's lives, yet understanding the female workforce is also an important element in gaining an entire picture of the system. In contrast with early campaigning writers like Hutchins (1915), Bracey draws attention to the fact that in Sheffield "several female workers in the metal trades, irrespective of their marital status, open savings accounts independently from men", thus gaining a financial autonomy, at odds with the common experience of the time (2016, p. 192).

Hutchins (1915) alluded to the hazards that women metalworkers of her day were exposed to, which were often the problems caused by tinkering and soldering for very long hours (Hutchins, 1915, p. 137). Risks to health are likely to have included deafness, burns, repetitive strain injuries, eye strain, and lung disease or poisoning from the inhalation of lead solders and flux in unventilated rooms. *Women in Modern Industry* (Hutchins, 1915) was a study by a champion of women's causes, an advocate for a minimum wage, and a campaigner for laws to protect women in the industrial environment. As a leading activist in the movement opposing sweated labour, Hutchins' agenda was to draw attention to hardships and exploitation in industry, but of course this made those dangers no less real.

Hutchins' work would suggest that our present-day assumptions about who does metalwork are derived not from older and more integrated communal models of metalcraft, but from the more recent social conventions introduced through the factory system. Modern ideas of female capability and value in relation to metalwork might then be seen as a change brought about by the capitalist and industrial system imposed on individuals during the 1800s. Under the subtitle *The Woman Wage-Earner* Hutchins said:

The initiation of the factory system undoubtedly fixed and defined the position of the woman wage earner. For good or for evil, the factory system transformed the nature of much industrial work, rendering it indefinitely heterogeneous, and incidentally opening up new channels of employment, first, unfortunately, of children, afterwards of women

(Hutchins, 1915, p. 53).

As an activist, she was less concerned with setting out the arguments for women's metalworking skills or capabilities and more concerned about exposing the working conditions provided by the industry. She believed the industry restricted the kind of metalworkers women were allowed to be. It paid small wages for small jobs, and this low remuneration in turn would appear to 'prove' a woman's inferior ability. This writing is a very specific kind of historical account and a treatise for social reform, much in keeping with the intellectual thinking of the day. Yet it remains a valuable and important reference to historians because it centres on the lived experiences of the women themselves (Pinchbeck, 1969); (Braybon, 1981); (Walby, 1986); (Tilly and Scott, 1987); (Valenze, 1995); (Thom, 1998).

In *Women Workers and Gender Identities, 1835 – 1913: The Cotton and Metal Industries in England*, Carol E. Morgan (2001) focused her study on just two manufacturing activities in order to explore how womanhood and genders were defined. Acknowledging the complexity of such an appraisal, she used the area of metalworking as a case study, rather than making a full investigation into the craft and the ways in which women carried out the smithing. Morgan argued that the market for metal objects was expanded in the 1800s in keeping with the expansion of the British Empire and that the increased market, in tandem with the mechanisation of manufacturing, led to an expanded female presence in the workforce. This use of machinery extended the range of work available to the whole population, including women (and children), whose labour was sold at a cheaper rate. The fear amongst trade unions was that women workers threatened to displace higher paid male labour; an anxiety which further fuelled the gender disparities. Morgan (2001) used the example of metalworking to unpack larger issues of gender divisions brought about by an industrial setting. If physical size and capabilities defined a worker's suitability for a task, any innate segregations were removed by the mechanisation of metalworking processes, and Morgan argued that arbitrary pay divisions were made when production levels could no longer be a basis for remuneration. Morgan examined some of the newer metalworking trades that emerged in the mid-1800s, such as the production of metal bedsteads and steel pens. This particular avenue of female metalworking had been opened by the invention and introduction of foot operated stamp-hammers, allowing small components to be produced in a cleaner and more efficient manner, compared to the previous (male dominated) methods of forging and casting. It seemed that working identities were open to reinterpretation, and Morgan proposed that the debate at the end of the 1800s over what was

deemed suitable female labour was located entirely in the male domain – whether within the contexts of industry reporting, social commentary, or trade union agreements. Traditions in well paid metalworking for men based on long apprenticeships were being tested by the onset of mainstream mechanisation, now that unskilled women could be employed to operate machinery at a fraction of the price. Morgan examined ways in which trade unions not only defined the parameters of what could be considered female work, but later set out to protect the entire concept of the skilled male craftsman by actively excluding women from certain areas, even suggesting that this gender apartheid was a necessary component of the capitalist nature of the post Industrial Revolution era. By ‘othering’ female metalworkers they drove down costs. Building on Sylvia Walby’s *Patriarchy at Work* (1986) Morgan went on to argue that the exclusion of women from work paid at a similar rate to men, also served to maintain women’s subordinate position within the family. However, as a caveat, Morgan did see problems with critiquing the relationship between the patriarchy and capitalism. Referencing the work of Lerner (1969), she questioned whether women can reasonably be conceptualised as a single group, given their range and dispersal throughout a population.

In addition to investigations into the systems of female employment in metal industries, Morgan also argued that this related to ideas of male and female cultural norms. She suggested that simply by being employed in this sector, women had somehow transgressed the bounds of womanhood, and that the response from a paternalistic culture was an attempt to frame and control this kind of employment. By working in a group under a male employer, women could gain a certain respectability (especially if deemed a ‘good girl’) but any emerging separate female culture was “marked by such purported trivialities as gossip” (Morgan, 2001, p. 83). Morgan took the view that changes within the metal industry were more far-reaching than simply mechanical. They became challenges to notions of masculinity and tradition, questioning who owned the right to define craft and the material cultural narrative: “It was clearly the male Artisan, who traditionally passed on his skill to his son, who was the bearer of that culture. He represented ‘male armour’, based not only on the qualities of hard work or skill” (Morgan, 2001, p. 84).

Morgan further stated that there was an active agenda to prevent female labour from being introduced into a number of trades - namely those “monopolised” by men. She gives the example of The Society of Galvanizers and Turners, who went on strike against the introduction of women to the trade, refusing to admit them to the society (Morgan, 2001, p. 90). Unions representing

male workers objected to the threat of cheap female labour and began to frame their arguments less around equal pay and more about what work was suitable for a woman. This male centred debate attempted to define what the “proper avocations” of girls and women should be. Morgan suggested that this argument utilised the growing moral outrage of the day against sweated labour, namely that women should in fact be saved from themselves. She illustrated this by citing the 1909 campaign of the ‘Brass and Metal Workers’ Crusade’ – a “moral” attempt to remove women from the non-ferrous industry in Birmingham (although of course this may have been an isolated example). Certainly in the late 1800s and early 1900s there were genuine concerns about serious welfare issues to do with employing women and children in factories that were not just cynical attempts to incite moral outrage as a tactic against cheap female labour. However, as set out by Morgan, this debate paved the way for an understanding of the First World War concept of ‘dilution’ - the apparatus largely rooted in trade union definitions of female suitability and worth, which permitted women to enter the metalworking space albeit under the timed restriction of the duration of the war.

In relation to ideas of gendering and capability, Morgan’s research also covered some of the metalworking industries of mid nineteenth-century Birmingham and the Black Country. Here small nailmaking (hob and tack) was predominantly done by women, but Morgan (2001) stressed that there were no simple divisions between the kinds of work men and women did. What Morgan makes less clear is that nailmaking and chainmaking at this time were examples of the non-mechanised smithing done in small forges at home and overseen by a master (or mester). The notion of gender-appropriate tasks may be entirely connected to the act of bringing metalworking out of non-segregated domestic environments and into the gender segregation of factory settings. Morgan referred to the female chainmakers in the Dudley Wood district as an example of changing norms and expectations around women working with metal, although there are some ideas to the contrary. Certainly Hutchins (1915) had found evidence in the historical records of women working in earlier metal industries either as miners, smelters or forgers, going back as far as the 1400s. It would appear that the Black Country nail makers and chainmakers were continuing a much longer if overlooked tradition, rather than being accepted into new roles. That there were more women and children working in the metal trade is not in doubt, because as the British Empire expanded there was a greater need for chains and nails, leading to the industry’s demand for yet more cheap labour. Morgan noted an inevitable spiralling

degradation within the female chainmaking and nailmaking communities as she suggested that the model of family groups working together, with children learning the trade at mother's knee, could only lead to surpluses of labour in the decades to come.

As female factory workers became more visible within the industrial space at the end of the nineteenth century, attention turned to those in more obscured settings where vulnerabilities varied, depending on the location and format of the work. Literature written at the time increasingly revealed to the public the poverty that existed for those working in the home environment, out of sight of factory inspectors. Roberts (1995), in *Women's Work, 1840 – 1940*, explained the differing working arrangements for homeworkers and out-workers in factories. Out-workers would often carry out a single process in the chain of production, whereas homeworkers made items from raw materials supplied and controlled by an employer, and these women were often the most exploited.

Pinchbeck (1969 [1930]) had also made this connection between homeworkers and the worst examples of exploitation. Much of her research centred around Birmingham and the Black Country, and she described how children were put to work in chainmaking from the age of eight or nine, and pin-making from five onwards, with skills learned at their mother's knee. This blurring of home and work life contributed to the trade's invisibility to the public at large. Pinchbeck regarded the lives of women and children as a single group experience, discrete from the better paid male labour force. She noted how, even throughout the mid-1880s, the Children's Employment Commission in the Black Country (1841-3) appeared surprised to discover this concealed level of infant industry.

You might pass along a street fifty times, up the passages and courtyards of which there were shops containing nests of young children, and never know it ... They are as much out of sight as birds' nests.

(Tooke et al., 1843 quoted in Pinchbeck, 1969 [1930], p. 273).

Descriptions of female labour are often linked to ideas of the definition of female behaviour. In the same way that concerns would later be raised about the social habits of 'munitionettes' (Thom, 1998); (Moss, 2008), Pinchbeck again cited a section of the Children's Employment

Commission in the Black Country from 1843, saying that a different kind of young woman seemed to be emerging from these changing industrial settings, apparently 'growing up' before her time.

Accustomed to all kinds of rough and heavy work from childhood, girls employed in the small metal trades were grown up long before they were out of their teens. "*The effects of early work, particularly in forges,*" says the report of 1843, "*render these girls perfectly independent. They often enter the beer shops, call for their pints, and smoke their pipes like men.*" Some of them supported three and four illegitimate children and worked for them "*without a murmur.*" Others at sixteen or seventeen married workmen in the same trade, and as wives of little masters continued their industrial occupations in their homes. In the Birmingham trades also, it was customary for women to continue to work after marriage, either in workshops, where they frequently worked with their children, or at home

(Pinchbeck, 1969, p. 273).

These women bucked the social trend, continuing to work after marriage by bribing little masters and working from home. Home conditions were of a low standard, and Pinchbeck's observation that "Godrey's cordial" (an opiate based sedative, designed to be given to babies) was in frequent use, suggests one of the ways in which mothers negotiated their working days (Pinchbeck, 1969, p. 274). Absent is any tone of moral outrage in the report, although there is a sense of intrigue and certainly concern. These women, while undoubtedly living in poverty, nonetheless had a certain sense of empowerment.

If the first person voice is absent in the record of women metalworkers before the First World War, their lives do occasionally appear in fiction. In *Victorian Working Women: An Historical & Literary Study of Women in British Industries and Professions 1832-1850* Neff (1966 [1929]) set out to give an overview of women's paid labour and working conditions by drawing comparisons between their lived experiences and how they were represented in fiction. She tracked the arrival of working women as specific and definable figures in the literature and her inquiry largely examined the lives of governesses, textile workers, and dressmakers. Only some 'non-textile' workers were included – in part because they represented less of the female workforce of the day, but also because their lives existed outside the culture of letters and literacy. Neff noticed how the earliest working women to arrive fully formed into the world of literature, such as

governesses, were writers themselves, rather than those from any laboured trade (Neff, 1966, p. 151). She reviewed the ways in which the narrative around women workers was shaped by writers who did not entirely understand the industrial world, misreading the complexities of female employment. She suggested that if writers appeared unsettled by the appearance of women labouring in mills or factories, they had completely overlooked the long established hardships of domestic service or manufacture. The distinct concerns or even prejudices that fuelled the arguments that women should be kept at home, were identified by Neff as threads within literature, juxtaposed with themes of virtue and vice. Neff's research offered some useful accounts of female metalworkers in the fiction she researched, namely *The Wrongs of Woman* by 'Mrs' C. E. Tonna from 1845 (cited by Neff, 1966 [1929], p. 96; Tonna, 1845). Tonna described the tasks common to girls and women within factory settings, such as pin heading and polishing, nicking and worming screws, and burnishing and lacquering within the jewellery trade. Her prose evoked scenes of hardship in the cruelty meted out to girls working in pin making factories. Neff referred to another account of work related to the metal industries, found in an article in *Household Worlds* by Harriet Martineau (1852) entitled *Tubel-cain*. It gave a more positive view of such employment for women, explaining that if the lacquering environment was not ideal, the wages were comparatively high; an appropriate reminder that metal trades were not synonymous with poor remuneration in every single case.

2.2 The Cradley Heath chainmakers strike of 1910

At the turn of the twentieth century, it would seem that the best known female metalworkers in the United Kingdom were the chainmakers of Cradley Heath in the Black Country. Such recognition was prompted by the publication of *The White Slaves of England – Being True Pictures of Certain Social Conditions in the Kingdom of England in the Year 1897* written by Robert Harborough Sherard (1897). This publication is a compilation of articles written by Sherard over two months, following his investigations into the sweated labour of Britain. He interviewed alkali workers, nailmakers, slipper-makers and tailors, woolcombers, white-lead workers and chainmakers, endeavouring to report first-hand accounts of these people's lives. Of particular interest to this study is his description of the conditions found among the chainmakers of Cradley Heath - both male and female. He used direct quotes from the people he met, detailing their wages, expenses, accommodation and food. His account told of an unrelenting string of sorrows and terrible poverty. Designed to provoke public sympathy, if not outrage, Sherard's prose was

augmented by the high quality illustrations provided by Harold H. Piffard; no doubt serving to heighten the public response. An example of his work is found on the second page of the publication, which is a startling, almost photorealistic study entitled *Done to Death. Elizabeth Ryan dead in the Newcastle Workhouse* (Fig 2.1).



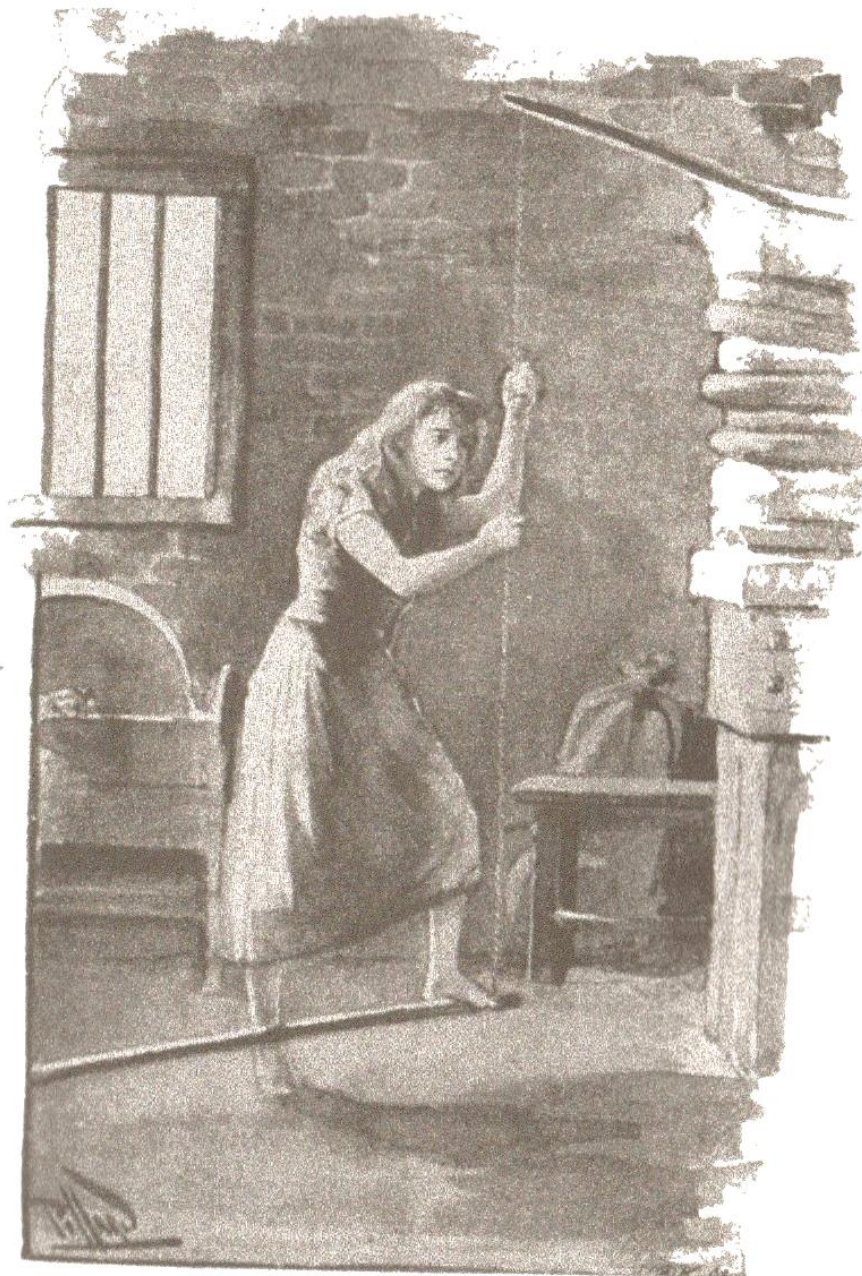
Figure 2.1 *Done to Death. Elizabeth Ryan dead in the Newcastle Workhouse* (Sherard, 1897, frontispiece)

In contrast to Sherard's stated method of interviewing workers away from the industrial environment, Piffard chose to walk through the front gates (having liaised with the owners and bosses) and openly draw from life. Sherard's apparently covert approach to his research made him vulnerable to criticism, and it was argued that his prose did not entirely chime with Piffard's visual account. He was accused on occasion of having exaggerated the plight of workers or having been misled ("kidded"), and questions were asked about whether he had understated the role of heavy drinking as a contributing factor in least some of the poverty and accompanying hardship (Maltz, 2020, p. 108). However, Piffard's iconic studies of the female chainmakers took hold of the public's imagination, particularly with their accompanying captions: *A Woman Plying her Task in a Cell-like Shed, Silent, Absorbed and Alone* (Fig 2.2), *A Particular and Pitiful Sight Was that of a Sweet Little Lass - such as Sir John Millais would have liked to paint - Dancing on a Pair of Bellows for Three Pence a Day* (Fig 2.3) and *Three Farthings Apiece* (Fig 2.4)



"A WOMAN PLYING HER TASK IN A CELL-LIKE SHED,
SILENT, ABSORBED, AND ALONE."

Figure 2.2 A woman plying her task in a cell-like shed, silent, absorbed and alone (Sherard, 1897, p.221)



"▲ PARTICULAR AND PITIFUL SIGHT WAS THAT OF A SWEET LITTLE LASS—SUCH AS SIR JOHN MILLAIS WOULD HAVE LIKED TO PAINT—DANCING ON A PAIR OF BELLOWS FOR THREEPENCE A DAY."
(See page 230.)

Figure 2.3 A particular and pitiful sight was that of a sweet little lass - such as Sir John Millais would have liked to paint - dancing on a pair of bellows for threepence a day (Sherard, 1897, p.231)



Figure 2.4 *Three Farthings Apiece* (Sherard, 1897, p.237)

Whilst the purpose of these images is to acknowledge and disclose the harsh realities of the lives of these women, their competencies and abilities as smiths is not in question. Together with all the other trades described in Harborough's book, the metalworking here provides just a detail in the overall scenes of poverty.

Well known suffragist and artist Sylvia Pankhurst also made watercolour and gouache studies in Cradley Heath during her 1907 tour of the North of England and Scotland, for her series *Women*

Workers of England, which was described in the publication *Sylvia Pankhurst, artist and crusader: an intimate portrait* (1979, p. 75). If Piffard's illustrations allowed us to imagine the toil described in Sherard's work, Pankhurst gave contrasting images of strong and rather beautiful women (Fig 2.5). Along with her written accounts she made powerful arguments for improved working conditions and pay, yet her subjects are imbued with more strength than pathos. Originally she had intended that her articles would be extended to form a published book, but instead her time became consumed by her involvement in the suffrage campaign.



Figure 2.5 "The Chainmaker" by Sylvia Pankhurst. Reproduced from Bonhams 'Votes for Women The Lesley Mees Collection' Auction 2023

It was within this world of campaigning that Pankhurst's path most certainly crossed with B. L. Hutchins who, as well as being a significant figure in the Women's Industrial Council and Fabian Society, was also a member of The Sweated Industries Exhibition Council, featuring prominent luminaries such as H.G. Wells, George Bernard Shaw, Mary MacArthur, and Kier Hardie (Mudie-Smith, 1906, p. 4). A year before Pankhurst painted her pictures of chainmakers, the *Daily News* Sweated Industries Exhibition opened to the public in May 1906, attempting to communicate to the affluent middle-classes the true cost of their commodities in a manner reminiscent of today's fair trade movement.

Featuring a large number of different industries, this presentation and its accompanying illustrated catalogue did much to bring the issue of sweated labour into mainstream consciousness (Figs 2.6 and 2.7). Within the growing awareness of sweated labour *per se*, the story of the chainmakers of Cradley Heath became one of the most well-known case studies, both from a contemporary viewpoint and retrospectively. Their story became one of the earliest illustrations to the public of the conditions in cottage industries (Rickard, 1979).



Figure 2.6 Cradley Chain Maker (Mudie-Smith, 1906, p.60)



Figure 2.7 A Cradley Chain Maker (Mudie-Smith, 1906, p.57)

B.L. Hutchins also visited Cradley Heath, publishing her report ten years after the visit and giving an account of the working forges (1915, p. 133). The 1910 strike she refers to is the one John Galsworthy witnessed in his essay *The Procession*, published in his collection *The Inn of Tranquility* (Galsworthy, 2001 [1910]). He set the scene of hammers being stilled and anvils silenced, as the procession gained momentum and more and more joined. He is unequivocal about the moral righteousness of this action, describing the women as a thousand and more of the poorest-paid and hardest-worked human beings in the world and when he draws the reader's attention to the tall, grey-haired lady interested in 'the people' he is most certainly referring to union leader Mary MacArthur, the founder of the National Federation of Women Workers.

At the start of the 1900s the Black Country produced most of the chain for the British Empire, and the Cradley Heath area was the centre of that activity (Moss, 2006, p. 17). Large chains were manufactured in factories by the men, and the smaller hand-hammered or country-work chains were produced by women in small forges at home. The women could not afford childcare, so their children came with them to work, tending the fires or learning the trade. Babies were wrapped up in boxes next to the forge or suspended from the ceiling in baskets to keep them out of the way (Nothing to Lose - The Women Chainmakers Strike of 1910 Cradley Heath, 1976).

Aware of these conditions, and following a Royal Commission enquiry into sweated labour, the Liberal government passed the Trade Boards Act in 1909, setting up regulatory bodies to instigate minimum pay rates in the most exploitative trades (Blackburn, 1991, p. 43). As a direct result, in early 1910, the Chain Trade Board arrived at a minimum wage of two and a half pence an hour for hand-hammered chain workers. This amounted to almost double the existing rate for most women, yet after the Trade Board's consultation period later the same year, employers were permitted six months' grace before bringing in the new pay levels. During this time, attempts were made by the employers to stockpile chain, with some hoodwinking employees into signing agreements ('petitions'), that bound them to the inferior pay structure (Hunt, 2019, p. 88). Many of the women were illiterate and did not understand what they had put their mark to, and this deception became the final catalyst for industrial action. Four hundred of the workers were trade union members as part of the National Federation of Women Workers (NFWW) (Barnsley, 2010, p. 41). Mary Macarthur eventually led a strike which would last for ten weeks. By 1910 she had become a well-known national figure, in part because of her suffragist campaigning, but also, like B. L. Hutchins, because of her involvement in the Exhibition of Sweated Industries in 1905 and in

the formation of Britain's Anti-Sweating League a year later (Mudie-Smith, 1906, p. 4). Hutchins acknowledged the energy MacArthur brought to the chainmaking community, whose union was, at that time, in decline (Hutchins, 1915, p. 131). In 1908 MacArthur presented her research on the lives of women in sweated labour to the House of Commons Select Committee on Home Working, and it was her testimony to the House of Commons in 1909 that helped pass the Trades Boards Act (*Minimum rates in the hand-hammered chain*, 1910). This Act allowed for the establishment of fixed rates of pay in four of the country's most sweated industries, namely chainmaking, box-making, lace-making, and the production of ready-made clothing. Chainmaking would become the Act's first test case. When in May 1910 it was agreed that a new rate of 2½ d an hour should be paid to the women, the Board had in fact legislated for a minimum wage for women chainmakers. Within a month of MacArthur calling the chainmakers strike, 60% of employers had signed the 'White List' and agreed to pay this minimum rate. The dispute finally ended on 22 October 1910, when the last employer signed the list (Barnsley, 2010, p. 47).



Figure 2.8 Cradley Heath Chainmakers' Strike (from "Women Chainmakers be hammer or anvil", 2021, p.3)

Mary MacArthur remains an enduringly fascinating character to historians, with writers like Barnsley (2010) celebrating her trade unionism, and others such as Cathy Hunt (2019) researching her hard work and life. Of relevance here is her ability to create a visual culture around a cause, and to promote it. Aside from the energy she put into the organisation of mass

meetings and marches, she understood the power of imagery and the impact of new media such as cinema. When she took twelve of the chainmakers to London to raise awareness and funds she insisted they wore their best clothes, but made sure they were photographed with the chains they had made, draped symbolically around their necks and shoulders (Fig 2.8). She also made certain that the frailest looking women appeared in the press photographs. This powerful blend of concepts, of fragile but dignified women in their 'Sunday best', apparently enslaved by the chains they had forged with their own sore hands, had a profound effect on the public, who donated sufficient funds to enable the industrial action to prevail (Hunt, 2019). Over a century later, this image of the Cradley Heath chainmakers, triumphantly rising up for justice, is still with us in the form of parades and re-enactments, the annual TUC Women Chainmaker's Festival, and most recently in the Opening Ceremony of the 2022 Commonwealth games in Birmingham. At this most recent event, all the striking chainmakers' names were projected onto the running track, whilst women, actors dressed in chainmaker's clothes, tamed the massive animatronic bull that represented the steel industry.

If this collective remembering of the women chainmakers celebrates the story of the triumph of trade unionism, one needs to look elsewhere for first person accounts from the women themselves, particularly about their high levels of skill and their relationship with their craft. Conversations about the 'unsuitability' of women as chainmakers tended to overshadow any appreciation of their expertise. In his review of the *Black Country Working Women* exhibition (held at Wolverhampton Art Gallery from November 1989 to January 1990), Christopher Bailey made a point in a similar vein:

At the same time the evident capabilities of such women contradict the notion of 'unsuitable work' which was, by the end of the nineteenth century, being used to debar women from making a living in trades such as nail, brick, and chainmaking.

Throughout the nineteenth century a theme among male writers was the diabolical character of the Black Country, a land of weird reversals in which women unnaturally took over men's work. The tone and emphasis of such writings often betray the introduction of sexual politics as where commentators noted simultaneously the physical beauty of young female labourers, and declared their 'unfitness' for the work

(Bailey, 1990, p. 76).

In *Chain & Anchor Making in the Black Country*, Moss (2006) gave a good technical overview of the metalworking practices involved, set against the historical context of the industrial Black Country a century ago. Read through the eyes of a smith, this is as much a working manual of technique, as it is a chronicle. He said, “I have never seen a formal legal, indentured apprenticeship agreement for a girl chain-maker but I have seen several agreements for boys” (2006, p. 44). He went on to give a fulsome synopsis of what the long path to competency would look like for anyone making chains, but leaves one to assume this applied to boys who had signed the apprenticeship agreement, even though girl chain-makers certainly existed.

A lack of literate metalworkers generally prevented the women’s own accounts of their work from entering the historical record, leaving their lives as craftswomen to be examined and remembered by others who are often less interested in the actual smithing. The advent of filmmaking within the lifetime of these women gave them a first person voice on a small number of occasions. In October 1970 Tom Farmer and Peter Barnsley of the Sandwell Society of Film Makers produced a short film about Lucy Woodall, said to be the last woman chainmaker from Old Hill (*Lucy Woodall*, 1971). In it, footage is shown of her forging chains in her seventies set against her own narration. She reminisces about her working life, her family, her wages, and her holidays hop picking. Yet although the film is illustrated by her incredibly skilful forging of two different kinds of chains, none of this is actually spoken in the narration. This visual record provides a wealth of practical information about smithing that does not appear to have been analysed by the filmmakers.

A more detailed film, showing interviews with elderly women chainmakers, was produced by researcher Valerie Ann Lester and directed by Sarah Boston (*Nothing to Lose - The Women Chainmakers Strike of 1910 Cradley Heath*, 1976). This half hour documentary shows footage of interviews with chainmakers Sarah Chater, Dora Stoneley, Bella Lowe and Myra Hall – all of whom had participated in the strike of 1910. It is relevant because no earlier account of women actually explaining their own metalworking skills, or how they were smithing could be found during this research. Sarah Chater described her rapid training when she began chainmaking in 1905, remembering how she was challenged by a stranger whilst fetching the iron rods from the suppliers and told that this was not the job for her. She recalled how her decision to enter the forge and do chainmaking was the preferable alternative to going into domestic service. “There was nothing else really. If you went to service you was a prisoner. They never let you out much.”

She described her limited resources in terms of equipment and gave a step by step account of how she formed chain links from rods of steel.

Dora Stonely talked about starting work as a twelve year old child and about adapting the work space because of her stature. “I had to stand on four bricks. I weren’t tall enough to reach the block, you know”. In the film, she raises her right hand to the camera, showing how the joints of her knuckles were distorted. “This is my hammering hand. You can see that knot. Look at it. My hammer hand that there.” Myra Hall also started chainmaking as an eleven year old. She explained the process of learning and the risk of ‘burning’ the iron (making it brittle and pitted by overheating). “My mother learned us ... she got the work up and worked for Sykes and Willets and big factories you know. Well, I had nothing when I was eleven. We’d got to learn, when we used to spoil a lot of iron, burn it, or you know, not get it just right – but when we got it done right we’d got to make chain”. Both Myra Hall and Bella Lowe referred to managing childcare by putting the babies (in a basket) on a wooden block in the workshop and working beside them when they were awake, and taking them indoors when they slept. Such firsthand insights into the processes of being a woman smith whilst managing childcare are rare. Filmmaking had bridged the gap between their non-literate world before the First World War, and new metalworkers who would arrive as a result of the conflict.

2.3 Working women in the First World War

Just four years after the Cradley Heath chainmakers’ strike the First World War broke out, bringing with it rapid changes in the ways women worked within the metal industries and the ways they were viewed by society. Much of the contemporary literature about women working in metal industries comes from the newspapers and government reports of the day. Later academic appraisals start from the 1960s onwards, when the female experience of the war started being considered an aspect of the conflict worthy of research. Previously, accounts of the war had concentrated largely on the political landscape, actions and strategies on the frontline, and the paraphernalia of battle.

In her doctoral thesis, Hogg (1967) looked at all female work in Great Britain from 1891 to 1921, to understand the mechanisms of gender division in employment. Her research covered a comprehensive and far reaching range of trades, from domestic service to teaching, medicine, law, social work, literature, and administration. She referenced manufacturing trades and

included a small section on metalwork, asking questions about why women were absent from the work that men did, and why men were absent from the work that women did. By investigating the years immediately before and after the First World War she examined how and why permissions of entry into male spaces changed because of the conflict, and to what extent they represented long term progress for women. She defined twenty-one of the nation's industries and sorted them into two categories, in which either women or men were the vast majority of workers. She identified female dominated occupations as, personal service, clothing and textiles, and then categorised male dominated occupations as agriculture, fishing, and mining. Hogg (1967) argued that the female/male discrepancies in earnings could not be explained by differences in the hours worked or non-corresponding tasks, instead concluding that the very different upbringings the girls and boys received, based on the view that a women's hands and brains were naturally inferior to a man's, played a far greater role. A woman's function in life was to be the homemaker. To be a 'lady of leisure' was a measure of success, unlike men, whose sense of accomplishment was linked to the kind of work they were engaged in and how well they performed it. However, Hogg also stated that:

From this it does not follow that sex differences in labour attributes would have vanished if upbringing had been occupationally insignificant. Obviously biological differences exist and they might have diverted the labour of men and women into separate channels. All that is being claimed is that the supply distinctions noted for the 1891-1914 period were traceable in the first instance to the different upbringings of men and women.

(Hogg, 1967, p. 234).

Recognising that there were legal limitations designed to protect the nation's child bearers from unhealthy environments in place, Hogg noted that restrictions were also being imposed by employed men protecting their positions from cheap labour. Women had no choice but to accept 'women's wages'.

In the years immediately preceding the First World War, the overall quality of the work that women were engaged in improved, despite the fact that the number of females in paid employment was declining. According to Hogg (1967) this drop in numbers was attributable to the rise in the school leaving age, as it had been girls and the youngest women who made up a greater proportion of the female workforce (Hogg, 1967, p. 2). The nation was also developing

an interest in social and welfare reforms, and the growing women's rights movement may also have been a factor in these changes. Inroads were starting to be made into the male workspace as mechanisation and automated processes widened the scope for women's inclusion in developing industries such as chemicals, oils and metals. This initial shift in the work demographic mostly represented the start of more opportunities for women, rather than a usurping of male roles. Hogg (1967) concluded that industrial developments were altering female and male roles within labour, not necessarily at the expense of the other's employment, and it was this existing shift that was then accelerated by the First World War:

The unprecedented orders for standardized articles to equip the military had the effect of rendering a higher proportion of the nation's work within the performance powers of women. In this regard women's entry involved no new principle.

(Hogg, 1967, p. 238).

This blurring of the lines of gender roles within employment developed in a number of directions. As well as a shift towards 'rougher' occupations, opportunities also arose for women to take on new roles as supervisors and oversee an increasingly female workforce. If Hogg argued that the problems in implementing the wartime substitution process lay in deeper rooted ideas of what constituted male and female work, she also noted how other inhibiting factors, such as welfare legislation, were easier to negotiate under the common aim of winning the war. This sense of a common aim had managed to convince the men that sacrifices were necessary to secure victory whilst offering tangible assurances that their "privileged occupational position would not be affected detrimentally either during the war or in the immediate post-war period" (Hogg, 1967, p. 184).

Hogg also noted how the process of redesigning men's skilled work to create unskilled labour for women workers took two forms. Either the skilled elements were separated from the unskilled parts, or the skilled processes were divided into smaller operations. As each of these approaches had limitations in quality production, a new approach was adopted to recruit women with higher skills and abilities (Hogg, 1967, p. 189). Hogg suggested that this marked a change in the way that female workers were viewed and that it was necessary to see them as individuals, forcing employees to "reexamine their stereotyped conceptions of women" (Hogg, 1967, p. 240). Recruitment policies were supported by training, welfare and sometimes childcare provision, all

subsidised by the government as part of the cost of war, rather than by the factories. Hogg argued that the length of the war had a bearing on these changes:

Had the war lasted only two years instead of four, women's employment patterns would have registered very little change even though change was in the making. On the other hand, had the war lasted longer, even greater changes would have been noted.

(Hogg, 1967, p. 241)

Hogg noted how sex divisions manifested throughout wartime. Women were still excluded from areas such as combatant service, the merchant marine service, and mining - despite the shortage of labour there. She maintained that structural changes in wartime labour patterns failed to last long term and that by 1921, the number of working women returned to what could have been expected from pre-war trends (Hogg, 1967, p. 241). When the legal and employed men's restrictions (suspended during wartime) were reintroduced, it led to the mass withdrawal of married women from the labour market and most female employment gains were lost (Hogg, 1967, p. 217). However, Hogg concluded that being a woman had become less of an employment handicap because the war had exposed individuals to new ideas and many employers continued use the dilution template of staged production.

Hogg's thesis examined the structure of female employment during the First World War, but the experience of those women participating was not reviewed in academia until the 1960s when Mitchell (1966) wrote on the subject. According to the Imperial War Museum's librarian Sarah Paterson (2018), he was one of the first researchers to investigate the Women's Work Collection for *Women on the Warpath* (1966). Mitchell researched the growing presence of women in areas such as nursing and healthcare, clerical work and public transport, set against a lengthy discourse about trade union activity and the campaign for women's voting rights. In a chapter *The Munitionettes* he offered an overview of women working in munitions factories, but with little detail about the processes involved and work being undertaken. He highlighted the massive scale of operations at the Woolwich Arsenal, mostly referencing tasks around filling and priming shells. He discussed the accidents and explosions that killed or injured women engaged in the work, illustrating the narrative by homing in on Miss Lilian Barker, the Lady Superintendent of the factory, and explaining her popularity as a supervisor and her compassion for the underprivileged. Mitchell used her story to make comparisons between the middle and upper

class workers and considered the changes in social structure instigated by the needs of wartime and of a mixing of the classes (1966, p. 249). He also gave an account of Mary MacArthur, describing her ongoing lobbying for better pay and conditions for women workers during the conflict.

Researchers in the 1980s and 1990s such as Gail Braybon (1995), Deborah Thom (1998), Angela Woollacott (1994) and Deidre Beddoe (1983), began to identify the experiences of working women in the First World War as important and pivotal parts of war history. This developing interest in women's history in general can be considered a part of second wave feminism, and coincided with emerging first-person accounts from older women like Peggy Hamilton (1978), now reviewing their own war service. Braybon, Thom, Woollacott and Beddoe revised the notions of the home front and the war front - and hierarchies thereof - by questioning the way that wars had traditionally been described in terms of weapons, manoeuvres, conquests and men. They argued that these were only aspects of war that gave a partial and incomplete view of how people are affected. Feminist historians Braybon (1981), Thom (1998), and Woollacott (1994) all looked at primary source material from the Women's Work archive in the Imperial War Museum, examining the processes by which women were allowed into a male space and how this could be rescinded as peace returned. They considered how women returned to their pre-war lives and how careers were denied, after years of service within the munitions and metalworking industry.

Braybon became one of the definitive authors on female lives during the First World War. Her first publication (1981) examined the experiences of working class women by charting the changes seen in their working practice during the 1800s and a developing factory system that had led to a separation of home and work spaces. She made a distinction between paid and unpaid working women, tracing mechanisms that led to the social norms defining each. These included her view that the:

...patriarchal system coexists with the capitalist system; the working class have been exploited by the latter, but women have also been oppressed by men of their own or other classes in a multitude of ways.

(Braybon, 1981, p. 12).

Her investigation accepted the notion of a system in which working class men were required to accept the lower status of women and of the strictly defined gender roles in the home – a mechanism, she argued, that bolstered capitalism. It added to men's own economic vulnerability, motivating them to “fight for higher male wages, rather than shorter hours or better conditions for all”, based on the assumption that “women need less money when working, that they will be dependent upon men for most of their lives and that they will perform all domestic tasks and look after the children whether or not they are doing paid work themselves”. (1981, p. 12). Braybon explored how new gender roles came into being when challenged by the war: “a study of women's position during the First World War isolates one phase of a continuum” (1981, p. 13). Her work examined the moments when societal norms had become negotiable, taking a broad overview of how women initially adopted men’s jobs in the early stages of war and how this evolved. When men started to be enlisted, women often informally took the places of male family members in roles such as van driving, window cleaning, or working as shop assistants, but:

...major industries remained wary about using them, unions remained worried about the effect of female labour on wages and security, and the women themselves were given little opportunity for training.

(Braybon, 1981, p. 45).

This ad hoc arrangement changed on 9 May 1915, when The Battle of Aubers (an offensive attack on the Western Front) ended in a disaster caused by a lack of munitions, and British casualties exceeded those of the German side by ten to one. It triggered a political emergency known as the ‘Shell Crisis’ resulting in an upgrade for the Munitions Department from War Office to cabinet level (Hughes-Wilson, 2014, p.134). A coalition government was formed, Lloyd George was made Minister of Munitions, and a year later he became Prime Minister, bringing with him the dilution of labour programme.

Braybon (1981, p.46) noted that at this time there was a surplus of unemployed women, largely released from domestic service as big houses reduced their outgoings because of wartime. A national registration scheme for women looking for paid employment was set up, and this brought a large number into engineering and explosives work, which in turn created a shortage of labour in the ‘traditionally’ female clothing and textiles trades. By August 1915, the number of women working in the now more lucrative munitions industries increased, but they were still

doing the work considered within the remit of their capabilities. When conscription for men was introduced in January 1916 (albeit with exemptions for older, married, or skilled workers) the number of female munition workers increased further still. When in February 1918 The Manpower Bill was passed, it cancelled all previous conscription exemptions, largely due to the success of female labour (Braybon, 1981, p. 46 (citing Cole, 1923)). This development briefly opened up new skilled opportunities for the wedded women who had previously been removed from industry at the point of their marriages.

2.3.1 Engineers, munition workers and 'substitution'

In her thesis, *Women Munition Workers During the First World War with Special Reference to Engineering*, Marion Kozak (1976) became one of the first researchers to examine changes in women's employment brought about by the conflict. Like Hogg (1967), Kozak noted in her preface the increasing number of women who had been working in the new metalworking industries over the twenty years preceding the war, attributing this in part to early motor industry growth. Kozak saw this emerging engineering industry as having slightly different expectations about the kinds of work women could do, and so whilst the number of female engineers was indeed small, limitations imposed by the new unions in this industry were less established or far reaching.

When the Munitions of War Act of 1915 was passed, it was designed to maximise output and bring the private companies supplying arms under the control of the recently created Ministry of Munitions, led by David Lloyd George (Braybon, 1981, p. 53). Specifically, the Act defined munitions as:

1. Manufacture or repair of –
 - a. Arms ammunition ships vessels vehicles aircraft and any other articles or parts of articles intended or adapted for use in war
 - b. Other ships or vessels certified by the Board of Trade to be necessary for the successful prosecution of the war
 - c. Metals, machines or tools required for any such manufacture or repair
 - d. Materials of any class declared by an order of the minister to be required for any such manufacture or repair

2. Repair of fire engines and fire brigade appliances when certified by the Minister to be necessary in the national interest
3. Construction –
 - a. Construction alteration or repair of –
 - i. works of construction or
 - ii. buildings for naval or military purposes
 - iii. buildings for munitions work
 - b. Erection of machinery or plant in such buildings
 - c. Erection of houses for munition workers
 - d. Construction, alteration, repair or maintenance of docks and harbours and work in estuaries where the work is certified by the Admiralty to be necessary for the successful prosecution of the war
4. Supply of light, heat, water, power or tramway facilities when certified by the Minister as of important for carrying on munitions work and the erection of buildings machinery or plant for such supply
5. The operation of the extended definitions of munitions work in the new Act was postponed until the provisions relating to leaving certificates took effect

(Chartres, 1916).

Angela Woollacott (1994) built on Kozak's ideas, but focused entirely on the women brought into factories as a direct response to the Shell Crisis, rather than those who had been involved in the industry prior to the war. Using government reports to pinpoint demographic changes in the industries, she examined how the supposedly fixed points of 'appropriate' work choices for women shifted in times of upheaval. Citing the 1911 census, she suggested that women working in industry had actually outnumbered those in domestic service by 2,047,700 to 1,734,040 (1994, p. 20). This difference grew as the war escalated and more younger women found themselves without paid household work, becoming available to take on new roles as part of the war effort. Woollacott agreed with Hogg's view; that it was attitudes that were changing, rather than women's abilities (Hogg, 1967, p. 224).

Reviewing literature on women's munition work uncovered only small and almost incidental accounts of the actual metalworking practice. Of the new recruits arriving into munitions

production from other trades and occupations in 1915 and onwards, Woollacott showed that many women had already worked within the metal industries. Activities she identified included making, “chains, nails, bolts, nuts, screws, rivets, and springs; light castings and allied trades; tin-plating; wire drawing; the making of both general and electrical engineering; and cutlery and metal smallwares” (Woollacott, 1994, p. 21). In Birmingham and Newcastle, women were employed in small arms and ammunition manufacture and electrical engineering (Woollacott, 1994, p. 21).

Woollacott argued that the lives of women metalworkers had been less well understood partly because metalworking was perceived as a male occupation. She arrived at a figure of 175,000 women working within the industry, but also made the point by citing Walby (1986) that:

Male craft unions in metals and engineering had jealously excluded women in the nineteenth century, but after the turn of the century that exclusion weakened in areas of semiskilled work.

(Walby, 1986 cited by Woollacott, 1994, p. 21).

In examining the increasing number of munitions workers (and within this group the metalworkers) Woollacott made comparisons between the different industries during the First World War. She noted that the 863,000 women working in the textile industry in 1914 had fallen to 827,000 by 1918, and compared it to the 170,000 women working in metal industries in 1914, which rose to 203,000 in 1915, then to 370,000 in 1916, 523,000 in 1917, and finally to 594,000 in 1918.

Braybon (1981) echoed Woollacott by showing how the programme to bring women into male work spaces should not be confused with parity or equal opportunity. She suggested that women were systemically disadvantaged because of the arbitrary ways in which their deployment was structured: “labour exchanges were not fully utilised, women were sent to areas where there was no accommodation available, skilled women were sent into unskilled jobs etc” (Braybon, 1981, p. 56). Braybon highlighted other obstacles to women’s entry into metalworking, such as a lack of standard training and limitation by union agreements. Embedded within the Shells and Fuses Agreement of 1915 were clauses that effectively futureproofed industries against the use of female employees beyond the conflict. Braybon (1981) made the political point that these

women had very little political autonomy, and she objected to the idea that they were rewarded for the work they did during wartime with the vote, in her later essay *Women and the War* (1995).

Historians have examined how women's inclusion into munition manufacture was facilitated. Prior to the war, a male metalworker would have undertaken an apprenticeship of around six to seven years (Kozak, 1976, p. 107), following which he would become conversant with all stages of production, progress to being a journeyman, and when fully skilled would be paid a high wage. When rapid output became the highest priority during the First World War, a method of breaking production tasks down into the smallest operations became necessary (Woollacott, 1994, p. 93). These operations would be taught to unskilled workers on production lines, who could rapidly fabricate and assemble components. In engineering especially, this was known as dilution of labour, although the concept extended to other areas of metal construction work, and was widely seen as a substitution programme. According to Braybon this was broadly a four part process:

- (1) Complete, or direct substitution (each women replace one man, doing all of his work).
- (2) Indirect substitution (e.g., women replaced unskilled or semi-skilled men while they moved on to more difficult work).
- (3) Group substitution (several women replaced a smaller number of men).
- (4) Substitution by rearrangement (the processes were changed, and women replaced men with the aid of improved or new machinery).

(Braybon, 1981, p. 61).

This idea of splitting the processes of industrial construction into small production line tasks, in order to facilitate the recruitment of non-apprenticed female workers, had an ambiguity about worth, observed by Braybon:

...the majority of women in industry were 'substituting' for the men who were absent, and it may seem pedantic to worry about the extent to which each woman employed was actually doing each man's work, but this in fact mattered greatly – to women, who could be paid less on the grounds that processes had been changed, and to men, who were threatened by the use of women workers as cheap labour.

(Braybon, 1981).

Woollacott also explained how unions had been concerned for many years about the “incursion of unskilled laborers into the preserve of skilled workers, the ‘aristocracy of labour’” (1994, p. 91). She suggested that the threat of female incomers who represented cheaper labour contributed to an increased militancy within trade unions and a rise in the shop stewards movement. Woollacott gave the Amalgamated Society of Engineers (ASE) as an example of a union most nervous about the intrusion of women workers. They signed a separate agreement with the government, with an implicit promise that all women ‘dilutees’ would be forced out at the end of the war as part of the return to the status quo (Woollacott, 1994, p. 92). The lives of women working with munitions and metal sit firmly in the intersection between the needs of a country at war, the male protectionism of long established trade unions, and the background of first wave feminism, providing appropriate case studies for academic researchers of any one of those subjects. For writers like Braybon and Woollacott they offered illustrations of the complexity of a woman’s place in society and industry in the early 1900s.

Thom used the theme of munition work as a vehicle to explore the lives of women, first with her research about the Woolwich Arsenal (1978), then later in her book, *Nice Girls and Rude Girls: Women Workers in World War I*” (1998). In the former study, she outlined the union mechanisms that brought women into the munitions workspace, as well as the personal anecdotes of those same women. In the latter she broadened her exploration to consider how the research area of female history extended in the latter part of the twentieth century to include the material conditions of women’s lives as a means of understanding labour and gender divisions, comparing research from Kozak (1976), Braybon (1981) and Woollacott (1994) with the traditional male historian styles of Mitchell (1966) and Marwick (1977). Wightman (2014) examined both the First and the Second World Wars, looking very specifically at how women were able to enter skilled and well paid fields of engineering, and what prevented them.

Most research into women’s metalworking in munitions looked at London and large operations like the Woolwich Arsenal, although some work has been done investigating other home nations. Beddoe (1989) initially explored the subject from the standpoint of the interwar years, assessing the extent to which life returned to ‘normal’ for the women, and what changes may have become more permanent. Beddoe (2000) revisited the subject over a decade later, studying the

experience of Welsh women and looked at the broad range of setups where female labour was deployed, which included some metalwork and munitions. The picture she created is one where there were pockets of female activity within metalworking (such as tin plate working) prior to the war, whilst acknowledging that the vast percentage of the industrial workforce was male, mostly working in mines. As an aside, she noted the case of Amy Dillwyn who owned and ran a spelter works in Swansea, presumably to show that although rare, the potential to be a female metalworker in control of a business was possible (2000, p. 36). Beddoe wrote of similar issues in Wales to other parts of the country, such as the demand for women in munitions and the process of substitution. Privately owned companies became government-controlled as part of the war effort, and National Shell Factories were set up in South Wales at Cardiff, Llanelli, Newport, Usk and Swansea, as well as in the North at Caernarfon, Porthmadoc, and Wrexham. There were also explosives works at Queensferry and Pembrey, and the factories in Swansea and Caernarfon produced massive shell casings for (up to) eighteen-pounder high-explosives. Beddoe highlighted the health hazards that workers were exposed to by pointing out that between 1917 and 1918, 3813 acid burns, 2128 eye injuries, 763 cases of industrial dermatitis were treated, and 12,776 accidents occurred at Queensferry. Fatal accidents, while uncommon, did occasionally happen, and she refers to a photograph of one of the two funerals of women munitions workers which took place in Swansea on August Bank Holiday Monday 1917, showing a “quasi-military tribute to the two dead girls with their coffins draped in a Union Jack and with their fellow female munitions workers, in their uniforms, acting as pallbearers” (Beddoe, 2000, p. 62). Beddoe also reflected on the paradox of the celebration of women’s war service in the munitions factories, followed by the sense of dismissal post conflict:

Newspapers and other media agencies, which in the war had celebrated the part played by “our gallant girls” and “our Amazons”, changed almost overnight: before 1918 was out, they attacked “women who stole mens jobs” and “pin-money girls” and held up the role of the stay-at-home housewife and mother as the only desirable model of womanhood.

(Beddoe, 2000, p. 75).

Baillie’s thesis (2002) visited similar themes in terms of recruitment and conditions, and also examined the prevalent union activity prior to and following the intake of female workers. She

argued that some women did become proficient in certain specialised engineering processes, but she qualified this by stating it would be 'ludicrous' to claim that a six-week training course would result in women having comparable abilities to the skilled engineer who had undergone a seven-year apprenticeship. However, "Women demonstrated that they had the capacity to learn advanced machine work, and that, given similar circumstances and the same training as the men, women had the ability to become skilled engineers." (Baillie M., 2002, p. 61). Walsh's journal article (2017) focused on munitions production in Ireland, namely the five state-run National Shell Factories which were built in Dublin, Waterford, Cork, and Galway. Although the capacity of these combined facilities was less than the larger set-ups outside Ireland, the study found specific preference for women workers from the outset, based on the success of 'substitution' programmes elsewhere such Great Britain and France (Downs, 1995).

A consequence of the wholesale recruitment of women into munitions factories was the interaction between people from increasingly diverse demographic, as munitions factories were set up in many locations across the British Isles and women often moved away to seek work. Braybon referenced I. O. Andrews (1921) in accounting for the increased labour in munitions; namely by women transferring from slack to busy trades, the return of married women, the movement of workers from low paid industries, the entrance of some older women or girls straight from school, and very few middle or upper class women. "In spite of impressions to the contrary, the proportion of previously unoccupied upper and middle-class women entering "war work" was by no means large" (Andrews and Hobbs, 1921 cited by Braybon, 1981, p. 47). Braybon also observed how a significant proportion of women arriving at the metalworking industries were the married women who had previously been barred (1981, p. 49). Woollacott (1994, p. 32) also reviewed the class demographic of the wartime metalworkers, and credited the incumbent government with finding a balance between creating financial inducements to recruit a sufficient female workforce and then successfully dismissing them at the end of the war. Woollacott also suggested those from wealthier backgrounds may have been less inclined to protest about job losses at the end of the war.

The great appeal of these women in the eyes of the ministry and employers, beside their assumption that better educated women would learn skilled work more quickly, was that these women would be pleased to hand their jobs back to returning soldiers at the end

of the war. Working-class women, they knew, would be more likely to resist dismissal and demand to be kept on.

(Woollacott, 1994, p. 40)

This wider recruitment agenda swept literate women into this environment, whose self-reported accounts are now on the record. These include the private diaries of policewoman G.M. West, assigned to munitions works at Pembrey in South Wales (West, 1917), which offer insights into local and trade unions disagreements. When Peggy Hamilton committed her memories to the page, in her book *Three Years or the Duration* (Hamilton, 1978), she offered an unusual first person appraisal of the lived experience of a female munitions worker, and may be one of the first examples of a women metalworker able to record and narrate her own experience.

2.3.2 Gendered language, imagery and attitudes

The ways in which female experience of the First World War was reported has been observed by authors examining the styles used and the vantage points of the writers. In *Gender-Charged Munitions: The Language of World War In Munitions Reports* Culleton (1988) used the case of female munition workers to explore how gendered language works in atypical times, and to expose some of the tropes and metaphors used in reports of the day. She suggested that some writers seem only to be able to understand the idea of women successfully carrying out 'men's' work by overlaying traditionally feminine or sexual attributes to the processes. She referenced for example Hall Caine's *Our Girls: Their Work for the War*, which overlooked the mundane and practical reasons why women may be accepting positions in munitions by stating:

a stronger impulse than the desire for large earnings must be operating with many to enable them to defy so much discomfort. This is not the first time that women have made munitions of war. For every war that has yet been waged women have supplied the first and greatest of all munitions – men... Therefore, consciously or unconsciously, the daughters of Britain may be answering some mysterious call of their sex in working all day and all night in the munitions factories.

(Caine, 1916, p. 34 cited by ; Culleton, 1988, p. 110).

Cullerton explored an idea that the female response to the war effort, and in particular to physically demanding work, may have been a mystery to some commentators who seemed to

feel obliged to provide an explanation within the constructs of their own understanding of womanhood. It is hard to know if Caine (also referenced by Kozak (1976) for similar reasons) was a writer attempting to make the situation more acceptable to his readers by softening the making of weaponry as a kind of maternal delivery, and also hard to know from the article how typical this point of view was from the commentary of the day. Certainly, it sits uneasily with accounts from women like Peggy Hamilton (1978) whose own lived experience would emerge into print much later. However, both accounts have a certain undercurrent that all the upheaval would be gone after that war, and everyone could return to their *proper* place and occupation. There is a sense of a temporary situation here. It is also true to say that newspapers of the time would flavour their appeals for a nation's war effort with a certain kind of patriotism linked to being a *proper* woman, even if the work presented as masculine. Cullerton also draws attention to postcards of the day, some of which portray glamorous women sitting astride large and rather phallic missiles and shells. It is hard to know the context of these, and they were unlikely to be part of an agenda to sell the idea of female women munitions workers to the public. More likely, they were produced for the same reason that most saucy postcards were made – to titillate the male gaze and generally amuse.

Bowen (2008) also considered the portrayal of women in munitions and the manner in which this was cultivated for recruitment purposes, especially when aimed at educated women. She noted how the changing roles in wartime were motivated as much by wages as by patriotism. Those engaged in effective recruitment propaganda sought to shift visual expectations about how nice girls looked and behaved. If gender is reflected by appearance and that appearance had constraints, the shift was to create new normals for women by adapting rather than reversing norms - extending boundaries of convention to unlock an unused workforce. Bowen saw that although women's dress codes were required to change because of practical requirements of factory employment, a gender demarcation still remained.

Thus, Claudine Cleves [*sic*] in her regular Women and the War recruiting series for the Illustrated London News is systematically at pains to insist on the excellent family, careful education, acquired skills and practical but feminine clothing of the women seen at work. The photography is often inspired by the aesthetics of the pre-War studio with gently light, young and attractive women shown contentedly at work.

(Bowen, 2008, p. 30)

In contrast to Caine (1916), Claudine Cleve acknowledged the exceptional nature of the task and highlighted the adaptability of women workers capable of embracing all callings, including those outside of their previous experience. Bowen showed how Cleve used images as much as words to illustrate the 'logical' nature of female employment for recruitment purposes. The sensibilities of the early photography echo a pre-war visual culture of softly lit and posed scenarios, featuring almost whimsically attractive women.

How women were actually perceived in their own time is a subject debated by many historians, and opinions varied wildly in terms of how they were viewed by the media, other women, and male co-workers. Furthermore, 'dilution' both as a concept and as a government term, was problematic because it legitimised the idea that female workers were less capable, and that the quality of work was being reduced. It allowed trade unions (in particular the ASE) to protect the interests of their male workers by keeping them in a higher/ more elite category. Conversely, in other contexts they were the darlings of patriotism and treated with delighted surprise at their capabilities:

The Englishwoman reported the view of the manager of one large factory that women workers "are just splendid, eager and quick to learn, punctual and regular in attendance, obedient and tractable, and they don't 'raise trouble'". Moreover, women's wages were less than men's.

(Chadwick, 1916; cited by Woollacott, 1994, p. 94).

Contemporary debate about the disruption of social norms extended beyond the context of women's employment and into their private lives. As women working in metals and munitions became more established, questions were raised in certain quarters about 'unladylike' behaviour. One particular area of concern was examined by Moss (2008) in *Wartime Hysterics*?: *Alcohol, Women And The Politics of Wartime Social Purity in England*, and related to concerns of the day about the new phenomenon of women with disposable income from munitions work, and how they chose to spend their money. The main concern was about the way women were drinking, how they were beginning to inhabit a 'male' drinking environment, and what effects

this may have been having on childcare and family life. The tone is set at the start with a quote from Sylvia Pankhurst:

Wartime hysterics gave currency to fabulous rumours. Stories ran rampant of drunkenness and depravity amongst the women of the masses.

(Pankhurst, 1987 [1932] cited by; Moss, 2008).

Moss's research highlighted a 1915 report in *The Times* about a magistrate of the Old Police Court reprimanding twenty-six women for their "perfectly shocking" behaviour. She used it as an illustration of the kind of scrutiny women were apparently undergoing by more "reactionary social commentators". According to Moss, despite the societal unease about stories like these from temperance reformers and "social purity" campaigners, a number of government inquiries failed to uncover any major cause for concern. Women were now entering public houses unaccompanied by men, but with men away on combat missions and women munitions workers on shift patterns, these changes reflected societal shifts rather than increasing female inebriation. Furthermore, the government of wartime Britain was as concerned with male alcohol consumption, needing to ensure that recruits were able to fulfil their duties. Moss however used this inquiry into alcohol consumption to examine the broader issues of expectations around female behaviour. Certainly, there had long been concerns about the relationship between alcohol and poverty, but these had been entirely focused on the men of the household as they had the financial means to imbibe. Concerns about women drinkers stemmed largely from their overall 'transgression' into not only the male territories of pubs and factories, but also of financial autonomy. Moss highlighted the founding of the Central Control Board (C.C.B.) by the government in 1915 to limit the flow of liquor, with the direct intent of increasing ammunition production. The Women's Advisory Committee was formed to look specifically at any alleged excessive drinking by women, and eventually concluded that fears were largely unfounded. It also rejected the claims about the misuse of the household budget, noting that whilst money may not always have been spent "wisely" – on pianos, gramophones, jewellery etc., the overwhelming evidence suggested that children were being better clothed and fed, and that homes were improving. Moss concluded with a note that the C.C.B. rejected some of the findings because they were at odds with the overall perception of the behaviours of young women munition workers.

2.3.3 Material culture on the home front

The twenty first century has seen a developing interest in the archaeology of the home front, coinciding with centenary commemorations of both the start and end of the First World War. Between 2010 and 2011 a study took place at the former chemical explosives factory at Cliffe in Kent, which involved extensive surveying (Pullen *et al.*, 2013), and David Kenyon later reviewed the National Factories scheme in general, which culminated in a study for Historic England, *First World War National Factories: An archaeological, architectural and historical review* (2015). His analysis identified the locations of the 170 First World War National factories in England and assessed their survival and condition. It referenced the kinds of objects being produced in these places and examined their means of production, but it did not look directly at the artefacts. There was some reference to social history “including evidence for the organisation of work, welfare provision and, briefly, associated housing” (Kenyon, 2015, p. 3).

Material culture studies into the objects that affect women have been limited, but two unpublished theses have considered clothing. The way in which women dressed for munitions work was researched in an MA thesis by Roberts (2017) and a doctoral thesis by Richardson (2019) both of whom looked at female identity and the practicality of their clothing. Saunders (2004; 2009; 2011; 2015; 2020) has been at the forefront of the developing area of First World War material culture in general, highlighting the specific complexity of appraising the range of objects connected with the huge number of people involved and scale of the operation. In *Killing Time: Archaeology and the First World War* (Saunders, 2011), he examined sites on the home front - namely munitions factories in places such as Dorset, Oldbury, Woolwich, and Gretna. He argued that the sites which were not the scenes of battle used for other war activity should be included in the overall narrative. He also suggested that these locations are harder to interpret, in part it seems because of the presence of a female workforce:

The overlap between the home-front aspect of Great War archaeology and industrial archaeology in Britain is made more complex (and fascinating) by what might be called a social archaeology (or perhaps an anthropology) of domestic architecture created for the munitions workers – most of whom were women.

(Saunders, 2011, p. 210).

His observation supports a notion that the study of conflict in the twentieth century has been so constructed around the male experience that any research that examines the female experience will bring something new to academia.

2.4 The Women's Section at the Imperial War Museum

Academic interest in the Women's Section of the Imperial War Museum can be found in the work of Braybon (1981), Kavanagh (1988; 1994), Woollacott (1994), Malvern (2000), and Condell (2002), with Kavanagh first highlighting the prestigious line-up of the Women's Work Sub Committee and the standalone nature of their collecting agenda:

Although there were acknowledged areas of overlap between Committees, for example, collecting material to represent the medical services, and munitions and 'women's work', the subcommittee structure gave the museum the opportunity to collect reasonably comprehensively on the best possible advice.

(Kavanagh, 1988, p. 82)

Wilkinson (1991) wrote specifically about the Women's Work Collection, drawing attention to the range of work acquired for the collection by the Women's Work Sub Committee: the artwork, uniforms, memorabilia, books, documents, press cuttings and journals. She credited Sir Martin Conway with two major contributions; his vision for bringing art into the nascent museum as a means of understanding the conflict, and for putting his daughter Agnes Conway forward as the Women's Work Sub Committee's Honorary Secretary. Wilkinson (1991) also drew attention to the innovative idea of commissioning plaster models, offered a brief history of how work was exhibited, and concluded that the Women's Work Collection was effectively a memorial to all women who served in the war effort, as well the 687 who died.

Grayzel (2005) presented a broad overview of the Women's Work Collection which highlighted the efforts of Agnes Conway and Lady Norman, and explained the very wide range of women's activities covered. It described the extensive paperwork in the collection, detailing government policies for labour recruitment and volunteering. However, there is no mention of munitions, or any metal objects in the collection. Mercer (2013) in turn reviewed the performative nature of museum displays by discussing three ways in which women's war work from the last century had been represented. She touched on material cultural aspects by exploring the use of empty

uniforms and their curiosity value to represent females and the work they did. Her discussion about the Women's Work Collection suggested that one of the reasons for its formation was to energise a flagging public. Mercer noted the Women's Work Sub Committee's vision in attempting to enlighten the public in visual ways using artistic depictions - at odds, she suggested, with the museum's performative role to reflect back the audiences' own point of view to them. Here was an attempt to inform the public about the abilities and competencies of women workers. In 1972 a reorganisation project at the Imperial War Museum saw a change of thematic sections, and of the manner in which women's involvement in the war was displayed. Mercer wrote about two major exhibitions: 'Women at War, 1914 -18' (1977) and 'Women and War' (2003 - 2004) looking at the changing mode of display and representation, but there is no mention here of metalwork or munitions.

Buck (2015) considered the Imperial War Museum as a case study for representation in the context of Empire. She argued that exhibitions of the represented "the intersecting lenses of capitalist political economy, the physical sciences, and anthropology allowing objects to tell what Paul Young calls 'a good story... about the world'" (Young, 2009; cited by Claire Buck, 2015, p. 154). Buck saw the artefacts of the Imperial War Museum's collection as souvenirs largely brought from the war front, and described their transformation in the museum setting from the mundane to the significant. Buck suggested that souvenirs were important to the museum to support the notion of an Empire united in labour, sacrifice, and loss. She noted a collecting schedule that could be haphazard, and of instances when the provenance of objects was lost when labels fell off: "Without accurate labels the object's value can slide from historic relic to industrial specimen" (2015, p. 175). She argued that objects which had been away to war and then returned carried a higher premium, and that this was the issue that the Women's Work Sub Committee had to contend with. How could women's work be elevated to the status of war relics if they were from the home front? By comparing the styles of the first two exhibitions of the Women's Work Collection, Buck charted the evolution of this agenda. According to Buck, the Women's Work Sub Committee sought to imbue all aspects of warfare with the ideals of national sacrifice and endeavour and even found difficulties in "transforming the munitions objects made by women into signs of national unity" (2015, p. 178). She went on to say that "At the heart of the difficulty lies the fraught relationship between the object as relic and the object of manufacturing" (2015, p. 178), and that "In the exhibition space, the before and after moments

of newly minted shells and fragments of shrapnel threaten to invoke a story of "machinery and machine mentality as the source of war" (2015, p. 178). The idea here is that if an artefact is tightly linked to the technical developments that brought it about, it resonates with "pre-war fears that war is modernity's inevitable outcome" (2015, p. 178). The act of displaying munitions such as shells represented the link between home front and war front, and according to Buck, the way in which these were presented at the Burlington House exhibition of 1917 was to show the objects themselves, drawing attention to "the remarkable fact that women made them" (2015, p. 180). A year later, the Whitechapel Gallery exhibition placed emphasis instead on women as workers and women's labour, and Buck described the extensive collection of objects listed, "with their relentless logic of evolutionary and comparative industrial design" (2015, p. 183). "The guidebook list is tedious in its repetition of the point that women made them and bewildering in the preponderance of parts and tools over assembled objects such as guns" (2015, p. 183). By the time the Women's Work Collection was displayed at the Crystal Palace in 1920, all the emphasis was on the representation of the women's work, rather than on the objects they made.

Paterson's most recent appraisal of the Women's Work Collection (2018) considered its significance in her capacity as the Imperial War Museum's librarian. She discussed the dedication of the Women's Work Sub Committee and their methodical approach to collection and curation.

2.5 Discussion

This research into the academic literature about female metalworkers from 1880 to 1920 has been a way of appraising the contexts in which these women appear, and how they are presented as subjects in a craft profession that is often understood as being masculine. It has shown that accounts in historical records of women's metalworking are very limited, and also why, because of this rarity, the unusual studies done by B.L. Hutchins (1915) became so important and continue to be widely referenced by historians (Pinchbeck, 1969), (Braybon, 1981), (Walby, 1986), (Tilly & Scott, 1987) (Valenze, 1995), (Thom, 1998). As a contemporary commentator and campaigner for women in industry, Hutchins made the important case that women metalworkers and smiths were not newcomers to the trade and that their participation is likely to have been the case throughout the deeper timescape. Even if the mechanisation techniques introduced at the end of the 1880s had brought greater numbers of women into a more visible factory space, the objects they made were still similar to those previously made at

home (Roberts, 1995). The research shows how women had always been employed in making component pieces, setting the tone for how women's work in munition factories during the First World War might be understood as an extension of this practice and whether this was evident in the presentation of their work by the WWSC.

A lack of literature (rather than evidence) of this long history of female involvement in metalworking, supports the view that women metalworkers are an under-researched demographic, of interest mainly to social historians seeking to understand issues of conditions, pay and politics that are largely found in an industrial setting. The actual skills and abilities of women metalworkers and smiths are less commonly discussed, and first person accounts about identities are extremely hard to locate. Finding research that examines female metalworking outside the main theme of welfare concern is rare, and so the tone for the way in which these women were represented to the public has been set by writers such as Sherard (1897) and later Galsworthy (2001 [1910]). They acted as reporters (as indeed Sherard was (Maltz, 2020, p. 105)), bringing this dark otherworld to the public consciousness. Even in the art and campaigns of Pankhurst (1979) an emphasis remained on the poverty of the women metalworkers at the expense of any interest in their skills and abilities as smiths.

In the political context of the industrialisation of the 1800s and beyond, more has been written about women's lives, particularly in areas of gender discrepancy. Bracy (2016) explored inconsistencies between the remuneration of female metalworkers in comparison to males, whilst Morgan (2001) studied the issue of gender demarcations in industry generally, almost incidentally using metalwork as a case study. She showed how gender divisions were used to control pay, even when mechanisation had equalised productivity. Pinchbeck (1969) also understood women and children to be a subordinate set, separated from the better paid male metalworkers. Morgan (2001) suggested that such debates about industrial gendering and the segregation of tasks should underpin an understanding of the concept of 'dilution' and how it operated during the First World War, and this notion certainly did inform this research.

Studies into trade unionism help to better define and understand the dilution processes that concern this thesis, particularly using the Cradley Heath chainmakers' strike as a case study (Barnsley, 2010; Hunt, 2019). However there is a tendency to omit any appraisals of the women's own relationship with their skills, an oversight which feels obvious to a craftsperson. Actual

reports of the work done by the chainmakers do come from Bailey (1990) and Moss (2006), but first person accounts of women describing their own craft are rare. Neff (1966) enlightened this research by offering an understanding of the stages in which paid working women begin to appear in literature and fiction and are finally able to give insights into their own lives. Occupations that require literacy (such as teaching) will naturally feature in the literature before metalworking, which does not. The advent of documentary-making in the lifetime of some of Cradley Heath's chainmakers bridged the gap (*Lucy Woodall*, 1971; *Nothing to Lose - The Women Chainmakers Strike of 1910 Cradley Heath*, 1976) providing the only record of firsthand accounts of the chainmakers' strike found in this research. These films showed women describing their identities as smiths and metalworkers, as well as a sense of pride in their work.

This need for a connection between women and their metalwork was one of the reasons that the Women's Work Collection at the IWM was chosen as a focus for this research. Not only was the gender provenance of the metalwork in the collection established, but it was curated by women at an atypical time when female metalworkers had a higher profile and were known about in the context of the war. This review has also been an attempt to discover how other researchers such as Mitchell (1966), Marwick (1977), Braybon (1981), Woollacott (1994) and Thom (1998) interacted with the collections at the Imperial War Museum and in particular the Women's Work Collection. For these war historians the archive offered information about the home front, but for a later wave of women's history researchers it informed studies about gendering and the expectations of female roles in the context of extreme societal upheaval (Grayzel & Proctor, 2017).

The lives of women working with munitions and metal, sit in an interesting intersection between the needs of a country at war and the male protectionism of long established trade unions, set against a background of first wave feminism that illustrated the complexity of a woman's place in society and industry in the early 1900s. This research provides a timely review of some of these ideas, following a hiatus in interest since the centenary commemorations of First World War. It explores the actual metalwork made by female munition workers through the eyes of a metalworker, and asks questions about the women of the WWSC who enabled its collection, curation and preservation.

3 Chapter Three: The Women's Work Collection

3.1 Introduction

The focus for this research is the set of metal munitions objects that formed part of the Women's Section in the earliest exhibitions of the Imperial War Museum (IWM), and its accompanying documentation. It was collected by the Women's Work Sub Committee (WWSC) on behalf of the IWM as part of the Women's Work Collection (WWC). (The term 'Women's Work Collection' is now used to include the paper archive at the present day IWM.) Between 1917 and 1920, the WWSC oversaw the collection of objects and exhibits across a wide range of female activities, which included sectors such as agricultural work, public transport, and medical care. The munitions collection within the WWC represented only a tiny percentage of all the artefacts amassed, and this assemblage was adopted from an earlier set of metal samples brought together by the Ministry of Munitions for use in their dilution and recruitment exhibitions. This chapter focusses on the WWC and its formation, considering the steps that would lead to the (possibly unique) assemblage of female-made of metal objects, that was collected and curated entirely by women.

This original research required a review of the existing literature written about the formation of the WWSC, followed by work to locate and study the archives which held detailed correspondence and minuted meetings in order to understand the agendas for collection, curation and exhibition. It involved identifying the metal exhibits assembled by the WWSC, using contemporary documents and catalogues in the archives. Objects found during this process were then searched for in the present day collection catalogues, and the few surviving artefacts were tracked down across two IWM sites and finally examined in person (Chapter 4).

This chapter introduces some of those findings, giving context and background to the ideas that led to the founding of the Imperial War Museum and the formation of the WWSC. It shows the significance of the individuals involved in this Sub Committee, their approach to collecting, and their overall acquisition agenda.

3.2 The founding ideals of the Imperial War Museum

To appreciate the significance of the Women's Work Collection, it is helpful to understand how and why it was formed. On 27th February 1917, during the height of the First World War, Liberal

MP Sir Alfred Mond wrote to the newly appointed Prime Minister, David Lloyd George, suggesting that a National War Museum should be established. According to Wilkinson (1991, p. 2) the idea was well received, even if it was unclear at that time how long the war might last or more significantly, which side would ultimately prevail. The intention was that this museum would commemorate the war in a traditional manner, with displays of the weaponry deployed in overseas battles, and that it would also self-narrate the experiences of the population as a whole. The social upheaval that had affected the lives of all citizens in this first global conflict would be represented by collecting and recording ephemera from the home front (Kavanagh, 1994, p. 130). These dual aims of including the entire population and reflecting life on the home front made the inclusion of women's work an instinctive decision. Here was an attempt to understand the magnitude of this 'Great War' and to recognise and record the rapid innovations required to deal with it. Procedures now seen as standard wartime practices were devised for the first time during this conflict, and many ideas now associated with the Second World War, such as the substitution of women into perceived male roles, were constructed as a strategy a quarter of a century earlier (Fredette, 1976, p. 69).

The First World War was perceived as an international modern conflict, and it was this idea that the National War Museum sought to record and commemorate. It was hoped too that the project would revitalise a weary nation whose support for the war was waning, particularly following the great losses of life during campaigns such as the Somme (Kavanagh, 1988, p. 80). Any propaganda opportunities from such a project would not have been ignored and even if the core ideal was indeed to honour the efforts of British individuals, the timing was undoubtedly significant. Furthermore, this was intended to be a definitive monument to the kind of war that, it was believed, could never happen again. Mercer (2013) identified the differing agendas surrounding this anticipated National War Museum. She suggested that if the Department of Information (later the Ministry of Information) saw the project as an opportunity to inform the public about what was happening to their loved ones overseas, the War Cabinet had an alternative objective, namely "to stimulate a renewed enthusiasm for the war effort" (Mercer, 2013, p. 334). Although the majority of the population appeared broadly to support the war, the implementation of such an ambitious project was by no means certain. The country's political leadership had recently changed and because the Cabinet was still being restructured, this was a time of great political uncertainty.

On 5th March 1917, less than a month after Mond's letter to the Prime Minister, the creation of a National War Museum was approved by the War Cabinet as "a memorial, a record, and a place of study of the war in which the forces and civilian populations of the countries of the British Empire were then engaged" (Mercer, 2013, p. 334). It was Mond's own desire that "every individual, man or woman, soldier, sailor, airman or civilian... may be able to find in these galleries an example or an illustration of the sacrifice he made or the work he did" (Paterson, 2018, p. 534). The National War Museum Committee, chaired by Mond, was quickly established to decide what material should be assembled and how best to illustrate the war effort as a whole. As well as overseeing all the subcommittees, Mond also commissioned Edwin Lutyens to design a national war memorial (now familiar as the Cenotaph at Whitehall), and planned to construct a new building which, it was hoped, would eventually house the museum's entire collection. In late 1917, the planned establishment was renamed the Imperial War Museum, reflecting the interest shown by the Dominion governments and their expressed desire for inclusion and representation (Kavanagh, 1988, p. 88).

Among the notable names involved in the founding of the IWM was the Curator of the Tower of London Armouries, Charles ffoulkes, whose input directly influenced the ethos of the collecting agenda for the new museum. Originally a painter, he later became a metalworker and published author on the subject (ffoulkes, 1988 [1912]). ffoulkes was the Imperial War Museum's first Curator and Secretary, serving until 1922 when he retired, after which he continued as a Trustee.

The first Director General of the IWM was Sir Martin Conway, a position he held until his death some twenty years later (Evans, 1966, p. 227). As an art historian and former Slade Professor of Fine Art at Cambridge University, he brought with him the experience of an already distinguished career. Well known as an archaeologist, mountaineer and cartographer, it was Conway who originally suggested the idea of official war art, actively encouraging the recruitment of artists after seeing the value of visual chronicles during his visit to the Western Front in 1917 (Wilkinson, 1991). He believed that exhibits must "be vitalised by contributions expressive of the action, the experiences, the valour and the endurance of individuals", later expressing the hope that "anyone who had taken part in the war effort could visit the museum, point to an exhibit and say, 'This thing I did'" (Kavanagh, 1988, p. 84).

This research shows how the ethos and values of this war museum were in keeping with a post-Edwardian culture of public education and thriving exhibition societies of all kinds, including the 1906 Sweated Industries' Exhibition (Section 2.2), (Section 5.7). Objects would be collected, curated and placed into galleries for the nation to inspect, recontextualising them in an almost Dadaist manner. Absent at that time was the patina of nostalgia that would accumulate across the decades following the Second World War. Whilst certainly a patriotic endeavour, the fact that the collections were conceived and acquired during an unresolved conflict show how this museum was primarily a visual account of a collective experience. It was a snapshot of the times, recording both the technical advances forced along by the demands of war as well as the human endeavour required to achieve this. That an all-female subcommittee should be appointed to curate the Women's Work Collection was by no means inevitable, but here was a political landscape of socially liberal reform ideals and perhaps most significantly, a backdrop of suffragism.

3.3 Women's Work Sub Committee

Under Sir Alfred Mond's leadership, the National War Museum Committee rapidly assembled different groups to oversee the collection of artefacts and documents under specific subject types. These subcommittees initially included government departments such as the Admiralty, the War Office and Munitions, as well as the organisations like the Red Cross, although the Red Cross Sub Committee was later cancelled and its work absorbed by the Women's Work Sub Committee (WWSC). There were subcommittees for Records and Literature, the Air Services, Dominions and Loan Exhibitions (Kavanagh, 1988).

The idea that a body of work should be curated specifically to reflect the ways in which women contributed to the war effort was in keeping with the earliest ideals of the Imperial War Museum, and the Women's Work Collection was one of its original assemblages. The earliest minutes from the WWSC meetings show some sixty-eight members and supporters, although that number would dwindle as the years went by. When the WWSC was dissolved in 1920, only a small core of members was still very active, notably Agnes Conway, Lady Askwith, Miss Monkhouse, Miss Frances Durham, Lady Mond, Lady Haig and Lady Norman, all seven of whom had previous track records in campaigning work and activism (Kean, 2005).

On 4th April 1917, immediately after the founding of the National War Museum Committee, Sir Martin Conway's daughter, Agnes Ethel Conway, was officially made Honorary Secretary of the WWSC (Evans, 1966, p. 232). She was known to have been a supporter of the National Union of Women's Suffrage Societies (NUWSS) representing Maidstone at its General Meeting in February 1917 (Braybon, 2005, p. 54). Agnes Conway proved to be a well-qualified and appropriate choice for the role of Hon. Sec., quite aside from her close connection to the Museum's Director-General. As Paterson (2018) has noted, Agnes had studied history at Newnham College, Cambridge and was very widely travelled. She was a keen archaeologist, had worked on excavations at Petra with her father, and was associated with the work of Sir Arthur Evans, who also became connected to the IWM as an Hon. Advisor to the medal collection (Evans, 1966). As well as being highly knowledgeable on the history of art, Agnes was a collector, photographer and author, publishing *A Ride through the Balkans: On Classic Ground with a Camera* during the same year that she began to work with the WWSC (Conway, 1917). On both this expedition and her previous one in 1914, she had witnessed the suffering caused by war and was involved in caring for wounded Belgian soldiers and refugees as they arrived in Britain, for which she was awarded an MBE (Evans, 1966, p. 225). Furthermore, her education at Newnham College had created a valuable social network that she maintained throughout her life. Two former Newnham Principals, Anne Clough and Katharine Stephen, were listed as early WWSC members, most likely introduced by Agnes (Thornton, 2011).

Lady Pricilla Norman (née McLaren), the Chair of the WWSC, was a distinguished member of the non-militant women's suffrage movement, with connections to the government of the day. Her husband Sir Henry Norman was a Liberal MP, as were her father Charles McLaren (Lord Aberconway) and her two brothers Henry D. McLaren and Francis McLaren. All had supported the campaign for women's votes. Lady Norman had previously been the Hon. Treasurer for the Liberal Women's Suffrage Union and by the time she was appointed Chair of the WWSC, she had received the 1914 Medal for running a hospital since the start of the war in France (Wilkinson, 1991). She would not only go on to become the first female trustee of the Imperial War Museum, but also serve for the longest time (Paterson, 2018, p. 535) (Section 6.5).

Olive Eleanor Monkhouse (referred to in documents as Miss O. E. Monkhouse) was another noteworthy member of the Women's Work Sub Committee, brought in by special request. On the 27th April 1917, a letter sent to Charles ffoulkes from Lt. Col. Bicknell (Secretary of the

Ministry of Munitions Sub Committee) reported that at the previous General Committee meeting, Martin Conway had said the WWSC “were desirous of having on their Committee a woman representative who was acquainted with the work of women in munition making” (IWM, ENI/3/GEN/10, 1917). When the response was positive, Miss O. E. Monkhouse, Chief Woman Dilution Officer in the Ministry of Munitions Labour Department, was nominated to join the subcommittee. It was Miss Monkhouse who had the foresight to propose the use of photography and illustration to create a comprehensive record of the metal and munitions work being collected. These images would later be published as a catalogue, and have proved invaluable to this research (IWM, LBY 16242, 1918) (Section 4.5).

The notion of meticulously chronicling the collection as it was being formed was integral to the philosophy of the WWSC. The group had immediately seen this endeavour for what it was; a finite opportunity to collect the objects that would highlight women’s work and capabilities, and record it all for posterity. Such intentioned material activism is evident in the broad collecting agenda that Agnes Conway devised and the extensive range of organisations to which she reached out in her letter writing campaign. New members of the WWSC would join the group later on, including Miss Durham of the Ministry of Labour and Miss Adelaide Anderson, the Principal Lady Inspector of Factories at the Home Office.

3.4 Acquisition agenda

The overall remit of the WWSC was to gather artefacts in anticipation of future exhibitions and to document the activities of wartime, both for the national record and for future historians (Hayashida, 2021, p.58). From the outset, they were each tasked with devising their own collecting agendas and the Chair of each subcommittee was authorised to bring new members into their group, to enable representation in specialist areas (Kavanagh, 1988, p. 82). Therefore, despite being subordinate and accountable to the General Committee, the Women’s Work Sub Committee could operate largely independently in terms of deciding what their collection should consist of and how women should be represented within that.

From the first day, the WWSC appeared thoughtful about their collection’s future audience and about their representation of women’s wartime undertakings and accomplishments. Statements from the inaugural meeting of the 26th April 1917 reported that “They want to have every sort of work done by women represented, so that all Women in coming to the museum could look

out for their own particular section" (IWM, ENI/3/GEN/10, 1917, p. 1). The war had been underway for three years, and Paterson explained how the WWSC was attempting to "make sense of and record the vast variety of female activity that had taken place since 1914" (Paterson, 2018, p. 534). By doing so, they were charting the progress of female inclusion into traditionally male work spaces since the beginning of the war. Unlike the other subcommittees which were highly specialised, the WWSC's collecting brief covered the very wide and varied contribution made by the female population. This meant assembling documents and ephemera related to an exceptionally large number of different fields and industries.

The agenda to draw in data and objects from as many domains and institutions as possible developed very rapidly indeed, and within a month of becoming the Honorary Secretary, Agnes Conway had drafted a collection policy which was so effective it would remain in place throughout the three years in which the committee was operational. Beginning in April 1917, she mounted a tireless letter writing campaign, directing all communications with the organisations and businesses that might consider contributing items for the Women's Section. Members of the WWSC would then be delegated to oversee the areas relating to their own expertise and prior experience, for example "Lady Haig should do the subjects connected with Officers and their Families", "Miss Lloyd George should do the V.A.D. workrooms", "Lady Mond should undertake all the Hospitals run by Women in this country", and "Miss Conway – the work of Women's Universities, books written by Women on the War, the Belgian section" (National War Museum, Women's Work Sub-Committee, April 26th 1917, 1917, p. 2).

At the WWSC meeting on the 10th May 1917, Agnes Conway was able to report on progress in a number of areas. These included her dialogues with the Red Cross, overseas hospitals and organisations for assisting officers families, her correspondence with the Ministry of Munitions, and the early stages of commissioning artwork (IWM, ENI/3/GEN/10, 1917). In addition to researching the groups providing Belgian relief, Agnes Conway had also contacted women's colleges and asked publishers for copies of any female authored war books. The WWSC was tasked with organising and compiling all this documentation themselves, because despite the recommendations of the Museum's Director-General Martin Conway, they were never provided with a historian to offer a written account of their research.

As the WWSC's letter writing escalated, minutes show how the range of collecting areas increased and how each area required further organisation. In addition to existing duties, Lady Norman was now also allocated to hospital supply depots, agriculture and women landworkers, the war library, and the National Union of Women's Suffrage Societies. Agnes Conway was to oversee Queen Mary's Needlework Guild, exhibitions concerning Russia, Belgium and Serbia - and gas helmets. Lady Haig would be in charge of honours and decorations, regimental charities organised by wives of officers, the Soldiers' And Sailors' Families Association, and Comforts for Soldiers And Sailors viz. Queen Alexandra's Field Force Fund, and other similar organisations. Responses to the WWSC requests varied, from straightforward refusals to enthusiastic engagements with this opportunity to present women's work to a wider audience.

Furthermore, during this time when the WWSC was canvassing for donations of objects for the Women's Section, pressure was being applied by the administering General Committee to provide estimates of the amount of exhibition space the collection might eventually require (IWM, ENI/3/GEN/10, 1917c, pp. 1–2). Therefore, the kinds of representative work sought by the WWSC were constantly under review (Section 6.1).

The format of any future exhibitions was a serious consideration, and so the anticipated audience at those events was as important to the WWSC's agenda as the historical validation of the women whose work they sought to record. In terms of public exhibition, the WWSC were also conscious of the lacklustre appeal of just showing objects and records. They developed innovative ways of explaining women's war work through charts, photographs and models to make it easy for any viewer to understand what had been happening, or better still, to imagine themselves participating in the war effort (Section 5.7). This may have been evidence of Agnes Conway's own sense of visual culture and experience as an archaeologist being expressed in her collecting and communication, or part of the wider suffragist culture of curation of "records and relics" (Kean, 2005, p.588). In contrast to the other sections of the Imperial War Museum that assigned male artists to illustrate scenes of action on the war front, the WWSC became the first to commission female war artists to record the home front. Mercer (2013) stressed just how vital Lady Norman's role as Chair was at this stage, guiding the WWSC to find and employ female practitioners when commissioning reports and articles, sculptures, photographs and paintings under this overall agenda of self-narrating the female experience. The vast majority of the Women's Work Collection was amassed between 1917 and 1919, coinciding with both the peak activity of

women's work and its subsequent rapid decline. Within their curation, the WWSC had created an all-female space to represent work of women during the First World War.

3.5 The munitions collection

Two important areas represented in the WWSC's collecting agenda were developments in the production of munitions and the accompanying recruitment drive required to bring women into this workspace. Under the Munitions of War Act (1915), munitions operations were widely defined as the repair or manufacture of arms, ammunition, ships, vehicles and aircraft; as well as the metals, machines or any tools required for any such manufacture or repair. These requirements were mostly fulfilled by private companies now being commissioned to supply arms under the control of the Ministry of Munitions. When the Ministry of Munitions Sub Committee was formed (at the same time as the Women's Work Sub Committee), part of its contribution to the IWM was to illustrate to the public how dilution had brought huge numbers of women into the sector. This had largely been achieved by deploying great numbers of Dilution Officers to visit factories, where they would distribute photographs of female workers to the owners and foremen as proof of the women's competency in machine and engineering tasks. The use of such photographs is described in the first issue of *The Dilution Bulletin*, with an explanation of how they should be introduced during meetings with private companies (IWM, B.S. 28/5, 1916, p. 15). More images could be ordered so that they could be shown to any firm by a Dilution Officer "if he considers by doing so he can forward the cause of dilution" (IWM, MUN. VI/13, 1916).

The notion of displaying these photographs in exhibitions to transmit these ideas more efficiently came soon after, with references to upcoming events being mentioned in Issue 4 of *The Dilution Bulletin* in February 1917 (IWM, MUN. VI/16, 1917, p. 15). This article described the photography exhibitions now aimed at employers, to be held in the City Hall at Cardiff (19th February 1917), at the Engineer's Club in Manchester (28th February 1917), and again at the Royal Colonial Institute, Northumberland Ave. London (12th March 1917). In the same article, it is stated that arrangements were being made to "collect for these exhibitions a number of examples of good work performed by women. It is hoped to arrange for exhibits such as parts of howitzers, machine guns, rifles, aircraft, shells, etc., etc.". It is also noted that a "special effort is being made to collect evidence of women's work in tool rooms and on precision work generally". The article closes with

the words, “It is hoped that these exhibitions will do much to clear away the doubts in the minds of some firms as to the capacity of women to carry out accurate and responsible work.”

Later issues of *The Dilution Bulletin* give a sense of the gathering momentum of these exhibitions and the growing interest in them. Issue 5 from March 1917 reported on the successful Cardiff exhibition, which attracted over a thousand visitors in five days (IWM, MUN. VI/17, 1917, p. 79). An extensive list of companies sent delegates, with fifteen major concerns agreeing to introduce dilution through female labour as a result of the event. The report went on to say that the second exhibition at Manchester attracted 200 to 250 engineering firms from the area, although the third at the Royal Colonial Institute in London was postponed. However, when Issue 6 of *The Dilution Bulletin* was published in April 1917 it was able to report on the rescheduled exhibition, which had now been extended to include the first samples of metalwork by women (IWM, MUN. VI/18, 1917, p. 88). This exhibition ran from 26th March to 4th April, coinciding with the quite separate inception of the Imperial War Museum and formation of the WWSC.

Although it has not been possible to trace an accompanying catalogue, the article in *The Dilution Bulletin* gave a comprehensive overview of the event in March-April 1917. During the nine days it was open, the exhibition attracted “over 6,500 directors, engineering works managers, foremen, charge hands, supervisors and mechanics” (IWM, MUN. VI/18, 1917, p. 88). It also stressed that the women’s metalwork samples on display “were only a small part of what might have been collected had longer time been at the disposal of the Section”. The report gives quite detailed accounts of the types of metalwork women were engaged in under the following headings: General Labouring, Semi-Skilled Heavy Work, Shipbuilding and Marine Engineering, General Engineering, Tool Room, Gauges and Precision Work, Machine Tools, Gun Components and Small Arms, Shells and Fuzes, Internal Combustion Engines and Aircraft, with the final categories being General Woodwork and Optical, Glass-Blowing and Electrical Work. The same headings would reappear in the various subsequent iterations of this exhibition. It may have been that these exhibitions were targeting areas where women were already doing metalwork, such as Bristol (Section 2.1) (Hutchins, 1915, p. 64). In addition to setting up an invitation for training from scratch, recruitment for the dilution schemes would certainly have targeted workers with pre-existing metalwork skills, especially as married women were now being allowed back into this industrial workspace.

The earliest listing of specific metal items is in an undated typed catalogue of the munition work samples displayed at an exhibition in Bristol (IWM, MUN. VI/44, 1917). The event took place on the 30th May 1917 (IWM MUN. VI/20, 1917) and was opened by the Lord Mayor of Bristol, accompanied by a representative of the Ministry of Munitions, Ben H. Morgan (later to become a significant advocate of the WWSC's cause). A copy of the catalogue for this Bristol exhibition appears to have been donated in response to Agnes Conway's request for information, following the publication of a notice in the *Electrician* journal during the first month of the WWSC's formation (IWM, EN1/3/COR/1, 1917). In her letter to the Secretary of the Ministry of Munitions, she says that the WWSC has been formed:

...for the purpose of collecting all possible data about women's work, and a catalogue of this exhibition would be of great interest and important. If the exhibits themselves can be kept for the War Museum I am sure they would be greatly appreciated.

(IWM, EN1/3/COR/1, 1917).

This letter marks the moment at which the objects acquired for this series of Ministry of Munitions dilution exhibitions became destined to eventually form part of the Imperial War Museum's Women's Section, and where the meaning of what they represented would change and evolve. At this stage in the timeline, their purpose was to be part of the apparatus of recruitment, demonstrating the abilities of women and the successful outcomes of dilution. In the dilution exhibitions they were simply proofs, but in time they would become memorials and souvenirs of an atypical time in female industry and metalworking.

In fact, these metal samples collected by the Ministry of Munitions were never intended to be core exhibits for a museum, but instead were used to complement the large amounts of text, data and photographs on display at dilution exhibitions. The acquisition rate of these objects can be tracked using the catalogues published for all the exhibitions after the one at the Royal Colonial Institute in Bristol. The catalogue for the exhibition at the Royal Colonial Institute in Bristol, dated May 1917, listed 639 individual metal items and 37 non-metal ones (IWM, MUN. VI/44, 1917). By July 1918 this assemblage had grown to a total of 1030 metal and 103 non-metal

items, now being displayed at Nottingham Art Gallery and listed in the accompanying catalogue (IWM, MUN. VI/41, 1918).

Between November 1917 and May 1918, items collected for dilution exhibitions were displayed at an exhibition held in Burlington House in London, as part of the first IWM Women's Section. This was the first instance of the same metal objects being used simultaneously to represent different ideas by two different parties. They had been used by the Ministry of Munitions to encourage dilution, but now represented female achievement in its own right for the WWSC.

Table 3.1 Exhibitions showing metal samples collected by the Ministry of Munitions

Date	Organised by	Location	Metal items	Non-metal items	Reference
May 1917	Ministry of Munitions	Royal Colonial Institute Bristol	639	37	(IWM, MUN. VI/44, 1917)
July 1917	Ministry of Munitions	Leeds City Art Gallery	910	51	(IWM, MUN. VI/40, 1917)
November 1917	Ministry of Munitions	Whitworth Institute, Manchester	980	80	(IWM, MUN. VI/39, 1917)
January 1918	WWSC for the IWM	Burlington House, London	931	41	(IWM, LBY 2240, 1918)
May 1918	Ministry of Munitions	Whitechapel Art Gallery, London	983	44	(IWM, LBY 16242, 1918)
July 1918	Ministry of Munitions	Nottingham Art Gallery	1,030	103	(IWM, MUN. VI/41, 1918)

This emerging collaboration between the WWSC and the Ministry of Munitions began when they specifically requested a subcommittee delegate who understood the work of women munition makers. This resulted in the appointment of Miss O. E. Monkhouse, who on the 14th June 1917 presented a document entitled *Draft Scheme of Women's Work on Munitions to be Submitted to The Women's War Work Sub-Committee* (IWM, EN1/3/MUN/2/2, 1917).

Table 3.2 Category groupings (verbatim), Draft Scheme of Women's Work on Munitions, (IWM, EN1/3/MUN/2/2, 1917)

Group A - Engines (Aircraft)

Such as details of the following types of engines: - Clerget, Le Rhône, Hispano, Suiza, etc.
<u>Group B</u> - Engines Internal Combustion (for Motor Cars etc.) also details of Motor Vehicles. Such as Details of “Tank” Engines, Diesel Engines, and petrol engines for motor cars and motor lorries, also details of vehicles.
<u>Group C</u> - Engines Internal Combustions (Accessories) Such as details of magnetos, sparking plugs, air pumps, etc:
<u>Group D</u> - Engines and Turbines, Steam. Such as details of locomotive and stationary engines and turbines.
<u>Group E</u> - Guns and Components. Such as details of breech mechanism of the following guns: - 12 pounder, 18 pounder, 4 inch, Mark IV; 4 inch mark VII; 4 inch Mark VIII; 5 inch, 60 pounder; 6 inch Howitzer; also gun sights; and barrel of 1 inch sighting gun.
<u>Group F</u> - Small Arms Such as details of Lewis gun, Lee Enfield rifle, Vickers Machine Gun etc;
<u>Group G</u> - Tool Room Work. (Gauges) Such as samples of plug, ring and screw gauges,
<u>Group H</u> - Tool Room Work (Drills, Cutters etc;.) Such as samples of shell boring cutters, milling cutters, taps, reamers, twist drill etc;
<u>Group K</u> - Tool Room Work (General) Such as samples of drawing dies and punches, chucks test pieces etc;
<u>Group L</u> - Aircraft Fittings (Metal) Such as details of welded and other sheet metal work for aircraft.
<u>Group M</u> - Woodwork (Aircraft Etc:) Such as specimens for framing for planes, propellers, struts (<i>sic</i>) joinery etc;
<u>Group N</u> - Projectiles And Trench Warfare. Such as samples of fuzes, gaines, bombs, shells, etc;
<u>Group O</u> - General Engineering, including Machine Tool Parts. Such as samples of unclassified metal work.
<u>Group P</u> - Optical Munitions and Glassware. Such as Range Finders, binocular's, periscope's, lenses, prism's, etc:
<u>Group Q</u> - Surgical and Chemical Glassware. Such as samples of surgical glass, instruments, etc.;

Monkhouse offered suggestions about the kinds of documents that should be acquired for the WWC, such as the speech by Lloyd George on the necessity of employing women in munitions, issues of the Dilution Bulletin, process sheets explaining operations, catalogues of exhibitions,

wage agreements, and memoranda on welfare. She also suggested collecting photographs, uniforms and “specimens of work done by women under definite headings, such as: - Shells and Shell Components, Trench Warfare, Aircraft, Gun Work, Motor Work. etc.” (IWM, EN1/3/MUN/2/2, 1917).

The document noted that the Parliamentary Secretary to the Ministry of Munitions, Dr Christopher Addison, had given permission for the Technical Advisor to the Labour Supply Department, Mr B.H. Morgan, “to assist the Committee in collecting a fitting monumental exhibit of women's work on munitions. He is now preparing a detailed scheme under which exhibits of Women's work can be systematically ear-marked and collected”.

Later that year in November 1917, the first evidence of the WWSC collecting metalwork in its own right could be found in a draft letter, intended to be sent to munitions and engineering companies. It gave a brief overview of the aims of creating a Women's Section in the new 'National War Museum, adding that this:

...collection will be limited to the most interesting and striking examples of work of an engineering or manufacturing nature, in which women were not employed before the war, and will therefore constitute a record of the manner in which women adapted themselves to work which was previously considered beyond their powers.

(IWM, ENI/1/COM/24/2 A1/4, 1917).

However, the letter that was eventually sent was amended and did not contain this sentence. Instead, it set out a clearer set of requests about the categories of engineering and metal objects required for the collection. Entitled *Permanent Memorial To Women's Work On Engineering Munitions*, it had the additional words:

It is hoped that firms employing women on engineering work in connection with the making of war material will be willing to contribute specimens which will constitute a permanent memorial and record of the work women have done in the war.

(IWM, ENI/1/COM/24/2 Permanent Memorial To Women's Work On Engineering Munitions, 1917).

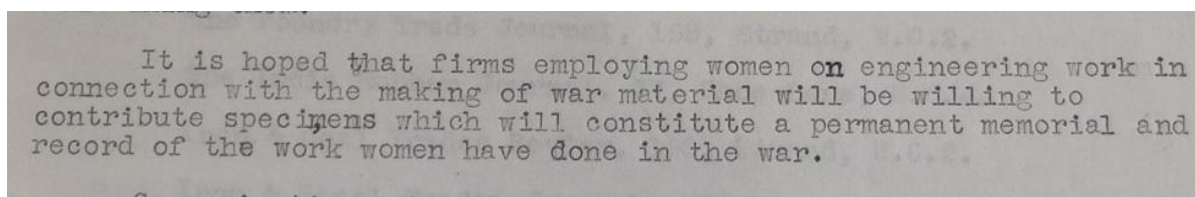


Figure 3.1 Notice of 'Permanent Memorial to Women's Work' on Engineering Munitions (IWM, ENI/1/COM/24/2, 1917)

Requests were sent to a number of companies (Table 3.3) and copies of the same correspondence were also sent to specialist journals ('Technical Papers') (IWM, ENI/1/COM/24/2 Draft letter to firms on list, 1917) either to be published as a notice, or printed in the letters section (Table 3.4).

Table 3.3 Requests sent to companies (verbatim) (IWM, ENI/1/COM/24/2 Draft letter to firms on list, 1917)

Company Approached	Items Requested
<u>Gwynnes Ltd.</u> , Church Wharf, Chiswick	Assembled Air pump for Clerget engine & parts. Mounted in Glass case. Clerget engine cylinder & other Details of Clerget engines. Mounted in Glass case. <i>1918-07-18(2) reference to Clerget engine received as an exhibit.</i>
<u>Ruston, Proctor & Co. Ltd.</u> , Sheaf Iron Works, Lincoln	Aircraft engine complete
<u>Crossley Motors Ltd.</u> Napier St, Gorton, Manchester	Selected examples of Details of motor vehicle work, e.g. inner hubs Mounted in glass case.
<u>E.G. Wrigley & Sons Ltd.</u> Foundry Lane Works, Soho, Birmingham	Collection of twist drills reamers milling cutters taps dies. etc., Mounted in glass case.
<u>North & Sons Ltd.</u> Whippenhall Road, Watford.	Finished Details of Watford magneto. Mounted in Glass case
<u>Armstrong Whitworth & Co.</u> Elswick Works, Newcastle	Details of breach mechanism. Mounted in Glass case. Also collection of cartridge cases
<u>Lanston Monotype Co. Ltd.</u> Horley, Surrey	Details of Vickers Machine gun. Mounted in glass case. Selection of cutters, reamers, drills etc; Mounted in Glass case.
<u>W Beardmore & Co. Ltd.</u> Parkhead, Glasgow	Details of gun work, mounted in glass case.
<u>Saxby & Farmer Ltd.</u> Railway Signal Works, Chippenham	(a) Details of gun sights. Mounted in Glass case. (b) Details of pneumatic tools Mounted in Glass case.

<u>Birmingham Small Arms Co. Ltd.</u> , Birmingham	Details of Lewis gun. Mounted in Glass case.
<u>Royal Small Arms Factory.</u> Enfield Lock	Details of Lee Enfield rifle. Mounted in Glass case.
<u>Durnford & Elliott.</u> Birmingham	Details of Lee Enfield rifle. Mounted in Glass case
<u>Vidal Engineering Co. Ltd.</u> Croydon	Specimens of screw gauges. Mounted in Glass case.
<u>National Tool Factory.</u> Gateshead	Specimens of spade cutters Mounted in Glass case.
Herbert Hunt & Sons (Dyer St) Hume, Manchester	Specimens of spade cutters counterbores, etc., Mounted in Glass case.
<u>Alfred Herbert Ltd.</u> Foleshill, Coventry	Details of Coventry Die-head. Mounted in Glass case.
<u>Bolton & Poole Ltd.</u> Norwich	Selected specimens of Aircraft metal work to show welding. Mounted in Glass case.
<u>Wearden & Guyles Ltd.</u> 12 Northgate, Bradford	Details of Drill chuck. Mounted in Glass case.
<u>Smith Barker & Wilson Ltd.</u> Halifax	6" Lathe
<u>WH Allen & Sons & Co. Ltd.</u> Queen's Engineering Works	Le Rhône cylinder, finished & other selected details of engine, mounted in glass case.
<u>Optical Munitions Dept.</u> 177 Piccadilly	Suggest seeing Mr. Stevens as to what could be obtained
<u>David Brown Ltd.</u> Lockwood Huddersfield	Selected specimens of gear cutting mounted in glass case.
<u>Spencer & Co. Ltd.</u> Melksham	9.2" Mk. IX Shell & adapter
<u>Vickers.</u> Barrow	Parts of airships
<u>Thornycraft Ltd.</u> Basingstoke	Motor Lorry engine - Complete
<u>G.E.C. or Phoenix Dynamo.</u> Bradford	Complete dynamo or motor
<u>Lister R.A. & Co. Ltd.</u> Victoria Works Dursley	Complete dynamo or motor
<u>Armstrong.</u> Whitworth	6 Pounder Naval Gun
<u>Vickers.</u>	Machine gun complete. Stokes gun

Erith	
<u>Cambridge Scientific Instruments Co.,</u> Cambridge	Wireless Telegraphy Instrument
<u>Tibbenhem,</u> <u>Ipswich</u>	Woodwork (Aircraft) Range of shells made by women Range of Fuzes made by women Range of Cartridge Cases Range of French Munitions Examples of Foundry Work Various examples of aircraft work Soldiers' equipment

Table 3.4 'Technical Papers' contacted by the WWSC (IWM, ENI/COM/24/2, 1917)

Aeronautics
Aeroplane
The Auto-Car
Automobile & Carriage-builders' Journal
Automobile Engineer
Auto-motor Journal
The Electrical Review
The Electrical Times
The Electrician
The Engineer
Engineering
Engineering Review
The Foundry Trade Journal
The India Rubber Journal
Iron & Coal Trades Review
Iron & Steel Trades Journal
The Ironmonger
Jeweller & Metal Worker
Machinery Market
The Marine Engineer
The Mechanical Engineer
The Mechanical World
Time Engineering Supplement

This marks the moment when the WWSC began to build onto and develop the Ministry of Munitions metalwork collection, procuring artefacts in their own right whilst introducing the notion of developing a memorial to the service of women. There is also a sense of an awareness that when the war finally ended, women would be removed from the professions in which their ability had now been proven; and this is evidenced in a handwritten note from Miss Monkhouse to Agnes Conway. In a dialogue about commissioning new artwork and dioramas of working women - only two months after the Armistice - Miss Monkhouse says, "I am afraid we are too late for any other retort house except Vauxhall the one[s] about which I spoke to you have already given up all their women in order to replace the returned men" (IWM, ENI/3/MUN/2/2, 1917). It is here that the agenda shifted from the need to bring more women into these industries, to the need to make sure their efforts would not be forgotten.

Managing these two collecting agendas both simultaneously and in concurrence with other connected parties and subcommittees presented occasional challenges for the WWSC. The management of these situations offer insights into their core intentions for the Women's Section in the Imperial War Museum and the representation that it offered. The seriousness that the members of WWSC had about which their collection and its long term representation of female ability is illustrated by the way it responded during the times of discord with the Ministry of Munitions Sub Committee. One such example is found in the exchange on 29th August 1917 between Colonel Stansfeld (Chairman of the Ministry of Munitions Sub Committee) and Lady Norman. His letter agrees to her memorandum explaining the scope of the WWSC, apart from "one particular point on which I remarked to you when you were here, and that is, the exhibition of all productions made by women" (IWM, ENI/3/COR/1 Letter from J.R. Stansfeld to Lady Norman 29th August, 1917). He goes on to explain how:

Women's work has covered such an extraordinarily wide field that if steps were taken to include in the Women's Work Section, samples of every Munition made by them, it would mean a duplication, very nearly complete, of the exhibits of the Ministry of Munitions and trend very largely on the exhibits of some other Departments.

(IWM, ENI/3/COR/1 Letter from J.R. Stansfeld to Lady Norman 29th August, 1917).

He went on to raise issues of exhibition space required:

I think that the main War Museum Committee would be indisposed to provide any material additional space for Munition exhibits in the Women's Section, when those exhibits were duplicating the samples shown in another Department.

He also suggested that "typical examples of the more common or important types of work" should be included in the Women's Section, adding:

I think it will be quite possible to indicate on the exhibits shown in other parts of the Museum, such as the Ministry of Munitions, War Office or Admiralty Sections, that a large proportion of the supply of the particular exhibit has been due to the work of women operatives.

(IWM, ENI/3/COR/1 Letter from J.R. Stansfeld to Lady Norman 29th August, 1917).

Handwritten notes in the left hand margin of this document say: "Lady Norman's intention is to exhibit types only" and "This letter sent by Lady Norman to Mr B.H. Morgan. See his report".

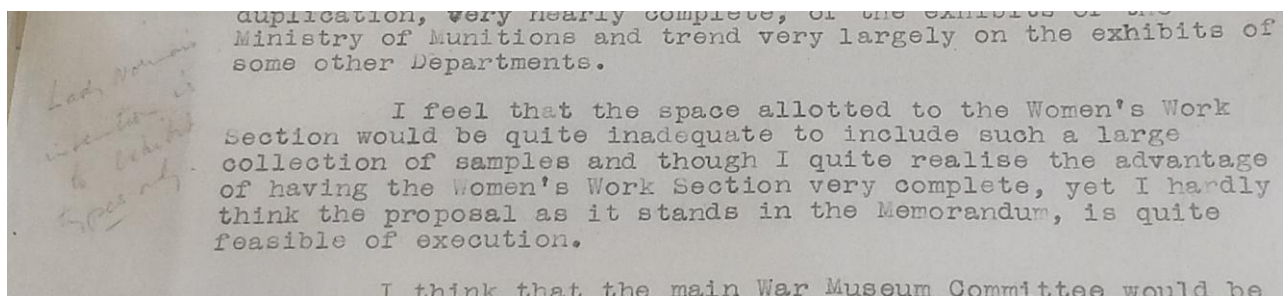


Figure 3.2 "Lady Norman's intention is to exhibit types only" (IWM, ENI/3/COR/1, 1917)

Lady Norman's formal response agrees that women's work covers an extraordinarily wide field, making it impossible to collect and exhibit samples of every class of work. She added:

We stated in it that we proposed to collect specimens etc., of women's work under definite headings such as Guns, Aircraft, etc., examples of turning, fitting, planing, acetylene welding, tool-making, etc., with the intention of showing how astonishingly women, under the stress of war, have developed engineering and scientific skill, and how in a few years from mere labourers they have become skilled mechanics, turning out gauges to an accuracy of one ten-thousandth of an inch. This development is so remarkable and historical that it should, apart from the important consideration of women's patriotic effort in the war, be permanently recorded in the Museum.

(IWM, ENI/3/COR/1 Letter from Lady Norman to J.R. Stansfeld 12th September, 1917).

In this document it is agreed that the remit for collecting is wide, with a stressed need for specimens (rather than wholesale collecting) and with the emphasises on illustrating very specific engineering skills. The tone is more confident than WWSC's other letters of this time, with an insistence and even indignance about recognising "remarkable" and "historical" developments, and the need for this permanent record of women's work within the Museum.

A clue as to how the wording in this letter evolved is found written in pencil at the top of the copy: "This letter drafted by Mr B. H. Morgan (*two illegible words*) Section, Ministry of Munitions".

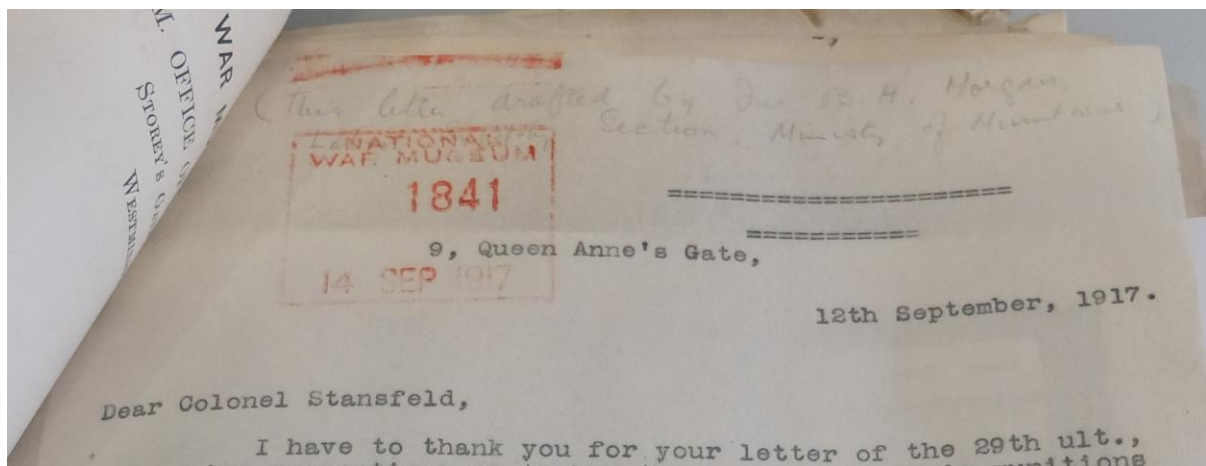


Figure 3.3 "This letter drafted by Mr B. H. Morgan" (IWM, ENI/3/COR/1, 1917)

B. H. Morgan's input into this letter, which was signed by Lady Norman, signals a partnership that valued the need to place women's achievements at the forefront of the objects collected for the Women's Section, rather than as footnotes. Morgan's wording in this communication references the proficiency of the women as established fact, with no validation being sought. It does not describe exhibition objects as a device for recruitment, but frames it for the first time as a memorial to the women's service. This term 'memorial' is loaded with permanence, remembrance, and a consensus of quality of effort.

Morgan's collaboration with and advocacy for the WWSC coincided with developing ideas about the acquisition of large scale metal exhibits like guns or even an aeroplane, in order to illustrate the entire range of women's skills in one single dramatic piece. Whilst still mindful of the need to record the proven abilities of these women for posterity, another objective was to make big

visual impacts on future exhibition attendees. To have visitors inspect an entire aircraft at close quarters would allow the women's capability and proficiency to speak for itself. Agnes Conway's early request to Morgan for larger objects was turned down for logistical reasons, namely that the components were manufactured at different locations (IWM, ENI/3/GEN/4 Letter from Agnes Conway to Ben H. Morgan 7th July, 1917). He explained this situation in a thoughtful letter of reply 12th July 1917, in which his full support is still evident:

Women are actually performing all the operations in their manufacture but at different works, and it would be necessary therefore to accumulate all the separate parts and have them specially assembled for the purpose of an exhibit. The details of such a scheme would require to be gone into very carefully and in due course I will send you such a proposal for the Committee's consideration. Equally remarkable work is being done in many other directions and I would like to have a little time to consider the question as a whole with a view to deciding what specimens in each industry it would be advisable to ear-mark for the museum"

(IWM, ENI/3/GEN/4 Letter from Ben H. Morgan to Agnes Conway 12th July, 1917).

If the WWSC did not succeed in acquiring an aeroplane for their Section, there is testimony that they did manage to obtain exhibits that were larger than the original samples for the dilution exhibitions. One such example is evidenced in a tense exchange found in a note written on the 19th July 1918 from Mr Tyler, the Officer in Charge of the Munition Exhibition at the Art Gallery at The Castle in Nottingham. In it, he asks for how long the WWSC intends to borrow an 8" lathe and a chart "illustrating the growth of the employment of women on munition work". The WWSC Hon Secretary responded, "I wish to make it clear to Mr Tyler that our lathe and chart are our property" (IWM, ENI/3/COR/2/1 Letter from Agnes Conway to Charles ffoulkes 19th July, 1918). In an inquiry a year later, Agnes Conway was obliged to explain that this significant object had been presented for the Women's Section and should remain there.

Concerns about ownership of exhibits arose elsewhere in the same month, when the WWSC acquired quality exhibits that other subcommittees felt should belong in their Section. A memo from Charles ffoulkes in July 1918 shows that an aeroplane engine had been delivered to the Lupus Street Stores with a label saying that 33% of the work on it had been made by women. The proposal was to transfer it from the stores to the Air Force Section because the majority of the

work on it had been done by men. Agnes Conway's response is clear (IWM, ENI/3/COR/2/1, 1918). She explained that the reason Messrs. Ruston, Proctor and Co presented the aeroplane engine to the Women's Section was because it exemplified the highest percentage of women's work to date on such a highly skilled job. She stressed that the valuable gift was being received by the firm on the very understanding that it should be used to commemorate "the comparatively high degree of skill of the women employed by them", and that it would not be appropriate to give the aeroplane engine to the Air Force Section. In addition to making it clear that the aeroplane engine had been received into the collection specifically for the Women's Section, there is a tacit reference here to the corporate pride many companies did express for successfully bringing women into the skilled workplace.

If there were occasional disputes about which Section should own the better objects, there was also a certain resistance by the Ministry of Munitions Sub Committee to allow any duplication of artefacts. In his letter to Lady Norman in August 1917, Colonel Stansfeld closes by saying:

I think that the main War Museum Committee would be indisposed to provide any material additional space for Munition exhibits in the Women's Section, when those exhibits were duplicating the samples shown in another Department. Do you not think the necessities of the case would be met if typical samples of the more common or important types of work were included in the Women's Section, and the remainder of their productions dealt with by documentary records giving a reference to the other portion of the Museum where the particular store in question would be found? In order that the importance of Women's Work may be made fully apparent, I think it will be quite possible to indicate on the exhibits shown in other parts of the Museum such as the Ministry of Munitions, War Office or Admiralty Sections, that a large proportion of the supply of the particular exhibit has been due to the work of women operatives.

(IWM, ENI/3/COR/1 Letter from J.R. Stansfeld to Lady Norman 29th August, 1917).

Col. Stansfeld was expressing his concerns about the duplication of exhibits in the context of space restrictions, yet this letter also highlights the problem of what these objects represented to each party. To the WWSC, metal cutting tools or shells were important as manifest evidence of female metalworking and engineering ability, whereas the Ministry of Munitions Sub

Committee were seeking representation of the latest and best warfare technology and engineering. The former speaks of the person, the latter of the engineering design that the item exemplifies.

The need for the WWSC to safeguard the gender provenance of their collections, particularly in munition and metal work, also factors into this debate about duplication. The duplication of objects in the Imperial War Museum's collection was seen as unnecessary and a poor use of space by those compiling the Munitions Section, yet duplication was seen as a useful device by the WWSC to prove the equal quality of comparative items made by women and men. Within the overarching agenda of self-representation was this need to irrefutably demonstrate that the work produced by women was of comparably high quality to that produced by men. Furthermore, the most successful exhibition by the WWSC, staged at Whitechapel Art Gallery in 1918, comprised only work done by women and was another reason why owning a complete set of female-made munitions was important.

The WWSC faced increasing problems as it collected more artefacts than could be housed by their allocated storage or exhibiting space, thus risking the separation of exhibits from their data and context. It did request more space, but the National War Museum Committee could not or would not increase the allowance, recommending instead that the WWSC curtailed its collecting or allowed exhibits such the munition work to be included in the general Munitions Section (IWM, ENI/3/COR/1 Letter from J.R. Stansfeld to Lady Norman 29th August, 1917). The caveat within this last suggestion was that the objects could carry labels explaining that women had made them. This solution seemed unacceptable to the WWSC and was rejected, possibly because it had the foresight to imagine that labels, provenance, and an understanding of female capabilities, can easily be lost over time. Objects orphaned from their accompanying data do easily default to any established narrative about how they came to be.

Buck's (2015) research suggests that the WWSC's fears may have been well-founded, as she described the haphazard and rapid collection of objects at this time by the Imperial War Museum's subcommittees generally, and how labels did come off and objects were orphaned. Buck describes how ffoulkes and historian Henry Beckles Wilson frequently expressed anxiety about the authenticity of the objects collected; an anxiety centred on certification and correct labelling (Clare Buck, 2015, p. 175). The WWSC's concerns about the misattribution of the work

seem reasonable. As discussed in the following chapter, it is relevant to note that two exhibits donated to the WWSC by the Cunard Shell Factory only survive to this day with their provenance intact because they were not labelled, but engraved with the words “Manufactured in Great Britain by Female Operators” (Section 4.5).

3.6 Discussion

The Imperial War Museum was founded in 1917 during the First World War, at the beginning of Prime Minister David Lloyd George’s tenure. The idea came from fellow Liberal MP Sir Alfred Mond, who envisaged a public place where the events of the conflict would be commemorated, and experiences of the population as a whole could be reflected. At a time of low morale caused by recent heavy military defeats and the political uncertainty of a new government, the propaganda opportunities for such a project did not go unnoticed.

On 5th March 1917 the War Cabinet approved the proposal to create a national war museum. Curator of the Tower of London Armouries, Charles ffoulkes, was appointed the IWM’s first Curator and Secretary, and Sir Martin Conway (also a Liberal) was appointed the first Director General. Both men brought with them artistic experience and an ethos of inclusion. This translated into two main aims for the museum. As well as the traditional ideas of commemorating enemy encounters and displaying the technology of conflict, it was also intended to reflect life on the home front and the experiences of every individual. Whilst this framework made the inclusion of women’s work inevitable, the idea of developing a discrete Women’s Section was not, and nor was the notion that all the collecting for this section should be carried out by an all-female subcommittee. No such similar effort was made in the Second World War, but in the early twentieth century the political backdrop was one of socially liberal reform ideals, and most significantly, suffragism.

The Women’s Work Sub Committee’s intention was to record and self-narrate women’s experiences during wartime and preserve the proof of their abilities for posterity. Led by Chairwoman Lady Pricilla Norman, it consisted of a number of highly educated, well-known and well-connected activists, including Sir Martin Conway’s daughter, art historian and archaeologist Agnes Conway. Other members of the WWSC had also been involved in the women’s rights movement and when suffragist activism was paused for the duration of the war, had also volunteered for other causes. By the time the WWSC was formed in 1917, many had already

been decorated with national honours for their work in supporting refugees and hospitals as part of the war effort.

Agnes Conway, with an apparent insight into the finite opportunity that had presented itself, rapidly designed a collection plan to cover the vast number of sectors in which women were now involved. As well as seeking artefacts for the museum, she sought the supporting published literature and first-person accounts of events, by contacting women's colleges and asking publishers for narratives of the war authored by women. As more subsections developed within the Women's Work Collection, workloads increased and members of the WWSC were delegated to oversee their particular area of experience and expertise.

Furthermore, whilst the WWSC largely operated independently and created its own agenda, it was nonetheless limited by the exhibition space constraints imposed by the IWM's General Committee. Minutes of WWSC meetings demonstrate strong considerations about how audiences of future exhibitions would interact with the displays, and so innovative forms of presentation and communication were used to chart the progress of women into male spaces. Representation of women by women was important to the WWSC, and the group appointed the first ever female war artists to depict women on the home front (Chapter 5).

Between 1917 and 1920 the WWSC collected an immense array of objects for the new IWM which included samples of metalwork. The assemblage of munitions objects was developed from an adopted earlier collection created by the Ministry of Munitions in support of their exhibitions intended to promote dilution practices in factories; exhibitions designed entirely to illustrate female metalworking skills to employers who would never previously considered them as employees. It is because of this, that the surviving collection comes with a rare assurance of the gender provenance of the metalwork, giving an opportunity to examine how women metalworkers were being understood differently, now that the demands of war had reconfigured previously accepted norms. It also provides a moment to consider how these artefacts have been valued in the intervening decades (Section 7.5).

Many of the metal objects pertinent to this research, were adopted from the earlier Ministry of Munitions exhibitions which coincidentally had started at a similar time to the formation of the WWSC in April 1917. This research has shown that the categories of object-type defined in these earlier exhibitions were adopted by the WWSC for their own collection, namely: general

engineering, tool room, gauges and precision work, machine tools, gun components and small arms, shells and fuzes, internal combustion engines and aircraft (as well as the non-metal categories of general woodwork and optical, glass-blowing and electrical work). These groupings would represent a narrow sample of the overall metalwork being carried out by the women working in the sector, but nonetheless became core exhibits of the WWSC because of their availability within a limited time frame. Under the curation of the WWSC, the meaning of the metal objects would alter. Beginning as sample proofs intended to illustrate substitution as a successful but temporary war strategy, the WWSC would present them as illustrations of female ability in fields where access was rarely gained.

Tensions occasionally arose between the WWSC and the IWM's Ministry of Munitions Sub Committee about which section should own and display what kind of item. The archives show evidence of objections from the Ministry of Munitions Sub Committee concerning duplication fears, and an expectation that all work pertaining to munitions should appear in their section, albeit with labels indicating which work was female made. The WWSC largely defended their decision not to comply, raising concerns that objects inevitably become parted from labels over time. This sense of concern about misattribution of work is a recurrent theme, and the view of the WWSC is vindicated in the case of the Cunard shells, which survived the intervening decades with their gender provenance intact, only because the donor had them engraved (Section 4.6).

Attempts were made by the WWSC to collect bigger metal items for its section, including an aeroplane. Dialogue between Lady Norman and B.H. Morgan (Technical Advisor to the Labour Supply Department) show his support for the WWSC, but also convey the reluctance of the Ministry of Munitions Sub Committee to support the display of completely assembled machinery in the Women's Section. For their section, the Ministry of Munitions Sub Committee were seeking to showcase the latest and best warfare technology and engineering. The WWSC were using their collection of objects like metal cutting tools and shells as manifest evidence of female metalworking and engineering ability. The former speaks of the engineering design that a displayed item exemplifies, whereas the latter speaks of the person and her capabilities.

The metal objects found within the assemblage collected by the Women's Work Sub Committee from 1917 to 1920 represent an important resource in the study of female metalworking and the way in which it is recognised and recorded. By charting the movement and survival of this

collection, and examining records of debates and tensions in the archive, it is possible to determine the intentions of the WWSC and illustrate how the same metal objects were used as proxies to represent different ideas at different times. There is also case to be made that the WWSC were engaging in a form of material activism during a hiatus in suffragist activity for the duration of the First World War.

4 Chapter Four: The metal objects

4.1 Introduction

The metal samples acquired by the Women's Work Sub Committee from 1917 to 1920 as part of their munitions collection represent an unusually specific record of female metalworking and engineering. The collection has been used in this research to examine the intentions of the WWSC, and to understand how female metalworking is recorded and remembered. It considers how these metal objects became proxies, representing different ideas at different times.

In order to discover what was collected and why, this research created a database of the metal objects found in the original collection, using evidence from the following primary sources:

- a) Contemporary catalogues from both the Ministry of Munitions dilution exhibitions and IWM exhibitions organised by the WWSC, found in the paper archive of the Women's Work Collection in IWM London and also accessed online via Gale Primary Sources' *Women, War and Society 1914 – 1918 Collection*
- b) Minutes of WWSC meetings, correspondence and newspaper articles also from the IWM Women's Work Collection archive in London, and accessed online via Gale Primary Sources' *Women, War and Society 1914 – 1918 Collection*
- c) The IWM's online 'Find an Object' catalogue, using the terms 'Women's Section' or 'Women's Work Collection' as selection criteria
- d) Objects located in the IWM London and IWM Duxford stores with data and provenance intact
- e) Objects found in the IWM London and IWM Duxford stores that appear likely to have been part of the original collection because of age and type, and are therefore worth examining.

4.2 Tracing the phased acquisition of the WWSC metalwork collection

The research identified three phases in the acquisition of the WWSC metalwork collection. These were:

- i. Sample metal components originally collected by the Ministry of Munitions to display at dilution exhibitions across the country in 1917 and 1918.

- ii. Similar sample metal components added by the WWSC when the collection was acquired for the IWM national collection.
- iii. Larger metal objects collected by the WWSC for future IWM exhibitions and memorial purposes

4.2.1 Metal objects from the Ministry of Munition's dilution exhibitions

When the WWSC was formed in April 1917, the dilution of labour programme had been in operation for over two years, since the Shell Crisis of 1915 (Section 2.3). The Ministry of Munitions Labour Supply Department was instigated to promote the programme, devising a series of temporary exhibitions at various locations across the country. In May 1917, the exhibition at the Royal Colonial Institute in Bristol introduced the idea of showing female-made metal samples as a means of augmenting displays of promotional material and photographs of working women. At this stage in the First World War, examples of female-made metalwork and engineering were abundantly available, so it was an obvious add-on which would be easily implemented.

Dilution exhibitions were aimed at prospective employees and factory owners rather than the general public, and were intended to showcase precision, accuracy, and rate of productivity. The number of objects in the Ministry of Munitions' travelling collection increased over the fifteen months of the exhibitions' duration (Table 3.1). Objects made from glass, rubber, leather and wood were included in the listed categories of optics, aircraft, medical and surgical categories, yet metalwork formed just over 90% of this collection.

The catalogues used in this study were from exhibitions held at the following locations:

- a) The Royal Colonial Institute in Bristol in May 1917 (IWM, MUN. VI/44, 1917).
- b) The City Art Gallery, Leeds in July 1917 (IWM, MUN. VI/40, 1917).
- c) The Whitworth Institute, Manchester November 1917 (IWM, MUN. VI/39, 1917).
- d) The Whitechapel Art Gallery, London May 1918 (IWM, MUN. VI/42, 1918).
- e) The Art Gallery at Nottingham Castle, Nottingham July 1918 (IWM, MUN. VI/41, 1918).
- f) Ministry of Munitions Catalogue. Exhibition of Samples of Women's Work and Official Photographs, 1918 (IWM, LBY 16242, 1918).

In addition to providing descriptions of many of the operations used in the manufacture of the metal objects, the final catalogue had a large number of photographic illustrations of the artefacts; undoubtedly those that Miss Monkhouse had the foresight to request (Section 3.3).

This last catalogue represented the conclusion of the Ministry of Munitions' episode of collecting metal samples, now that the need for dilution recruitment was over and the war had ended (IWM, LBY 16242, 1918).

Table 4.1 Collection rate of munitions objects for dilution exhibitions

Date	Exhibition	Catalogue Ref.	Metal Objects	Total Items
May 1917	Royal Colonial Institute, Bristol	MUN. VI/44	639	676
July 1917	City Art Gallery, Leeds	MUN. VI 40	910	961
November 1917	Whitworth Institute, Manchester	MUN. VI 39	980	1396
May 1918	Whitechapel Art Gallery, London	MUN. VI 42	983	1312
July 1918	Castle Art Gallery, Nottingham	MUN. VI 41	1030	1542

The catalogue from the Royal Colonial Institute's dilution exhibition in Bristol in May 1917 was presented as a simple typed document, in contrast to the later more professionally produced exhibition catalogues (IWM, MUN. VI/44, 1917). Under each heading - e.g. Group A – Engines (Aircraft) - there were subheadings such as Clerget, Hispano Suiza, 4A and Le Rhône, and beneath these were listed the actual items, such as 'exhaust valve seat', 'flange for induction tube', 'wrist pin', 'big end bush' and 'rocking lever'. A later version that accompanied the exhibition at the City Art Gallery exhibition in Leeds in July 1917 had developed a more polished presentational style, in terms of layout and typeface (IWM, MUN. VI/40, 1917). It listed 271 more metal objects in the collection than were displayed at Bristol, with considerably more data in the text. Under 'Group A. Engines – Aircraft (Clerget)' could still be found 'Exhaust valve seat' but with the stages of production added as well:

- (a) *Machine:* Sensitive Drilling Machine. *Operation:* Drilling between arms before milling.
Time: 6 minutes. *Remarks:* Jig Drill used.
- (b) *Machine:* No. 2 Van Norman Universal Miller. *Operation:* Milling openings and bevelling arms. *Limit:* To gauges and weight plus 3 grammes to minus 2 grammes.
Time: 60 minutes.

Evidence of the attempt to collect this kind of additional information was seen in the appeals to dilution officers, printed as articles in the Dilution of Labour Bulletins. At the end of the report in Vol 1, Issue 6, on the exhibition held at the Royal Colonial Institute in Bristol, there is a short piece appealing for specific data (reproduced here verbatim):

Type of Machine. - Engine Lathe, Capstan Lathe, Planer, Shaper, Slotter, Miller, Press, Boring Machine, Saw, etc.

Size of Machine. - Height of centres of lathe, stroke of shaping machine, and slotting machine, stroke and clearance of planing machine, etc. In the case of special machines known in the trade by recognized names or numbers, the recognized name or number will be sufficient. In all other cases the dimensions by which the machine is generally known is what is required.

Makers of Machine.

Class of work engaged on - The name of the article or articles most generally made on the machine in question.

Does the operator set her own work and tools?

Output – Any particulars of number of pieces machined per shift that can be obtained.

Name of firm using the machine.

(IWM, MUN. VI/18, 1917, p. 93)

This request was published in April 1917, and consequently the catalogues subsequent to the dilution exhibition in Bristol in May 1917 do carry larger amounts of information about the metal exhibits.

4.2.2 The WWSC's acquisition of metal munitions objects for the IWM

A memorandum sent by Sir Martin Conway on the 15th June 1917 informed Col. Stansfeld (Chairman of the Ministry of Munitions Sub Committee) that the WWSC had passed a resolution setting out a number of requirements. These included a request that the Minister of Munitions could:

...authorise the Technical section of the Labour Supply Department (to which their member Miss Monkhouse belongs) to collect data on women in Engineering Shops on the lines suggested by Miss Monkhouse.

(IWM, ENI/3/COR/1 Memoranda to Col. Stansfeld from Director General 15th June, 1917)

The memo went on to ask for further "data" regarding women's welfare, and stated that they would also:

...be very glad if Mr B.H. Morgan, Technical Advisor to the Labour Supply Department, were asked to advise the Committee as to the samples of women's work which should be collected as a memorial to the part women have taken in the production of Munitions of War in Engineering and allied Trades.

(IWM, ENI/3/COR/1 Memoranda to Col. Stansfeld from Director General 15th June, 1917)

The document gives the earliest indication of the developing partnership between the Ministry of Munitions Sub Committee and the WWSC in terms of their collecting agenda for the new IWM. It introduced B.H. (Ben) Morgan into this collaboration, and used the key word "data", a term suggesting that a different kind of purpose for the objects was being envisaged. Instead of presenting evidence of women's metalwork to employers considering adopting dilution practices, it imagined a future audience seeing evidence of female service, setting the tone for an agenda of evidence-gathering for archives and for posterity.

The first time that metal objects from the dilution exhibitions were displayed as part of the IWM was on the 7th January 1918 at Burlington House in London. According to its catalogue, this exhibition was in aid of the British Red Cross Society and the Order of St John, and organised by the IWM General Committee in collaboration with the "Canadian, Australian and New Zealand Authorities" who contributed photographs (IWM, LBY 2240, 1918). It took place between the exhibitions in Manchester (November 1917) and Whitechapel Art Gallery, London (May 1918). Similar numbers of metal and non-metal objects were displayed in these exhibitions.

Table 4.2 Comparison of number of metal objects displayed between Nov 1917 and May 1918

Exhibition	Date	Metal Objects	Non-Metal Objects
Whitworth Institute, Manchester (dilution exhibition)	November 1917	980	80
Burlington House, London (IWM Women's Section)	January 1918	931	41
The Whitechapel Art Gallery, London (dilution exhibition)	May 1918	983	44

The WWSC was offered two rooms in which to display these first exhibits of the Women's Section in the Burlington House exhibition, and the agreement between the WWSC and the Ministry of Munitions Sub Committee about how these objects would be shared can be found in a letter

from 26th November 1917 from Lady Norman to Col. Stansfeld (IWM, MUN. 1/2 Letter from Lady Norman to Col Stansfeld 26th November, 1917). In it she says that the Women's Work Sub Committee proposed to accept the offer of a temporary loan of exhibits and photographs from the Ministry of Munitions for this exhibition, with the intention of retaining them for a month, during which time the WWSC would amass similar objects before replacing the exhibits in stages with their own artefacts. These replacements would then be retained as the property of the IWM's Women's Section.

When examining objects as part of this research, it has not been possible to discern to what extent the original exhibits were replaced by identical copies, nor how it might be possible to tell them apart from the written descriptions in the catalogues. There is evidence that photographs in the IWM exhibitions were reprints of those shown in the Ministry of Munitions' dilution exhibitions, because in the same memo Lady Norman asked if B.H. Morgan could be authorised to prepare a set of permanent prints from the negatives of the dilution section, to be presented to the "National War Museum", in order to replace those on loan. This correspondence originally included a list of groupings for proposed exhibits for collection, but could not be found in the archive with this letter. It is safe to believe that this list resembled the one drawn up by Miss Monkhouse in June 1917, as the format remained unaltered thereafter, as shown in Table 4.4. In the catalogue for the Burlington House exhibition, 27 pages are dedicated to listing the now familiar types of metal samples, with additional references to the training establishments involved in supporting the dilution process.

When the collection was later exhibited at the Women's War Work exhibition at the Whitechapel Art Gallery in London, from 9th October to 20th November 1918, it was the only time the Women's Section was exhibited without any other IWM sections, and was the only exhibition organised entirely by the WWSC as an IWM event (Section 6.4). Defining exactly which metal objects were present at this venue is problematic. According to Buck (Clare Buck, 2015, p. 183), referencing Women's War Museum: Records and Models from The Times, 8th of October 1918, there was no catalogue for this exhibition because paper was scarce and the costs too high. However, my research did uncover a catalogue for the exhibition consisting of just eight pages (IWM, EMP. 26/2, 1918), which gave a simple overview of the categories of work displayed and artefact donors. As this pamphlet is located in the archive with a ticket for the exhibition's private

view on 8th October 1918, it may have been part of a limited print run, only to have been distributed to visitors on this occasion.

4.2.3 Larger metal objects collected by the WWSC

Attempts were made by the WWSC from the outset to acquire metal objects that were larger than the small component samples adopted from the Ministry of Munitions dilution exhibition collection. Evidence of these attempts is often found in the form of refusals to the WWSC's requests, or even occasional rebuttals. A letter from Agnes Conway to Col. Stansfeld of the Ministry of Munitions Sub Committee shows the acknowledgement of a denied request for guns to be displayed in the Women's Section at Burlington House: "The wish of your Committee regarding the omission of the inclusion of the three guns in the list of exhibits to be procured in the near future will most certainly be concurred in" (IWM, ENI/1/COM/24/2 Letter to Col. Stansfeld from Agnes Conway 8th December, 1917).

However, an exception to this unsuccessful attempt to bring larger items into the collection can be found in the catalogue for the Burlington House exhibition (IWM, LBY 2240, 1918, p. 15). Ahead of the list of metal component items derived from the dilution exhibitions were listed the "First 6" and 8" shells manufactured in Great Britain by Lady Operators at Cunard S.S. Cos. Shell Works". These shells were acquired by word of mouth, through Lady Norman's brother, the Liberal MP Henry McLaren, and are discussed more fully in Section 4.5.

Appeals were made for larger items, and a small number were collected in response to the written circular sent to various manufacturing bodies by the WWSC (IWM, ENI/1/COM/24/2 A1/4, 1917) (Section 3.5). Those exhibits that were donated can be seen referenced in correspondence found in the IWM archive. For example, an exchange between members of the WWSC and lathe manufacturers Smith, Barker and Willson discusses the 8" lathe which had been lent for the Burlington House exhibition (IWM, ENI/3/MUN/2/5, 1918). A further request was made to the manufacturers for it to be kept, initially for the 1918 Whitechapel Art Gallery exhibition then later for the longer term as part of the Women's Section of the IWM. Although this was agreed to, correspondence in November 1918 show that the lathe was not exhibited at the Whitechapel exhibition and was instead lent to the Ministry of Munitions on a temporary basis. According to a letter dated 1st April 1920, when the lathe was returned to Smith, Barker and Willson by the Dilution Department, it was said to be in such "a bad condition" that it was no longer fit for exhibition at IWM Crystal Palace (IWM, ENI/3/MUN/2/5, 1918). When Agnes

Conway responded, saying that Ben Morgan would liaise, she added that it is “most unfortunate that the lathe should have suffered as we valued this more than any of our engineering exhibits” (IWM, ENI/3/MUN/2/5, 1918). The exchange supports the idea that larger metalworking exhibits were harder to come by, and that a dialogue with the Ministry of Munitions Sub Committee was ongoing until both sub committees were dissolved.

Similarly, evidence of another large exhibit comes not from an inventory, but from a memo exchange dated 20th June 1918 between Charles ffoulkes and Agnes Conway. Here it is proposed by ffoulkes that an aeroplane engine (which had been delivered to the Lupus Street Stores with a label saying that 33% of the object had been made by women) should be transferred to the Air Force Section as the “larger proportion of the work has been done by men and as the particular exhibit is connected with the air services” (IWM, ENI/3/COR/2/1, 1918). Conway replied by explaining that the reason Messrs. Ruston, Proctor and Co. had been asked to present the aeroplane engine to the Womens Section was because it;

...exemplifies the highest percentage of women’s work yet attained on this particularly highly skilled job. As the exhibit is a valuable one and has been presented by the firm on the understanding that it should commemorate the comparatively high degree of skill of women employed by them we think it would not be right to transfer the engine to the Air Force Section.

(IWM, ENI/3/COR/2/1, 1918)

4.2.4 Items found in the present-day IWM collection

As well as using archives to identify and trace the metal objects in the WWSC’s collection for the Women’s Section, this research attempted to locate objects surviving in the present-day IWM collection. This was done by working through the IWM’s online object catalogue, identifying possible items and checking them with IWM curators Martin Anthony and Alan Wakefield. Of these items, some could be confirmed as having been collected by the WWSC. Other items fit the profile of the collection in terms of date, object type and manufacturer, but were not categorised as having been part of the original WWSC collection. These might have been objects collected by the Ministry of Munitions subcommittee, or they could have been included in the collection around 1920 when the WWSC had been dissolved.

Of the objects identified, twenty-two were viewed and photographed at IWM London in October 2021, and a further twenty-four were examined and recorded at IWM Duxford in visits between November 2021 and May 2023. One of these items (EPH 4750, a counterbore for a cartridge case) could not be physically located for the research visits, which coincided with Covid-19 restrictions. In addition to the metal objects at IWM Duxford, access was allowed to three surviving plaster dioramas from the WWSC's original collection. These could only be viewed in their open crates due to their fragility, but the visit provided the opportunity to take photographic records of the pieces (Section 5.5).

Establishing the survival rates of the metal objects from the original collection of the WWSC to the present day faced challenges such as discrepancies in labelling, movement between collections, damage cause by Second World War bombing, dispersal and destruction, and even anecdotal evidence of artefacts being used to provide spare parts for the other exhibits such as aircraft. These will be discussed in Chapter 6.

4.3 Reconstructing the collection

The early part of this research used catalogues printed for the Ministry of Munitions' dilution exhibitions between 1917 and 1918 to find information about individual metal objects that would later become elements of the Women's Work Collection. These documents gave data about the kinds of metal samples being displayed, and the areas of munition work they had been derived from. The composition of these assemblages is shown in Table 4.3 below and predates the final catalogue published the Ministry of Munitions (IWM, LBY 16242, 1918).

Table 4.3 Details of objects shown in dilution exhibitions between May 1917 and July 1918

Exhibition and catalogue reference	Bristol May 1917 (IWM, MUN. VI/44, 1917)			Leeds July 1917 (IWM, MUN. VI/40, 1917)			Manchester Nov 1917 (IWM, MUN. VI/39, 1917)			Whitechapel May 1918 (IWM, MUN. VI/42, 1918)			Nottingham July 1918 (IWM, MUN. VI/41, 1918)		
M = Metal N.M. = Non Metal N.E. = No Exhibit	M	N.M.	N.E.	M	N.M.	N.E.	M	N.M.	N.E.	M	N.M.	N.E.	M	N.M.	N.E.
Group A Engines Aircraft															
Clerget	19	0	0	47	0	0	32	0	27	32	0	0	33	0	26
Hispano Suiza	5	0	0	5	0	0	5	0	16	5	0	16	5	0	16
R.A.F. Engine 3a	0	0	0	0	0	0	15	0	15	15	0	15	15	0	15
R.A.F. Engine 4a	3	0	0	3	0	0	13	0	17	13	0	17	13	0	17
Le Rhône (incl a)	13	0	0	5	0	0	7	0	13	0	0	0	0	0	0

R.A.F. Engine	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
Beardmore 160 h.p.	0	0	0	3	0	0	25	0	34	25	0	34	25	0	34
Gnome	0	0	0	4	0	0	7	0	13	7	0	13	7	0	13
110 hp Le Rhône Engine	0	0	0	0	0	0	5	0	6	4	0	6	5	0	6
'Smith' Aero Engine	0	0	0	0	0	0	3	0	0	3	0	0	3	0	0
R.A.F. Engine	0	0	0	29	0	0	0	0	0	0	0	0	0	0	0
Group B Internal Combustion (for Motor Cars, Tanks, &c)															
5-inch by 6-inch Tank Engine (incl a)	18	0	0	18	0	0	18	0	0	18	0	0	18	0	0
7 ½ -inch by 8-inch Tank Engine	18	0	0	12	0	0	12	0	0	12	0	0	12	0	0
Tractor Engine	2	0	0	2	0	0	2	0	0	2	0	0	2	0	0
Motor 'Bus	4	0	0	4	0	0	4	0	0	4	0	0	4	0	0
Motor Lorries	21	0	0	21	0	0	21	0	0	21	0	0	21	0	0
20-25-h.p. Motor Vehicle	0	0	0	51	0	0	51	0	0	51	0	0	51	0	0
Motor Lorry	0	0	0	30	0	0	30	0	0	30	0	0	30	0	0
Motor Lorry Engines	0	0	0	13	0	0	15	0	0	15	0	0	15	0	0
Group C Engines - Internal Combustion															
Accessories	17	0	0	17	0	0	30	0	4	34	0	4	31	0	4
Magneto - Watford Type	0	0	0	0	0	0	7	0	0	7	0	0	8	0	0
Group D Engines															
Steam	9	0	0	9	0	0	19	0	11	19	0	11	19	0	11
Group E Guns and Components															
	15	0	0	15	0	0	15	0	0	15	0	0	15	0	0
12-inch Mark I Howitzer	0	0	0	2	0	0	2	0	0	2	0	0	2	0	0
12 Pounder, 12 cwt., Mark II Gun	2	0	0	3	0	0	3	0	0	3	0	0	3	0	0
5-inch 60 Pounder	8	0	0	9	0	0	12	0	0	12	0	0	12	0	0
4-inch Marks VII and VIII	8	0	0	3	0	0	3	0	0	3	0	0	3	0	0
4-inch Mark VII Gun	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0
8-inch Howitzer	16	0	0	18	0	0	13	0	0	13	0	0	13	0	0
Gun Sights	15	0	0	32	0	0	32	0	0	32	0	0	32	0	0
4-inch Breech Mechanism	4	0	0	4	0	0	4	0	0	4	0	0	4	0	0
18-pounder Breech Mechanism	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0

6-inch Howitzer Breech Mechanism	11	0	0	11	0	0	11	0	0	11	0	0	11	0	0
12 Pounder Breech Mechanism	4	0	0	4	0	0	4	0	0	4	0	0	4	0	0
18 Pounder Gunsights	0	0	0	14	0	0	13	0	1	13	0	0	13	0	1
6 Pounder H.A. Sight	0	0	0	7	0	0	6	0	23	6	0	23	6	0	23
Group F Small Arms															
Lewis Gun (incl 2x5s)	18	0	0	19	0	0	17	0	12	17	0	12	20	0	9
Lee-Enfield Rifle	9	0	0	11	0	0	17	0	16	17	0	16	18	0	16
Vickers Machine Gun Parts	57	0	0	60	0	0	41	0	24	45	0	24	46	0	24
Group G Tool Room Work															
Gauges	8	0	0	8	0	0	8	0	11	8	0	11	8	0	11
Group H Tool Room Work															
Drills, Cutters, Test Pieces	86	0	0	116	0	0	72	0	36	72	0	36	72	0	36
Group K Tool Room Work															
Dies &c	87	0	0	87	0	0	116	0	14	116	0	14	116	0	14
Group L Aircraft															
Metal Work	82	0	0	87	0	0	114	0	0	114	0	0	115	0	0
Group M Aircraft															
Woodwork	0	11	0	0	51	0	0	51	19	0	15	19	0	51	19
Joinery &c	0	0	0	0	0	0	0	3	0	0	3	0	0	3	3
Group N Projectiles and Trench Warfare															
Bombs	7	0	0	6	0	0	6	0	0	6	0	0	6	0	0
Cartridge Cases	14	0	0	6	0	0	27	0	0	27	0	0	27	0	0
Shells	3	0	0	3	0	0	2	0	0	2	0	0	2	0	0
Fuzes	27	0	0	11	0	0	14	0	24	14	0	14	48	0	11
Group O General Engineering															
	13	0	0	77	0	0	91	0	0	91	0	0	96	0	0
Group P Optical Munitions and Glassware															
	11	0	0	11	0	0	11	0	0	11	0	0	13	0	0
Group Q Medical and Surgical															
	0	26	0	0	0	0	0	26	0	0	26	0	0	49	0
TOTAL ITEMS	639	37	0	910	51	0	980	80	336	983	44	285	1030	103	309
No. of catalogue pages	22			81			120			120			124		

Determining whether each of the objects listed in Table 4.3 was precisely the same object in each exhibition is problematic for two reasons. Firstly, there was an overlap in the usage of the items.

The exhibitions at Bristol, Leeds and Manchester were entirely created by the Ministry of Munitions dilution department, and it can be seen that between the first and third events, the number of metal objects displayed had risen from 639 to 980. When in January 1918 the WWSC showed their first display of women's work in the IWM Burlington House exhibition, there were 931 metal items (excluding the two Cunard shells) and 41 non-metal items initially on loan from the Ministry of Munitions dilution department (Table 4.4). However, as shown in a letter dated 26th November 1917 from Col. Stansfeld to Lady Norman, it was proposed that the loan would be for just one month whilst replicas were requested from munitions companies for the WWSC's own IWM collection (IWM, ENI/3/COR/1 Letter from J.R. Stansfeld to Lady Norman 24th November, 1917). To what extent this actually happened is hard to tell from the archives or other records, but the catalogue for the subsequent dilution exhibition at Whitechapel Art Gallery in May 1918 had a similar number of objects to the exhibition in Manchester six months earlier, with more being present at Nottingham. (The Ministry of Munitions exhibition in May 1918 in Whitechapel should not be confused with the IWM's "Women's War Work" exhibition at the same venue in October/November 1918). It should also be noted that the last three of these catalogues had items listed as "no exhibit". These related to requests to companies which had been agreed upon, but were not fulfilled in time for the exhibitions.

Secondly, although the metal items in the Burlington House catalogue are listed in a familiar format to the dilution exhibition catalogues, and can safely be assumed to be the same or replica objects, this cannot be said for the WWSC's main exhibition of the IWM's Women's Section held at Whitechapel Art Gallery in November 1918, as no detailed catalogue was issued. However, given the close connection between the Ministry of Munitions' dilution exhibitions and the WWSC, it seems reasonable to accept the equivalence of these items as objects, even if the purposes of their display varied.

Table 4.4 shows both the acquisition rate of metal objects for the exhibitions and the similar numbers of objects shared between the WWSC at the IWM Burlington House exhibition and the ongoing dilution exhibitions.

Table 4.4 Number of objects exhibited between May 1917 and July 1918 showing acquisition rate

Exhibition & catalogue reference	Bristol May 1917 (IWM, MUN. VI/44, 1917)	Leeds July 1917 (IWM, MUN. VI/40, 1917)	Manchester Nov 1917 (IWM, MUN. VI/39, 1917)	IWM Burlington House, London (IWM, LBY 2240, 1918)	Whitechapel May 1918 (IWM, MUN. VI/42, 1918)	Nottingham Jul 1918 (IWM, MUN. VI/41, 1918)
Metal Objects	639	910	980	931	983	1030
Non-Metal Objects	37	51	80	41	44	103
Objects listed as "No Exhibit"	0	0	336	0	285	309
Total Objects	676	961	1396	972	1312	1442

Some metalwork was shown at the IWM's *Woman's War Work* exhibition at the Whitechapel Art Gallery curated by the WWSC from October 1918, but the event mainly covered the extensive range of other female war work, such as nursing and agriculture (Chapter 6). After the metalwork moved on from the Whitechapel Art Gallery in November 1918, it became part of the Women's Section in the first complete configuration of the Imperial War Museum at Crystal Palace between 1920 and 1924. Although posters existed for this exhibition, no catalogues remain available and so it is difficult to assess how many items were in the collection at this stage. The most comprehensive catalogue published by the Ministry of Munitions Labour Supply Department followed the final dilution exhibition in Nottingham in July 1918 (IWM, LBY 16242, 1918). This primary source was used in this research as the definitive reference in determining the final recorded assemblage of metal munitions samples listed in the category types shown in Table 4.5. With the exception of Groups M, P, Q, and R, all these group categories consisted entirely of metal exhibits. This catalogue included the most comprehensive data on the sequence of operations required to make the metal object in the assemblage.

Table 4.5 Listed objects and categories found in the Ministry of Munitions catalogue (shown verbatim) (IWM, LBY 16242, 1918)

Object type	No. of metal items
GROUP A - ENGINES – AIRCRAFT	
(Clerget)	37
(Hispano Suiza)	13
(R.A.F. 3a Engine)	15
(R.A.F. 4a Engine)	13
(Beardmore 160 h.p.)	25
(Gnôme)	6

(110 h.p. Le Rhône Engine)	5
(Smith" Aero Engine)	3
GROUP B - INTERNAL COMBUSTION ENGINES (FOR MOTOR CARS, TANKS &c.)	
(5-inch by 6-inch Tank Engine)	19
(7½-inch by 8-inch Tractor Engine)	15
(Motor 'Bus)	4
(Motor Lorries)	21
(20-25-h.p. Motor Vehicle)	50
(Motor Lorry)	53
GROUP C - ENGINES - INTERNAL COMBUSTION (ACCESSORIES)	
(Clerget Engine)	25
(Magneto – Watford Type)	7
GROUP D - ENGINES AND TURBINES, STEAM	19
GROUP E - GUNS AND COMPONENTS	127
GROUP F - SMALL ARMS	
(Lewis Automatic Gun)	17
Maxim Gun Parts	3
(Vickers Machine Gun Parts)	40
(Lee-Enfield Rifle)	22
GROUP G - TOOL ROOM WORK (GAUGES)	19
GROUP H - TOOL ROOM WORK (DRILLS, CUTTERS &c.)	56
GROUP K - TOOL ROOM WORK (GENERAL)	
Precision work, including Punches, Dies, Chucks, Jigs, Test pieces, &c.	117
GROUP L - AIRCRAFT FITTINGS (METAL)	126
GROUP M - WOODWORK (AIRCRAFT WOODWORK)	
GROUP N - PROJECTILES AND TRENCH WARFARE.	
Bombs	6
Cartridge Cases	27
Shells	2
Fuzes	60
GROUP O - GENERAL ENGINEERING	97
GROUP P- OPTICAL MUNITIONS	
GROUP Q – GLASSWARE AND CHEMICAL APPARATUS	
GROUP R – TANNING AND DRESSING	
Grand Total	1049

Of the 1495 metal and non-metal objects listed in this catalogue (IWM, LBY 16242, 1918), 308 were labelled “no exhibit”, possibly because they arrived too late to be included in the 1918 exhibitions, or possibly because they had become difficult to procure under wartime restrictions. Some entries in the catalogue were crossed out, and these may have been lost or returned to

their donors. However all these ‘trace’ objects have been included in this study, as they still contain information about the intended composition of the collection. The database created for this research listed every munition object found in the *Ministry of Munitions Catalogue. Exhibition of Samples of Women’s Work and Official Photographs* (IWM, LBY 16242, 1918) and which accompanied the Burlington House exhibition (IWM, LBY 2240, 1918). Where present, the following data were attached to each item in the list of the reconstructed assemblage:

- A. Reference number of object in the IWM Burlington House Exhibition Catalogue (IWM, LBY 2240, 1918).
- B. Page number of object in the IWM Burlington House Exhibition Catalogue (IWM, LBY 2240, 1918).
- C. Ref. number of object in the *Ministry of Munitions Catalogue. Exhibition of Samples of Women’s Work and Official Photographs* (IWM, LBY 16242, 1918).
- D. Page number of object in the *Ministry of Munitions Catalogue. Exhibition of Samples of Women’s Work and Official Photographs* (IWM, LBY 16242, 1918).
- E. Image of object in the *Ministry of Munitions Catalogue. Exhibition of Samples of Women’s Work and Official Photographs* (IWM, LBY 16242, 1918).
- F. Object accession number in present IWM collection.
- G. Location of object present IWM collection.
- H. Date object viewed.
- I. Description of object.
- J. Object type.
- K. Label/history Note.
- L. Process description.
- M. Lathing operations cited in *Ministry of Munitions Catalogue. Exhibition of Samples of Women’s Work and Official Photographs* (IWM, LBY 16242, 1918).
- N. Milling operations cited in *Ministry of Munitions Catalogue. Exhibition of Samples of Women’s Work and Official Photographs* (IWM, LBY 16242, 1918).
- O. Filing operations cited in *Ministry of Munitions Catalogue. Exhibition of Samples of Women’s Work and Official Photographs* (IWM, LBY 16242, 1918).
- P. Grinding operations cited in *Ministry of Munitions Catalogue. Exhibition of Samples of Women’s Work and Official Photographs* (IWM, LBY 16242, 1918).

- Q. Drilling operations cited in *Ministry of Munitions Catalogue. Exhibition of Samples of Women's Work and Official Photographs* (IWM, LBY 16242, 1918).
- R. Boring operations cited in *Ministry of Munitions Catalogue. Exhibition of Samples of Women's Work and Official Photographs* (IWM, LBY 16242, 1918).
- S. Reamer operations cited in *Ministry of Munitions Catalogue. Exhibition of Samples of Women's Work and Official Photographs* (IWM, LBY 16242, 1918).
- T. Tapping operations cited in *Ministry of Munitions Catalogue. Exhibition of Samples of Women's Work and Official Photographs* (IWM, LBY 16242, 1918).
- U. Welding or brazing operations cited in *Ministry of Munitions Catalogue. Exhibition of Samples of Women's Work and Official Photographs* (IWM, LBY 16242, 1918).
- V. Bending operations cited in *Ministry of Munitions Catalogue. Exhibition of Samples of Women's Work and Official Photographs* (IWM, LBY 16242, 1918).
- W. My Observations.
- X. Materials: General.
- Y. Materials: Specific.
- Z. Materials: Surface treatment.
- AA. Length (mm).
- AB. Width (mm).
- AC. Height (mm).
- AD. Diameter (mm).
- AE. Dimensions (as recorded).
- AF. Inscription.
- AG. Manufacturer referencing (IWM, MUN. 1/7 List Of Munition Gifts Received/Not Received/Refused/Unanswered, 1918).
- AH. Location of manufacture.
- AI. Latitude.
- AJ. Longitude.
- AK. First appearance in Women's Work Collection.
- AL. Percentage of work done by women (time based).

Finally, forty-four items listed in the present day collection were added to the reconstructed assemblage having been identified through the IWM's modern online catalogue of objects. All

but one had explicitly been described in some way as having been part of the Women's Work Collection or "Women's Work". Table 4.6 shows the surviving objects in the IWM collection that were found as a result of this research.

When added to the database of the reconstructed assemblage, these objects were cross-referenced with descriptions in the earlier dilutions catalogues, and where possible with any photographs of the items in the main catalogue (IWM, LBY 16242, 1918) to enable a full timeline to be established for these particular items. Detailed overviews of each object can be found in Appendix One. A decision was made not to include any of the later large objects in the database, as there were so few of them and they were largely donated after the WWSC was dissolved in 1920. The Cunard shells represent a separate case to be discussed in Section 4.5.

Table 4.6 Surviving metalwork from the IWM's Women's Section discovered in the present day collection through this research

IWM accession No.	Location	Type of object
EPH 4087	Duxford	Telescope holder
EPH 4088	Duxford	Deflection dial
EPH 4089a & EPH 4089b	Duxford	Obturator pad (two parts)
EPH 4095	Duxford	Fin clip
EPH 4101	London	Aeroplane part
EPH 4104	Duxford	Vent nut bolt
EPH 4733	London	Metal wiring plate
EPH 4735	London	Pulley second elevator
EPH 4736	London	End socket for fairing support tube
EPH 4737	London	Skid lever
EPH 4738	London	Flap cable pulley bracket
EPH 4739	London	Metal socket with various size holes
EPH 4740	London	Longeron clip
EPH 4741	London	Landing gear guide flange
EPH 4742	London	Aluminium socket
EPH 4743	London	Rear bracket for carburettor controls
EPH 4744	London	Main petrol tank bracket
EPH 4745	London	Metal socket with various size holes
EPH 4746	London	Strut socket

EPH 4747	London	Fish plate
EPH 4749	London	Strengthening plate
EPH 4750	Duxford	Counterbores for cartridge cases
EPH 4751	Duxford	Spade cutter for finish-boring magazine of 60pdr Mk. II/L shrapnel shell
EPH 4752	London	Spade cutter
EPH 4753	London	Spade cutter
EPH 4754	London	Front axle swivel pin
EPH 4755	London	Drill socket
EPH 8717	Duxford	Aircraft Part?
EPH 8718	Duxford	Aeroplane Part
EPH 8756	Duxford	Spade cutter for base of 4.5-inch HE Mk. V & VII shells
EPH 8763	Duxford	Spade cutter (finishing) for loose nosed Mark IV shell
EPH 8766	Duxford	Spade cutter for base of 6-inch HE Mk.III/L & IV/L shells
EPH 8767	Duxford	Spade cutter for a loose nose 6-inch HE Mark IV shell
EPH 8768	Duxford	Metal mechanical component comprising a thick metal plate with two machined holes through centre
EPH 8770	Duxford	Spade cutter for base of 3-inch HE shell
EPH 8771	Duxford	Spade cutter for base of 9.2-inch HE Mk.X/L shell
EPH 8778	Duxford	Piston (110 h.p. Le Rhône). Part No. 6068
EPH 8876	Duxford	Cartridge container for Stokes Shell
EPH 8903	Duxford	Spade cutter for base of 8-inch HE Mk. IV shell
EPH 8911	Duxford	Spade cutter for nose of 9.2-inch HE Mk. V/L shell
EPH 8912	Duxford	Spade cutter for base of 6-inch HE Mk.VI/L shell
EPH 8913	Duxford	Spade cutter for base of 4.7-inch HE Mk. Ia/L shell
EPH 10201	Duxford	Chronometer chain
EPH 10894	London	Bracket

Detailed analysis of these metal objects is found in Section 4.4.

4.3.1 Materials, making processes and operations

In total, there are 1530 items in the assemblage reconstructed for this research, of which 1082 are metal. Some objects here are listed in the catalogue (IWM, LBY 16242, 1918) but were not present at the time the exhibitions took place. 303 items are classed as “no exhibit”, 5 are “not present”, and 5 are “not listed”. This research set out to better understand the collection in following ways:

- a) Materials used
- b) Types and sizes of objects
- c) Processes and operations represented
- d) Data acquired by examining surviving objects

Table 4.7 Material found in the reconstructed assemblage

Material Recorded	Number of Objects
Metal	1082
No exhibit	303
Wood	53
Glass	51
Mixed non metal	15
Leather	8
Not present	5
Not listed	5
Metal glass	5
Asbestos, mutton suet & canvas	1
Fabric	1
Plumbago (graphite) & sulphur	1
Total	1530

Table 4.7 shows how metalwork accounts for 71% the items in the reconstructed assemblage although of the 1082 metal objects listed in the collection, only 86 items have additional notes about the kind of metal used.

Eighty one of these 86 objects were fabricated from ferrous metals. With the possible exceptions of “rolled mild steel” and “malleable iron”, these components are likely to have been cast alloys. The terms “rolled mild steel” and “malleable iron” could be applied to sheet metal, for which an appropriate metalworking process could be bending or folding. The non-ferrous metals listed in the catalogue (IWM, LBY 16242, 1918) are gunmetal, aluminium and brass. It is worth noting that across the different factory notes there are different ways of describing the same kind of metal. For example, in one entry the term “gunmetal casting” is used, whilst in another, “cast gun metal” is listed. (Gunmetal is a non-ferrous bronze and zinc alloy, less prone to corrosion than

other non-ferrous alloys.) It is not uncommon for very similar alloys to be referred to using slightly different terms, depending on region or era.

4.3.2 Types and sizes of objects represented in the collection

The metal objects found in the database are generally individual components, designed to be assembled into larger objects such as small arms and vehicles. They fall within a size range dictated by the capacity of the lathing, milling or other machinery being used. It should be noted that only 44 of the 1530 objects in the reconstructed assemblage have sizes attached to them, and it is hard to know how representative this sample is because most of the objects were lost. Even so, this <3% has been assessed to give a basic overview of size range, and shows a length range between 56mm and 597mm, a width range between 9mm and 85mm, and a height range between 9mm and 85mm. These dimensions are consistent with lathed component manufacturing processes.

4.3.3 Processes and operations represented in the collection

The metalwork assemblage began as a collection for exhibitions promoting the idea of dilution to private manufacturing businesses (only later evolving into a collection to commemorate the war service of women), and so much of the work was originally collected to show the quality and effectiveness of the new small-stage production processes that replaced pre-war practices of six year male apprenticeships (Kozak, 1976, p. 107). Therefore, the majority of items in this collection are smaller lathed samples, although other processes such as pressing were represented. They were formed up from cast blanks on lathes that could be modified for each operation.

This research has attempted to identify the kinds of processes in engineering and smithing that the women were doing, largely drawing on the information supplied in the final Ministry of Munitions dilution catalogue (IWM, LBY 16242, 1918). Listing and defining the categories of work and specific kinds of operations that were carried out to produce the metal samples has been problematic in the cases where contributing companies describe similar processes in a number of different ways. Notes accompanying some components can be so detailed that it would almost be possible to make a copy from the instructions (Fig 4.1).

69. E.63 Camshaft.

- (1) Rough form between cams—Napier Semi-Auto. *Time allowed* : 105 minutes.
- (2) Rifle drilling—Pratt & Whitney Rifle Drill. *Time allowed* : 84 minutes.
- (3) Drill and ream six holes in flange—Sensitive Drill. *Limit* : .0005 inch. *Time allowed* : 18 minutes.
- (4) Rough drill cams—Napier Semi-Auto. *Time allowed* : 108 minutes.
- (5) Rough grind cams—Churchill Cam grinder. *Time allowed* : 3½ hours.
- (6) Drill 1/16 inch holes in cam—Sensitive drill. *Time allowed* : 60 minutes.
- (7) Drill dowel holes—Sensitive drill. *Time allowed* : 12 minutes.
- (8) Drill oil holes—Sensitive drill. *Time allowed* : 8 minutes.

Remarks : All these operations are performed by females with male supervision.

Figure 4.1 Instructions for machining a Hispano Suiza camshaft (IWM, LBY 16242, 1918, p.11)

Conversely others are simply described as “machine work”, if labelled at all (Fig 4.2).

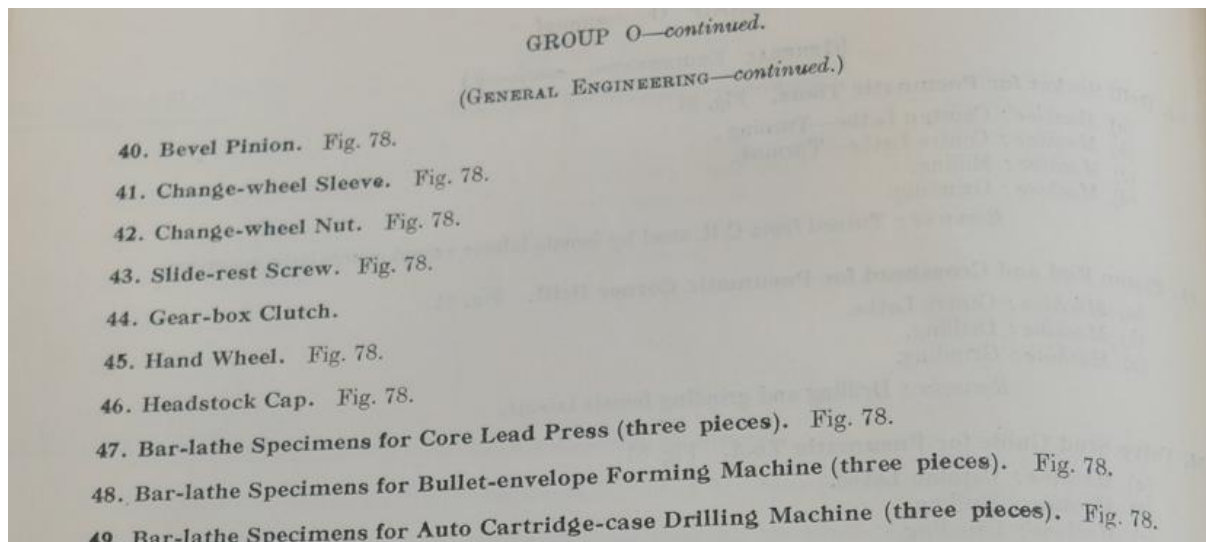


Figure 4.2 Objects without operations details (IWM, LBY 16242, 1918, p.116)

Occasionally additional comments can be found in the text, drawing attention to the individual who produced the work. In the context of this catalogue, designed to promote the process of dilution and mass production by staged operation, this comment can be interpreted as praise for the individual rather than just surprise at her ability.

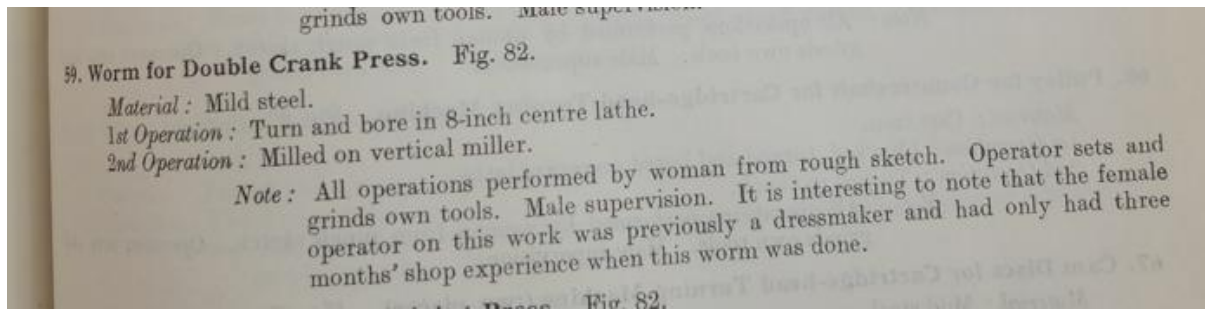


Figure 4.3 Note drawing attention to machine operator's previous occupation (IWM, LBY 16242, 1918, p.117)

This analysis has therefore been an attempt to consider each object and make ‘tick lists’ of likely operations in order to give an overview the kinds of metalwork women were engaged in. It is not a definitive list as it does not include processes such as lacquering, because this does not count as a metalworking skill.

This research found that all the operations described in the literature relating to this collection are processes used for finishing cast blanks and/or forming up sheet metal – rather than other metalworking activities such as casting molten metal. However, because lathing machines are used to carry out many of the other cited operations, “lathing” can be used as a catch-all term for many processes, such as reamering or boring. In some cases, these specific processes are listed in the data, but in others they are not.

Explanations of these operations are shown in Table 4.8.

Table 4.8 Explanations of the machining processes found in catalogue (IWM, LBY 16242, 1918)

Operation	Description of Process
Lathing	The lathe rotates a metal object (usually cast) against a single-bladed cutting tool in order to shape it. It can be a generic term for a number of operations carried out on a lathe.
Milling	Milling involves rotating the cutting tool against a stationary piece of metal (usually cast). It is the complementary process to lathing and can be a similarly generic term that is applied to different operations and outcomes in the catalogue. The term ‘milling’ describes various processes of cutting away surplus material, so it can mean grinding, cutting and pressing metal, and it is therefore not always completely clear what is being referred to. Milling machines can be set to be vertical or horizontal, differing significantly from lathes.
Filing	Filing is a means of removing rough excess metal (deburring) using an abrasive tool, either by hand or machine. It can be used as either a shaping process or as an early stage of the finishing process, to be followed by grinding then polishing.

Grinding	Grinding is a process which uses abrasive tools to remove excess material such as burrs, cuts or saw marks from a metal object, smoothing it ready for polishing. Although commonly carried out using a rotating wheel or hand files, in the case of the objects in this collection it is likely that an abrasive belt on a lathe would have been used, given the general set-up of these workspaces.
Drilling	Drilling will have been the most basic process to be taught to novices and is one of the most common processes, judging from examination of the small group of surviving objects. This can be done on the lathe or, as more commonly seen in the photographs of the time, by using a pillar drill.
Boring	Boring is the process of enlarging a drilled or cast hole, by using a single-point cutting tool. It is most commonly done by using a machine, but it can be carried out by hand. It is a means of achieving a greater accuracy of diameter, but can also be a way of creating a tapered hole.
Reamering	For further accuracy, this process can be followed by reamering (now more commonly known as 'reaming') - an operation to enlarge an existing hole diameter. It finesses the degree of accuracy and improves the surface finish of the hole's walls. This process uses a tool called a reamer - most probably worked on a lathe in these cases because they were mass-producing units. However, it can be done by hand. It is a finishing operation, removing much less metal than drilling or boring.
Tapping	Tapping is the process of cutting a thread into a hole in order to accommodate a screw or occasionally a bolt. It is routinely done using a lathe, but can be carried out by hand using a tap and die set.
Welding or brazing	Both welding or brazing are ways of joining metal by applying a flux (to prevent oxidation of the metals during the process) and heat. Welding uses higher temperatures and can only be used to join similar metals, which melt in order to fuse the join. Brazing uses lower temperatures - and only the 'filler' metal (or solder) is melted then resolidified, thus fusing the metal pieces together. It can be used to join components which are not made of the same metal, for example copper and nickel and aluminium. Gas torch brazing appears to be the most likely technique used in this collection, judging by the photographs of the time, although welding was certainly done by women in places like shipyards.
Bending	Bending involves simple folding of sheet metal in a press, in order to make the correct shapes required for the components. It tends to be a non-mechanical process using leverage applied to the handles of a folding press, rather than an engine or motor driven machine.

Some of the items listed in the catalogues have no specific making data attached to them beyond machining, so in the absence of other information I have described them as being made using a lathe; a conclusion consistent with my own professional metalworking experience.

From the metal objects in the database, 839 objects have no processing data attached to them from the original catalogue, whilst others have undergone more than one operation.

Table 4.9 Number of references to specific operations found in catalogue (IWM, LBY 16242, 1918)

Process undergone	Number of objects
Lathing	456
Milling	246
Filing	34
Grinding	174
Drilling	265
Boring	143
Reamering	38
Tapping	32
Welding or brazing	29
Bending	31

Analysis shows that many objects underwent a series of the operations shown in Table 4.8.

Table 4.10 Objects found in catalogue to have undergone more than one process (IWM, LBY 16242, 1918)

Number of objects undergoing more than one operation	Number of operations undergone
2	8
6	6
7	5
45	4
159	3
233	2
239	1

This is consistent with the way in which the dilution process is understood in terms of being a means of working up components in small, machined stages, although it cannot show whether the same woman carried out all the stages on one object, as she became more proficient over time, as in the case of Galbraith's production model at the Cunard Factory (Section 4.5).

4.4 Metal objects in the WWC

The opportunity to study and record surviving metal objects in the Women's Work Collection was limited by ongoing Covid-19 restrictions at the time of the research, so it was only possible to examine each object by eye for short time periods and take reference photographs under strict social distancing conditions. None of the objects had been used in the theatre of war, coming as they did from factories as samples. Some still smelled of finishing oil and their pristine condition was very unexpected. As well as photographing the items, all the accompanying labels were examined, but because they were not contemporary to the collection they gave no new insights into any making techniques or skills employed by the women in their manufacture.

However, what was achieved by examining and photographing the objects was the discovery that some of them were the actual items listed in the Ministry of Munition's last catalogue *Exhibition of Samples of Women's Work and Official Photographs* (IWM, LBY 16242, 1918), rather than similar items that supposedly replaced objects on loan from the Ministry of Munitions during the Burlington House exhibition in January 1918 (Section 6.3).

The images and notes for each of the 44 metal objects from the original Women's Work Collection, examined over five days at IWM London and IWM Duxford, can be found in Appendix One. Of those items, 26 appeared to have enough similarities with the objects found in the 1918 collection to undergo further inspection, using two versions of the catalogue: *Exhibition of Samples of Women's Work and Official Photographs. Illustrating the Various Types of Work upon which Women are employed in Engineering and other Industries on Munitions of War* for reference. The final version of the catalogue (IWM, MUN. VI/43, 1917) was accessed online via the *Women, War and Society, 1914-1918* archive held at Gale Primary Sources and is referenced for information about the objects. Although the text was clear in this online facsimile, the images were poor and indistinguishable. A bound copy dated 1918 was subsequently located in the IWM library (IWM, LBY 16242, 1918), and although this draft clearly predated IWM, MUN. VI/43, 1917 as it was incomplete and disordered. Nonetheless, the photographic images corresponded to both versions of the catalogue and could therefore be used interchangeably. In fact the quality was so good that it was possible to make a serious attempt to identify these objects and return them to their original categories. Evidence for this is presented below, using the original category sequence, rather than the modern object reference numbers. The 1917 image is shown first, followed by a comparison image taken during my research visits to see the IWM collection.

4.4.1 Group A

EPH 8778 (viewed at IWM Duxford in 2023) does not appear to be the same artefact as A223 in *Group A: Engines Aircraft*. It is a very similar object despite the missing gudgeon pin in A223. The description of EPH 8778 in the present day online catalogue as a “cylinder gauge for a shell 8.L 60-pounder” (IWM (2019) *Equipment: component, cylinder gauge, womens work*) does not correspond with the 1917 description of A223, which identifies it as a “Piston (110 h.p. Le Rhône” (IWM, MUN. VI/43, 1917, p. 25). Given the similarity for the two objects it is reasonable to assume that 1918 description is correct and that EPH 8778 has been misidentified, possibly because it was stored in a box with items from Group H. I concluded that A223 is not the same artefact as EPH 8778 because the proportions of the gudgeon pin hole vary between the two images. EPH 8778 has W101 painted on it and is part of a different collection. (see Section 8.1.37).

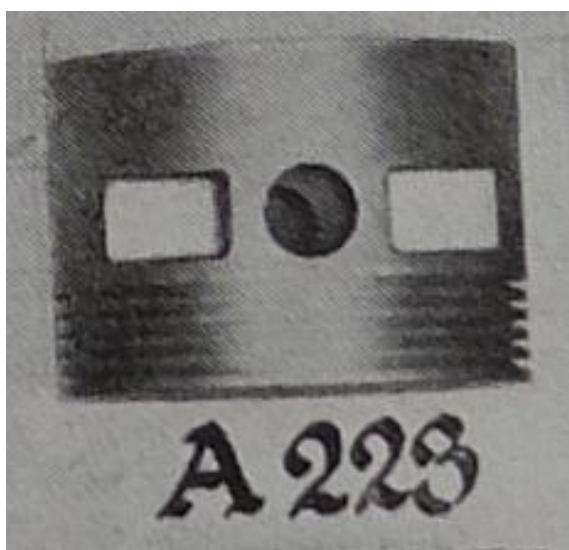


Figure 4.4 A223 (IWM, LBY 16242, 1918, Fig.6)



Figure 4.5 EPH 8778 (IWM Duxford)

4.4.2 Group B

EPH 4754 (viewed at IWM London in 2021) is described in the IWM online catalogue as a “front axle swivel pin” (IWM (2019) *Souvenirs and Ephemera: front axle swivel pin*) which corresponds with the 1917 description “swivel pin for front axle” (IWM, MUN. VI/43, 1917, p. 37), in *Group B. Engines Internal Combustion (for Motor Cars, Tanks, &c.)*. From the images it is difficult to ascertain whether EPH 4754 and B86 are one and the same as there are no distinguishing making marks to connect them (see Section 8.1.26). However the image of B86 was taken in 1917, whilst the online description of EPH 4754 states that this item was “acquired (donated by the

manufacturer) in March 1918 as part of the original Imperial War Museum's 'Women's Work' collection", which suggests it is a replacement for an earlier item in the dilution collection lent for the Burlington House exhibition (Section 6.3).

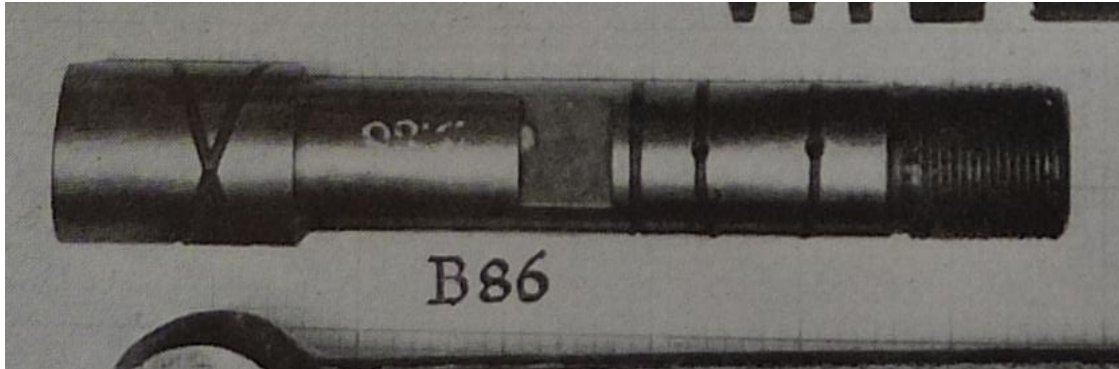


Figure 4.6 B86 (IWM, LBY 16242, 1918, Fig.18)



Figure 4.7 EPH 4754 (IWM London)

4.4.3 Group E

EPH 4104 (viewed at IWM Duxford in 2021) bears a very strong resemblance to E93 *Group E. Guns and Components* (IWM, MUN. VI/43, 1917, p. 61). The online description of EPH 4754: “a vent bolt nut for a 6 inch Howitzer” (IWM (2019) *Souvenirs and Ephemera: vent bolt nut, 6-inch howitzer breech mechanism, Women’s Work*) tallies with the 1917 description of B86 (IWM, MUN. VI/43, 1917, p. 61). However, this online description was not in place at the start of this research, and I conclude that the IWM has populated its pages with research I shared with Sean Rehling in 2023. Close comparison of the two objects led to the conclusion that EPH 4104 is certainly E93 because of the matching dent in the bottom right hand corner and the stamped no. “2” of “26 CWT” is worn in the same way (Section 8.1.6).

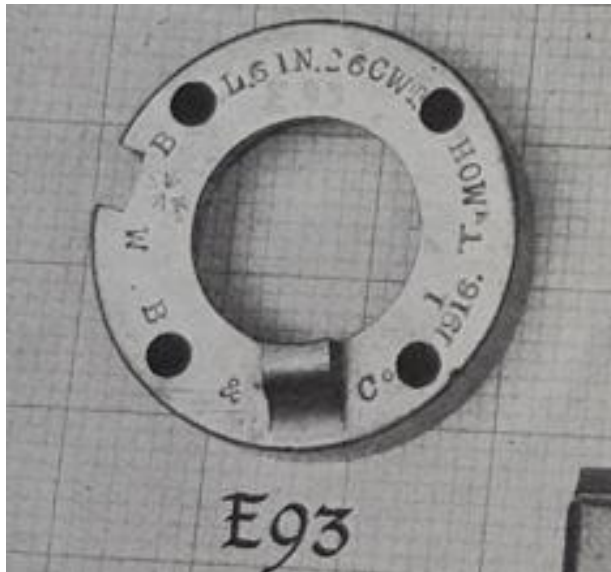


Figure 4.8 E93 (IWM, LBY 16242, 1918, Fig.36)



Figure 4.9 EPH 4104 (IWM Duxford)

Described as an obturator pad, EPH 4089 was comprised of two parts: EPH 4089a and EPH 4089b. The latter, a circular pad made of an asbestos and mutton suet mixture in a canvas cover, is mentioned but not featured in the 1917 catalogue. However, EPH 4089a, a pressed copper still clearly has the lettering E100 on it and can be identified as such in the 1918 catalogue. (See Section 8.1.3).



Figure 4.10 E100 (IWM, LBY 16242, 1918, Fig 35)



Figure 4.11 EPH 4089a (IWM Duxford)

EPH 4088 was also found to match E123, described in the 1918 catalogue as a “Deflection dial (engraved) for a 6-Pounder H. A. Mountings” (IWM, MUN. VI/43, 1917, p. 65). The online description uses the same wording (IWM (2019) *Souvenirs and Ephemera: deflection dial (engraved) for 6pdr HA mountings*). (See Section 8.1.2).

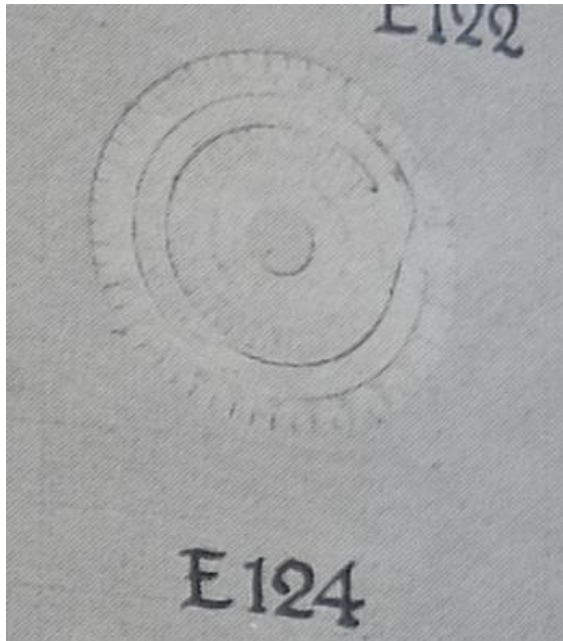


Figure 4.12 E124 (IWM, LBY 16242, 1918, Fig.35)



Figure 4.13 EPH 4088 (IWM Duxford)

4.4.4 Group H

Of the following fourteen items, one was viewed in IWM London, and the rest were examined at IWM Duxford. Not only do they all belong in the *Group H. Tool Room Work, Drills, Cutters, &c.* category, but they can be identified as the same objects photographed in 1917. The comparisons are shown below.

EPH 8771 (a spade cutter for base of 9.2-inch HE Mk.X/L shell) is the same item as H1. Both images show the same word CAPITAL stamped on the righthand side, and the L has been stamped more deeply than the A on both. The casting flaws to the right of the top hole on EPH 8771 match those on the image of H1. There are also what appear to vice bite marks to the right of the lower hole on both. (See Section 8.1.36).

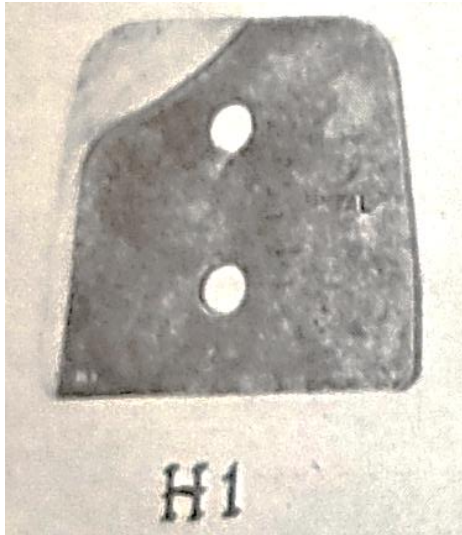


Figure 4.14 H1 (IWM, LBY 16242, 1918, Fig.46)



Figure 4.15 EPH 8771 (IWM Duxford)

For similar reasons it can be confirmed that EPH 8811 is the same object as the image of H3; a spade cutter for the nose of 9.2-inch HE Mk. V/L shell. Distinct casting flaws along the lower edge to the right of the hole match each other. (See Section 8.1.40).



Figure 4.16 H3 (IWM, LBY 16242, 1918, Fig.46)



Figure 4.17 EPH 8911 (IWM Duxford)

EPH 8768 (a spade cutter for the nose of an 8-inch HE Mk.V shell) is certainly H4 because the distinct casting flaw of three dots in a line, to the right of the top hole, can be seen on both images. (See Section 8.1.34)



Figure 4.18 H4 (IWM, LBY 16242, 1918, Fig.46)



Figure 4.19 EPH 8768 (IWM Duxford)

These three items are shown together below, in the original 1917 image.

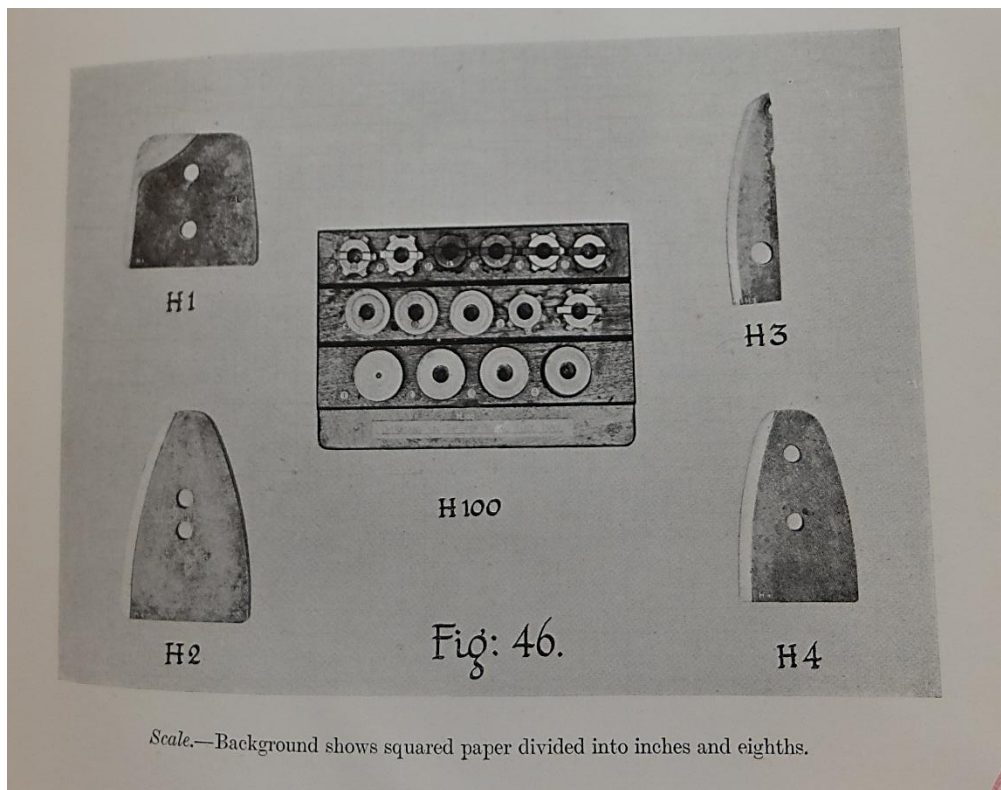


Figure 4.20 IWM, LBY 16242, 1918, Fig 46

Using similar observations it can be shown that the spade cutter for the base of an 8-inch HE Mk.IV shell, EPH 8903 is H5, because of the position of the two A stamps above the hole (see Section 8.1.39).

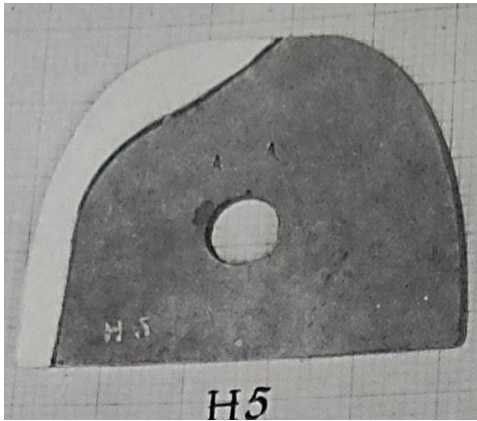


Figure 4.21 H5 (IWM, LBY 16242, 1918, Fig.47)



Figure 4.22 EPH 8903 (IWM Duxford)

EPH 4751 (a spade cutter for finish-boring the magazine of 60pdr Mk. II/L shrapnel shell) is H6 because of the well-defined casting flaw on the lefthand side (see Section 8.1.23).

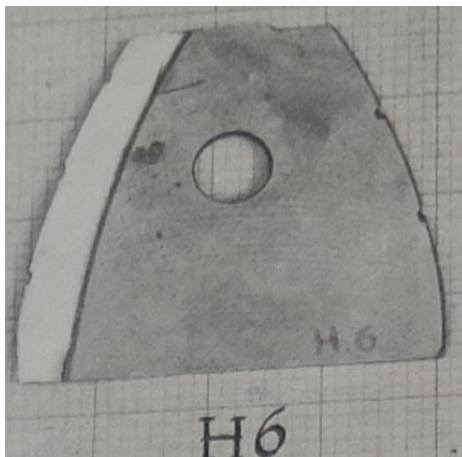


Figure 4.23 H6 (IWM, LBY 16242, 1918, Fig.47)



Figure 4.24 EPH 4751 (IWM Duxford)

EPH 8763 also has a casting flaw, in the form of a distinct lightning shape on the righthand side, confirming that this is H7, a spade cutter for a loose nose 6-inch HE Mark IV shell. (See Section 8.1.31).

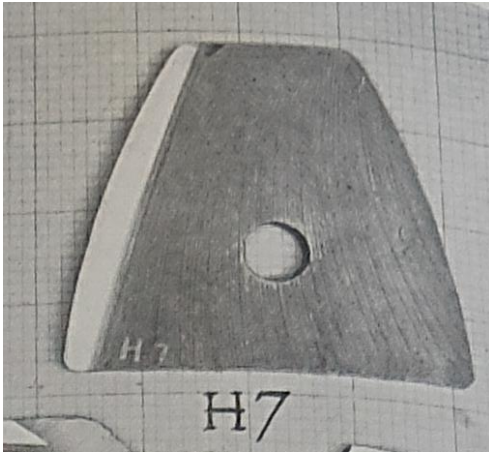


Figure 4.25 H7 (IWM, LBY 16242, 1918, Fig.47)



Figure 4.26 EPH 8763 (IWM Duxford)

The positions of the two stamped 'A's below the holes on EPH 8766 (a spade cutter for the bases of 6-inch HE Mk.III/L & IV/L shells) confirms that it is clearly H8. The lefthand 'A' has been stamped too heavily which is why it has a distinct semicircle on the right of it, where the edge of the stamp also made contact. (See Section 8.1.32).

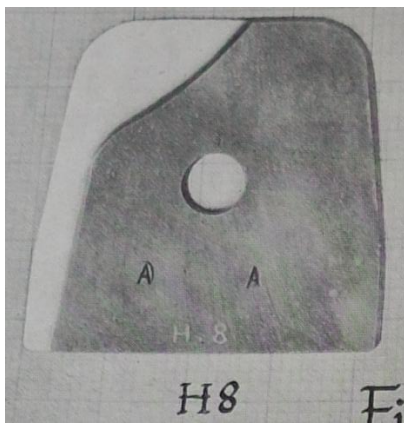


Figure 4.27 H8 (IWM, LBY 16242, 1918, Fig.47)



Figure 4.28 EPH 8766 (IWM Duxford)

On the bottom righthand corner of EPH 8912 (a spade cutter for the base of 6-inch HE Mk.VI/L shell) it is possible to see a faint shadow of the lettering 'H9', confirming that this indeed the same item (see Section 8.1.41).

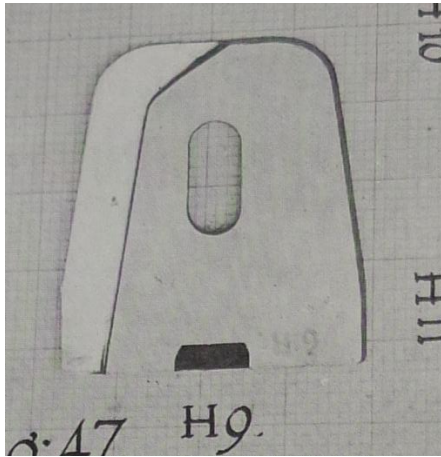


Figure 4.29 H9 (IWM, LBY 16242, 1918, Fig.47)



Figure 4.30 EPH 8912 (IWM Duxford)

The previous five items are illustrated together in catalogue LBY 16242, Fig. 47.

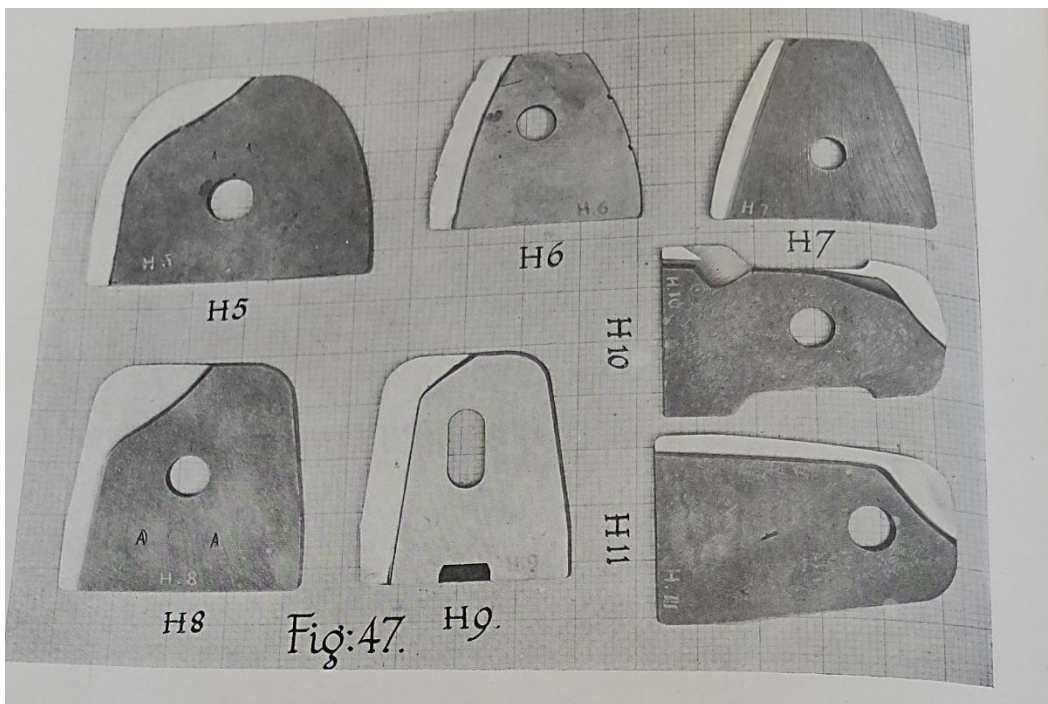


Figure 4.31 IWM, LBY 16242, 1918, Fig 47

EPH 8767, a spade cutter for a loose nose 6-inch HE Mark IV shell, can be identified as H12 because of the way it was stored with other identifiable items in the same group. The attempt to photograph the reverse side to show the distinct bite marks from a vice (below the lower hole) failed and so cannot be shown here (see Section 8.1.33).



Figure 4.32 H12 (IWM, LBY 16242, 1918, Fig.48)



Figure 4.33 EPH 8767 (IWM Duxford)

EPH 8913 is described in the modern online catalogue as a 'spade cutter for base of 4.7-inch HE Mk.Ia/L shell' (IWM (2019) *Equipment: component, spade cutter, womens work*) which is precisely the same wording as the 1918 catalogue for H14 (IWM, MUN. VI/43, 1917, p. 82). On examination, 'H14' could be seen in faint lettering on the bottom lefthand corner (see Section 8.1.42).

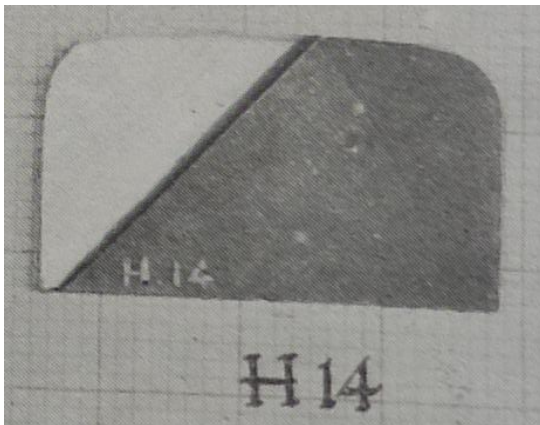


Figure 4.34 H14 (IWM, LBY 16242, 1918, Fig.48)



Figure 4.35 EPH 8913 (IWM Duxford)

EPH 8756, a spade cutter for the base of 4.5-inch HE Mk.V & VII shells is H16, identified by the diamond-like casting flaw on the righthand side of the lower hole (see Section 8.1.30).

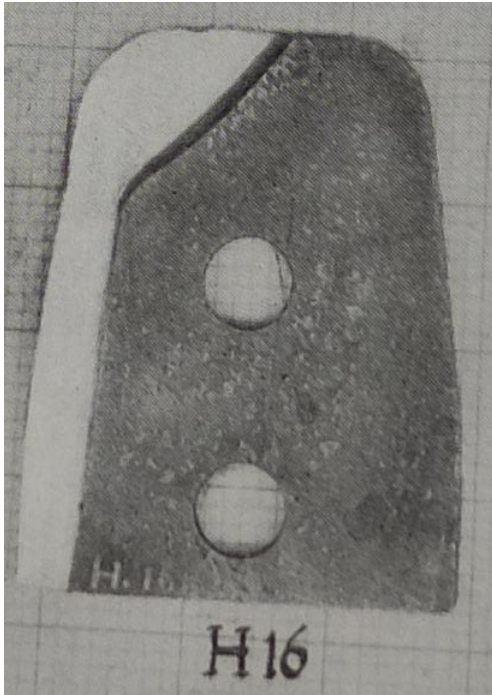


Figure 4.36 H16 (IWM, LBY 16242, 1918, Fig.48)



Figure 4.37 EPH 8756 (IWM Duxford)

EPH 4753 is described in the online catalogue as a ‘spade cutter (for sizing and coning shell noses)’ (IWM (2019) *Souvenirs and Ephemera: spade cutter (for radiusing base of 4.5in shell)*) and as a ‘spade cutter for radiusing base of 4.5-inch Shell’ in the 1918 catalogue (IWM, MUN. VI/43, 1917, p. 82). In a similar manner to EPH 8913, faint lettering can be seen on the straight edge of EPH 4753 confirming that it is H17 (see Section 8.1.26).

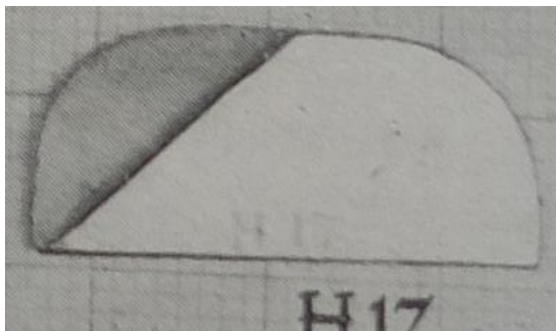


Figure 4.38 H17 (IWM, LBY 16242, 1918, Fig.48)



Figure 4.39 EPH 4753 (IWM Duxford)

EPH 8770 is described in IWM online catalogue as a ‘Spade cutter for base of 3-inch HE shell’ (IWM (2019) *Equipment: spade cutter for base of 3-inch HE shell*) and can be identified as H20 from the 1918 image (IWM, LBY 16242, 1918, fig. 48) that shows a distinct matching casting flaw shape down the righthand side (see Section 8.1.35).



Figure 4.40 H20 (IWM, LBY 16242, 1918, Fig. 48)



Figure 4.41 EPH 8770 (IWM Duxford)

EPH 4752, previously described in the online catalogue as a 'metal spade cutter' (IWM (2019) Collections item object 30084682) matches H22 and can be assumed to be the same item. The webpage that described it is now defunct, but this may be because the object was due to be taken from IWM London to IWM Duxford after I viewed it in October 2021. It could be undergoing recategorisation (see Section 8.1.24).

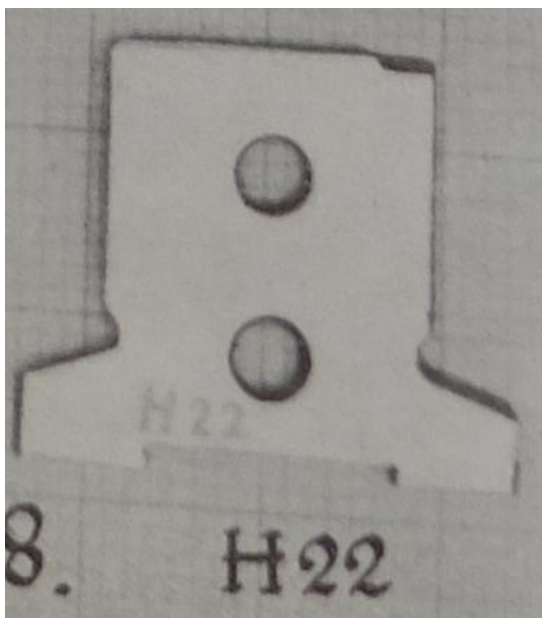


Figure 4.42 H22 (IWM, LBY 16242, 1918, Fig. 48)



Figure 4.43 EPH 4752 (IWM London)

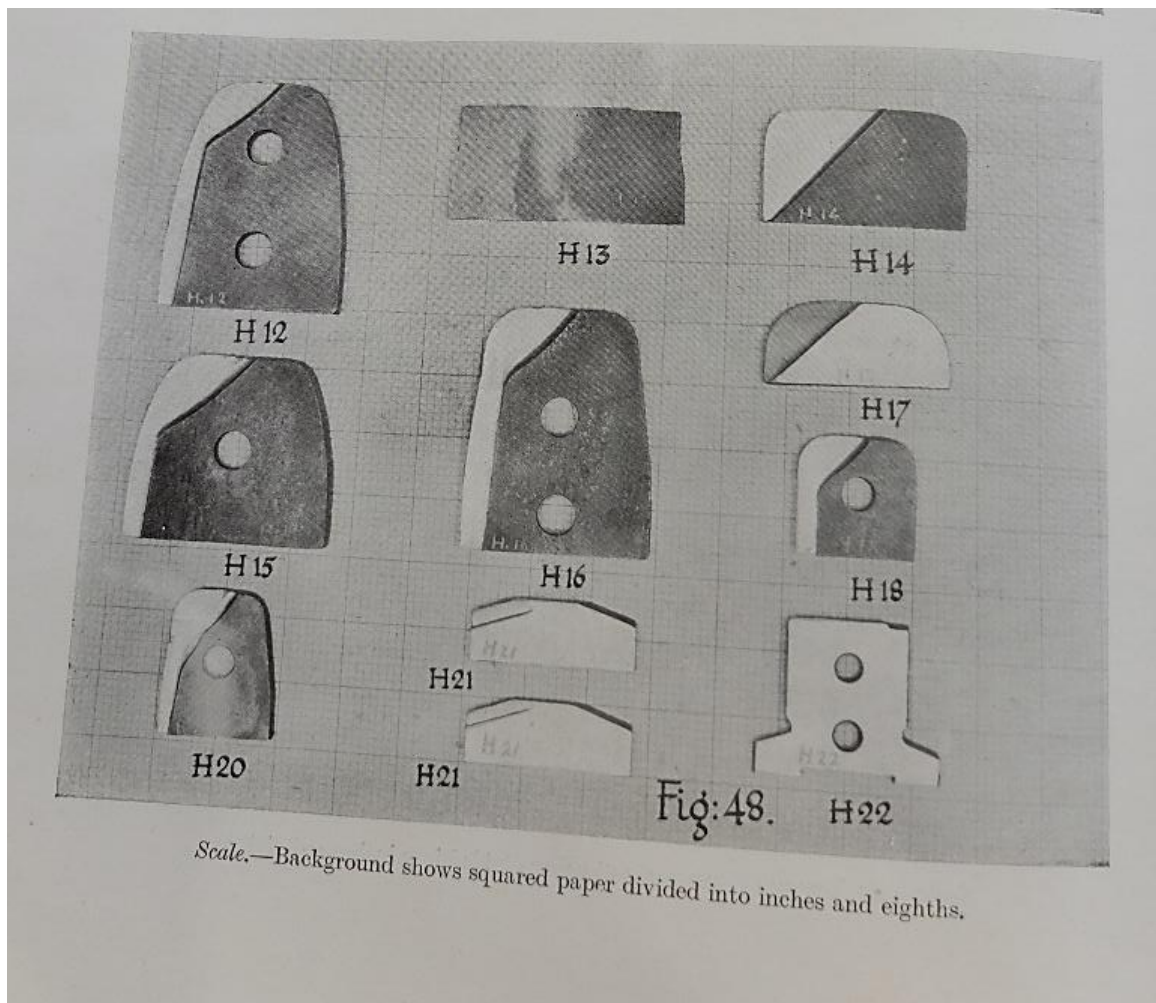


Figure 4.44 IWM, LBY 16242, 1918, Fig 48

Also found in Group H is EPH 4750 (IWM (2019) *Souvenirs and Ephemera: counterbores for cartridge cases*), a cartridge case counterbore identifiable as H81 (IWM, MUN. VI/43, 1917, p. 86). The end section of an engraving on H81 can be seen in Fig. 4.43 and it matches that found on EPH 4750, seen in Fig 4.45. (See Section 8.1.22).

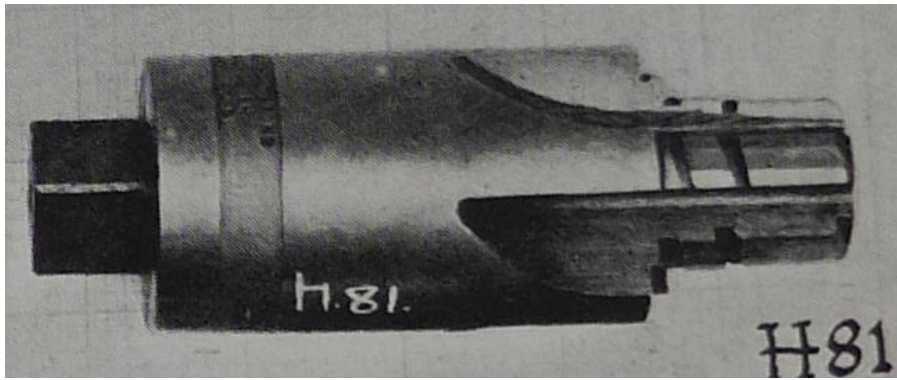


Figure 4.45 H81 (IWM, LBY 16242, 1918, Fig.50)

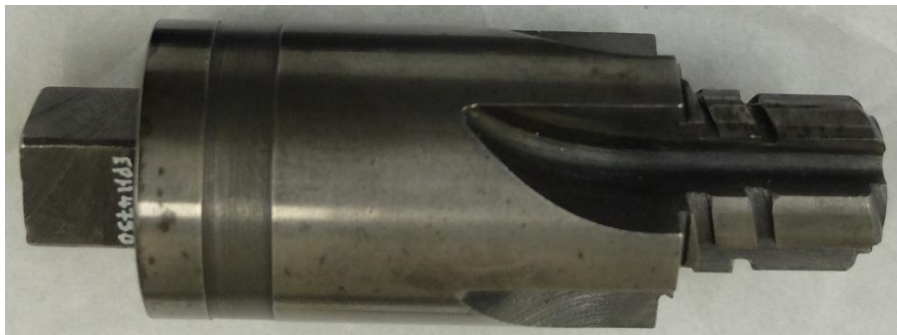


Figure 4.46 EPH 4750 (IWM Duxford)



Figure 4.47 EPH 4750 (IWM Duxford)

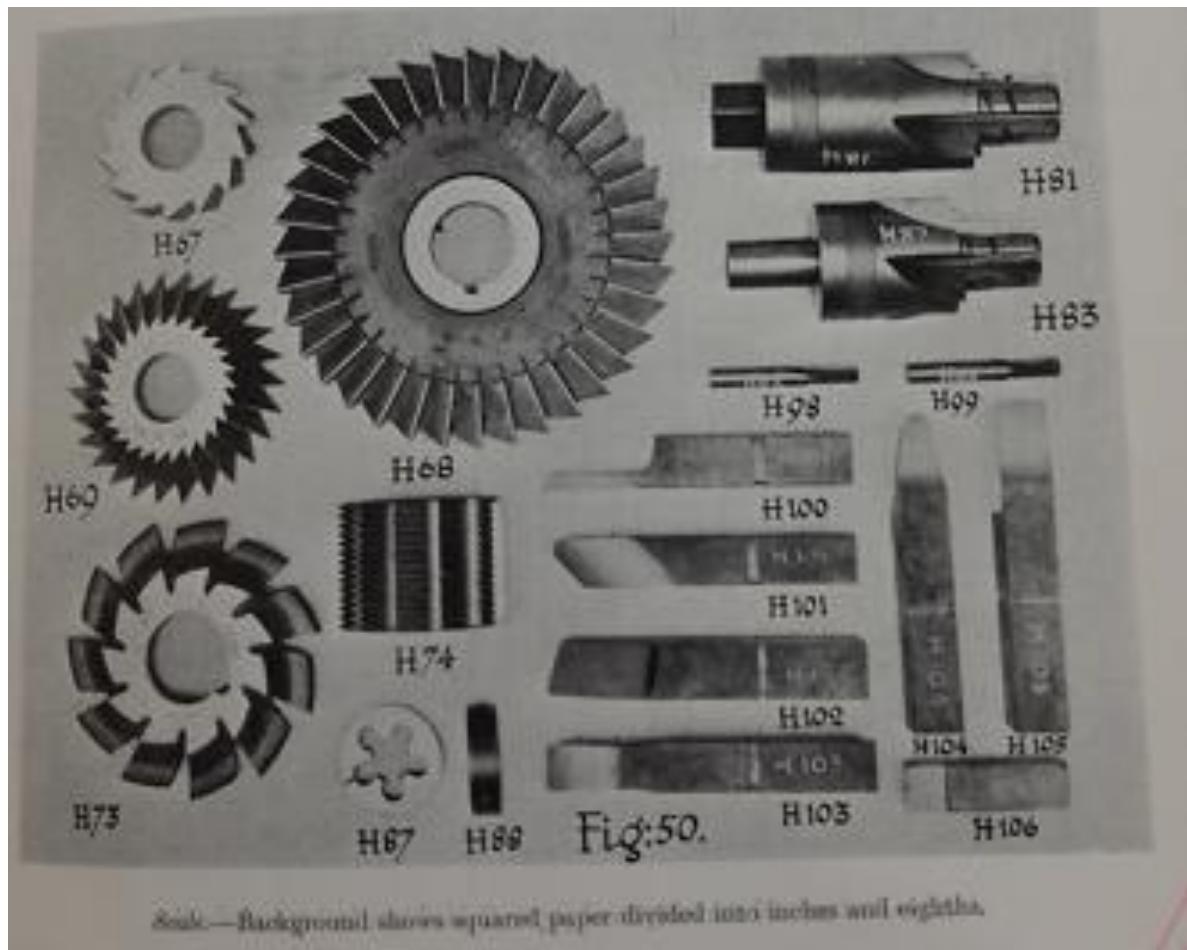


Figure 4.48 IWM, LBY 19242, 1918, Fig. 50

EPH 4750 is seen in the top righthand corner of Figure 4.46 (IWM, LBY 19242, 1918, Fig. 50).

4.4.5 Group K

Only one item was found to have belonged to *Group K. Tool Room Work (General)*. This was EPH 8718, described in the modern catalogue at a 'metal rod with flattened ends and hole in each end for fixture' but identified in this research as K120, part of a group of 'French Rail tensile test pieces' (IWM, MUN. VI/43, 1917, p. 89). The code 'K120' can still be clearly seen on EPH 8718. (See Section 8.1.29).

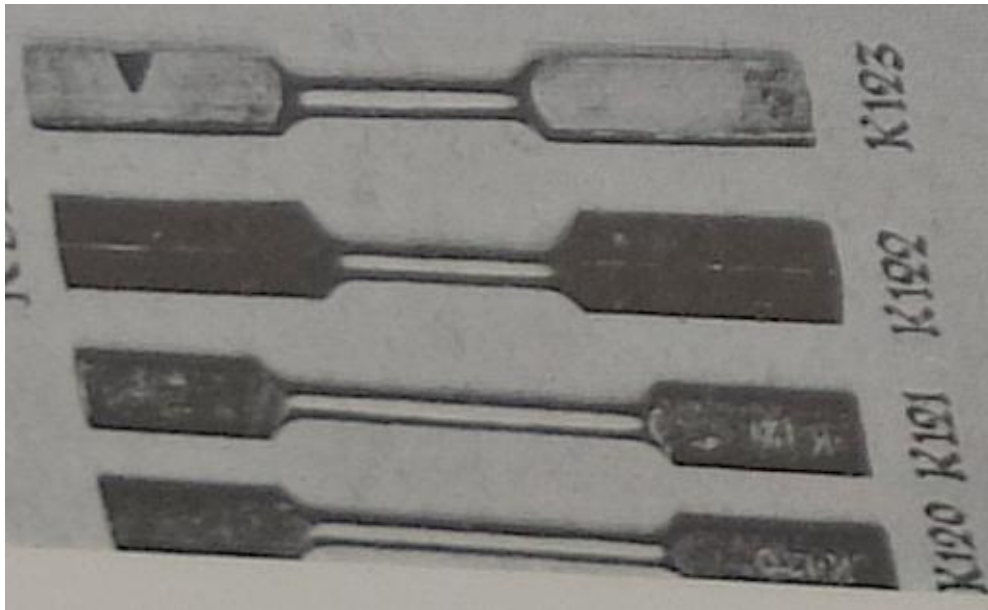


Figure 4.49 K120 (IWM, LBY 16242, 1918, Fig.53)

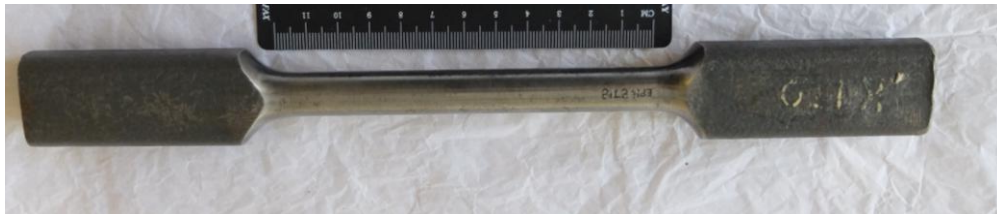


Figure 4.50 EPH 8718 (IWM Duxford)

K120 can be seen here in its original grouping on the left in Figure 4.49.

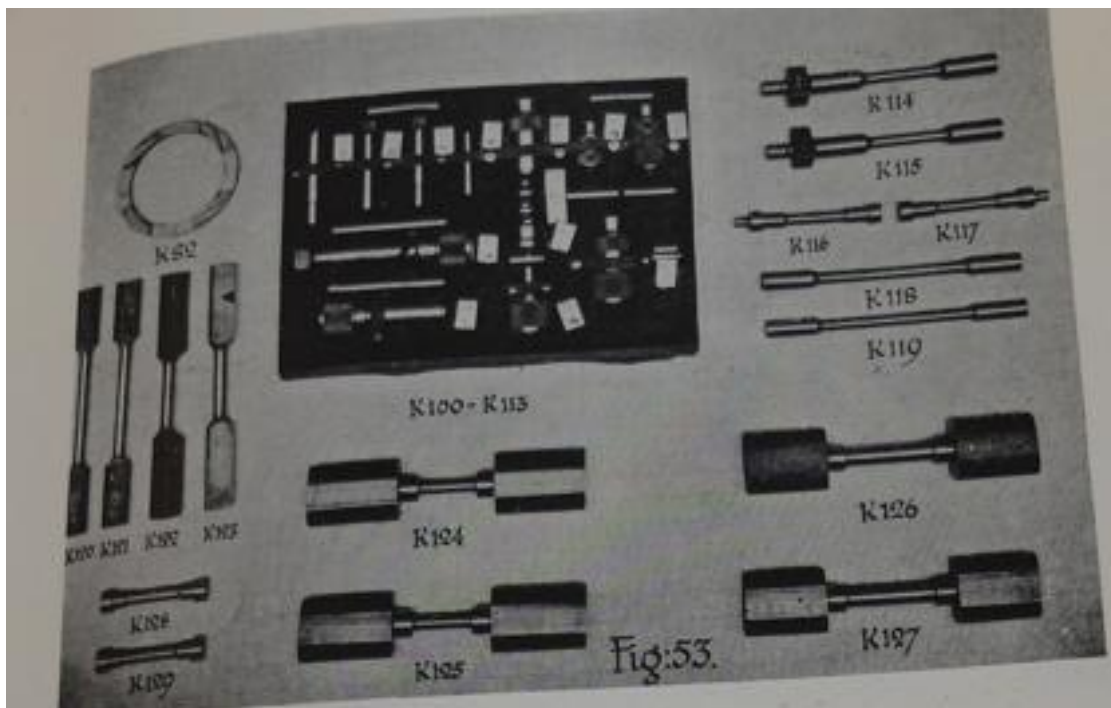


Figure 4.51 IWM, LBY 16242, 1918. Fig 53

4.4.6 Group L

Four other objects examined as part of this research appeared to come from *Group L. Aircraft, Fittings (Metal)*. The closest match to EPH 4746 appeared to be L11, described in the 1917 catalogue as a strut ferrule (IWM, MUN. VI/43, 1917, p. 90). However close examination showed that the angles on the righthand side of the objects do not match, and the proportions are slightly different. This is not to say that EPH 4746 is not part of the original collection described somewhere in the text of the catalogue, because only a small percentage of objects were actually photographed. However it can be concluded that this is not L11. (See Section 8.1.19).

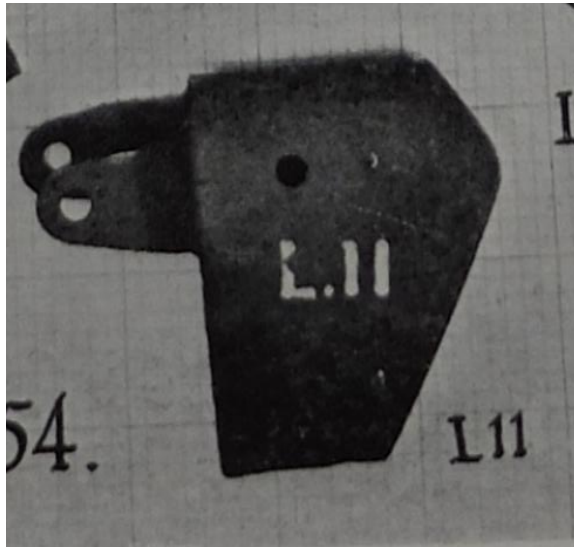


Figure 4.52 L11 (IWM, LBY 16242, 1918, Fig.54)



Figure 4.53 EPH 4746 (IWM London)

Similarly, it is safe to conclude that EPH 4747 is not L52, as their curves mirror rather than match each other. (See Section 8.1.20).

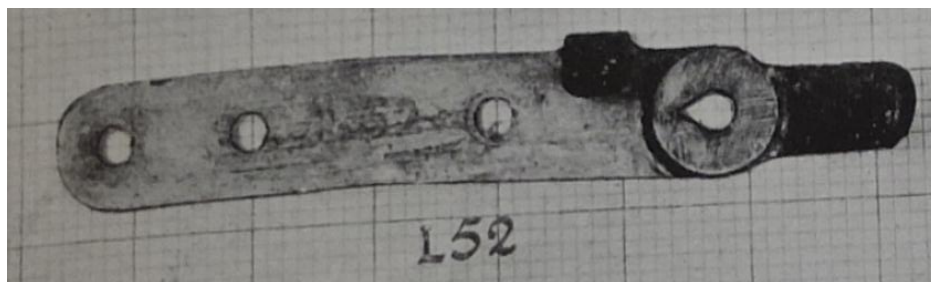


Figure 4.54 L52 (IWM, LBY 16242, 1918, Fig.58)



Figure 4.55 EPH 4747 (IWM London)

EPH 4095 appears to be one of the L42 trailing end clips listed in the 1917 catalogue (IWM, MUN. VI/43, 1917, p. 93) and does resemble the image in Figure 47 (IWM, LBY 16242, 1918, Fig.57), but without any distinguishing marks this cannot be concluded for certain. (See Section 8.1.4).

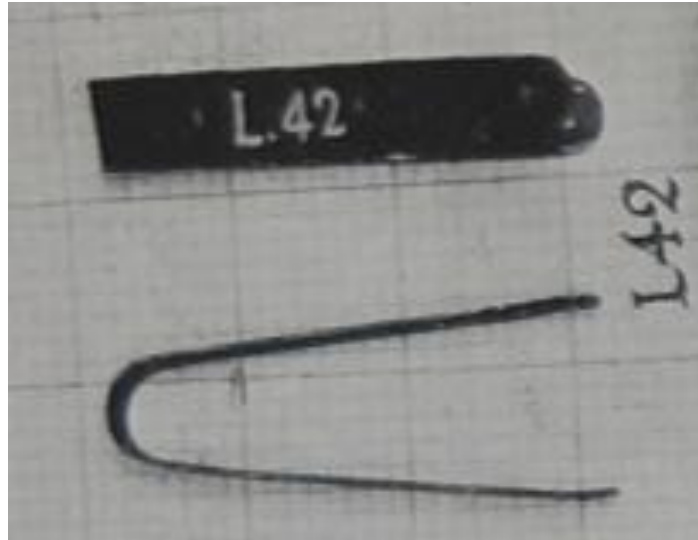


Figure 4.56 L42 (IWM, LBY 16242, 1918, Fig. 57)



Figure 4.57 EPH 4095 (IWM London)

EPH 4735 strongly resembled the pulley cases and brackets, disassembled and listed as L70 & L71 in the 1918 catalogue. There is too little evidence to say conclusively if they are the same objects. (See Section 8.1.8).

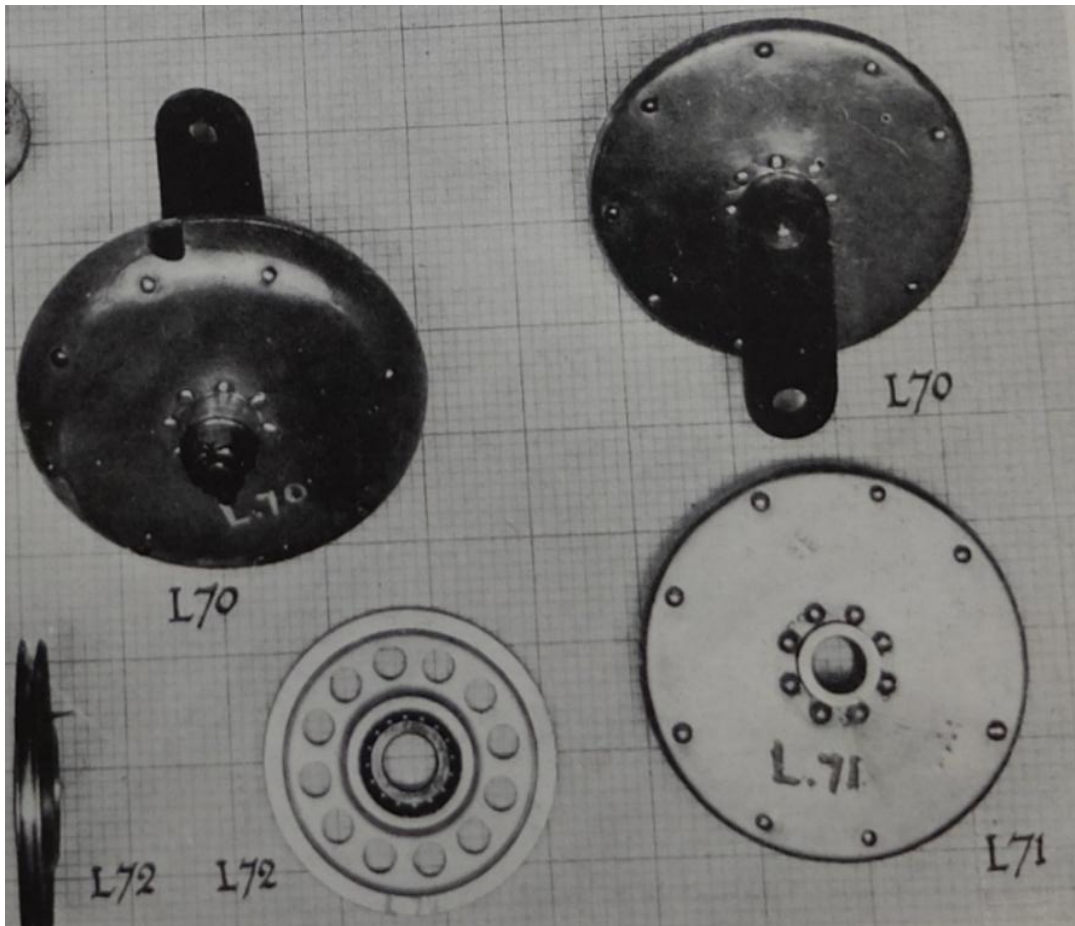


Figure 4.58 L70 & L71 (IWM, LBY 16242, 1918, Fig.58)



Figure 4.59 EPH 4735 (IWM London)



Figure 4.60 EPH 4735 (IWM London)



Figure 4.61 EPH 4735 (IWM London)

However EPH 8717, described in the modern catalogue as an ‘aircraft part?’ (IWM (2019) *Souvenirs and Ephemera: aircraft part?, Women’s Work*) is definitely a fork end, object L99, (IWM, MUN. VI/43, 1917, p. 97). It still has this lettering clearly on it. (See Section 8.1.28).

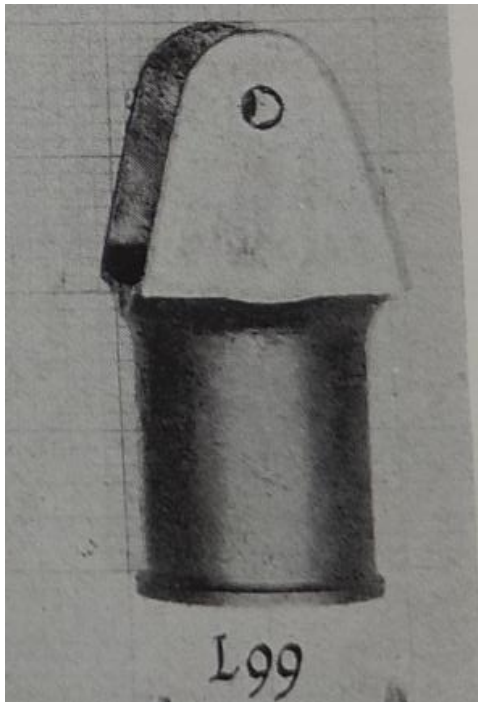


Figure 4.62 L99 (IWM, LBY 16242, 1918, Fig.62)



Figure 4.63 EPH 8717 (IWM Duxford)

4.4.7 Group O

Only one object appeared to have originated from *Group O. General Engineering* and this is EPH 4755. Described in the modern catalogue as a 'drill socket for pneumatic tools' (IWM (2019) *Souvenirs and Ephemera: drill socket for pneumatic tools*), it is safe to assume it is O32 which is described in an identical way in 1917 (IWM, MUN. VI/43, 1917, p. 115).

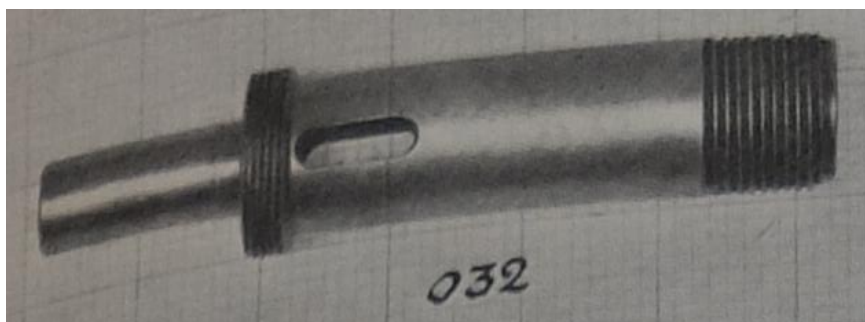


Figure 4.64 O32 (IWM, LBY 16242, 1918, Fig.81)



Figure 4.65 EPH 4755 (IWM London)

(Figure 4.60 appears to show that O32 is not straight, but this due to the way it was photographed during the research. Catalogue LBY 16242 could not be opened flat without causing damage.) (See Section 8.1.27).

4.4.8 Group P

The only item found belonging to *Group P. Optical Munitions* is EPH 10201, which corresponds to P12 (IWM, LBY 16242, 1918, Fig. 90). It is impossible to know if the four examples of chronometer chains mounted on cardboard (EPH 10201) correspond to those shown in the 1918 catalogue (IWM, LBY 16242, 1918, Fig.90) because the image is faint and the artefacts are uniformly made and indistinct (See Section 8.1.43).

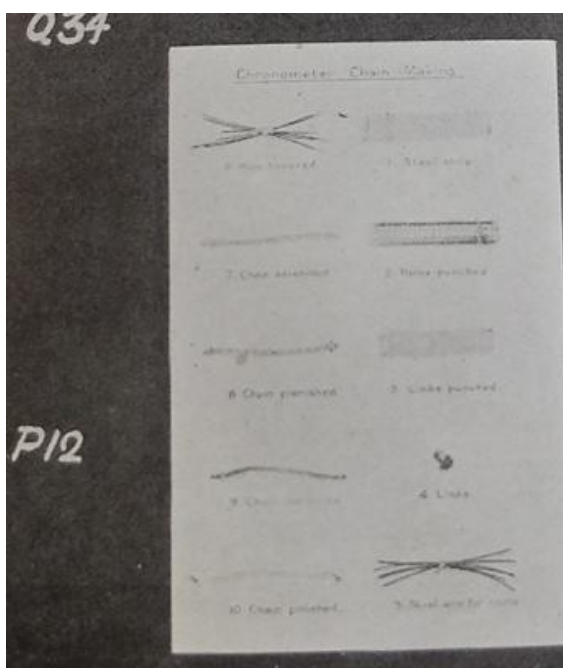


Figure 4.66 P12 (IWM, LBY 16242, 1918, Fig. 90)



Figure 4.67 EPH 10201 (IWM Duxford)

4.5 Appraising the evidence

Of the 26 objects examined, 21 were definitely the same objects shown in the 1918 Ministry of Munitions catalogue (IWM, LBY 16242, 1918) and 6 were not.

Different kinds of evidence confirmed the identities of the 21 objects. For example, in the case of H17/EPH 4753 the remains of the old accession code could actually be seen, and fine tarnishing on the surface of the metal caused by ink had left the shape of reference numbers on H9/EPH 8912. Distinct casting blemishes identified EPH 8911 as H3, and the shape of casting flaws in EPH 8768 showed that it must be H4. Such specific metalworking ‘fingerprints’ discerned from my own smithing experience, were used in conjunction with more obvious evidence, such as the distinct ‘A’ stamps on the surface of H5/EPH 8903.

Curiously, there was little correspondence between the numerical sequencing of 1918 and the present day accession numbers used by the IWM. Even the most complete section, “Group H. Tool Room Work, Drills, Cutters, &c.” failed to follow any modern order that related to that found in the reference catalogue (IWM, MUN. VI/43, 1917, pp. 81–87). It appears that this part of the collection was divided between IWM London and IWM Duxford, but even this does not explain their sequencing within those two groupings (see Table 4.11).

Table 4.11 Metal objects identified from 1917 catalogue images

1917 ref.	Present IWM ref.	Type of object	Location
E100	EPH 4089 a/b	Obturator pad (two parts)	Duxford
E124	EPH 4088	Deflection dial	Duxford
E93	EPH 4104	Vent nut bolt	Duxford
H1	EPH 8771	Spade cutter for base of 9.2-inch HE Mk.X/L shell	Duxford
H12	EPH 8767	Spade cutter for a loose nose 6-inch HE Mark IV shell	Duxford
H14	EPH 8768	Metal mechanical component comprising a thick metal plate with two machined holes through centre	Duxford
H14	EPH 8913	Spade cutter for base of 4.7-inch HE Mk. Ia/L shell	Duxford
H16	EPH 8756	Spade cutter for base of 4.5-inch HE Mk. V & VII shells	Duxford
H17	EPH 4753	Spade cutter	London
H20	EPH 8770	Spade cutter for base of 3-inch HE shell	Duxford
H22	EPH 4752	Spade cutter	London
H3	EPH 8911	Spade cutter for nose of 9.2-inch HE Mk. V/L shell	Duxford
H5	EPH 8903	Spade cutter for base of 8-inch HE Mk. IV shell	Duxford
H6	EPH 4751	Spade cutter for finish-boring magazine of 60pdr Mk. II/L shrapnel shell	Duxford
H7	EPH 8763	Spade cutter (finishing) for loose nosed Mark IV shell	Duxford
H8	EPH 8766	Spade cutter for base of 6-inch HE Mk.III/L & IV/L shells	Duxford
H81	EPH 4750	Counterbores for cartridge cases	Duxford
H9	EPH 8912	Spade cutter for base of 6-inch HE Mk.VI/L shell	Duxford
K120	EPH 8718	Aeroplane Part	Duxford
L99	EPH 8717	Aircraft Part?	Duxford
O12	EPH 4755	Drill socket	London
O32	EPH 4754	Front axle swivel pin	London

Furthermore, some objects appear to have the remains of a reference code beginning with W suggesting either some kind of interim numbering system, or possibly one used earlier by the Ministry of Munitions during the dilution exhibitions (see Section 4.2).

Closer inspection showed that 17 items had traces of 'W' codes painted on them, forming a discrete grouping which did not overlap with objects identified in the 1917 images (Table 4.12).



Figure 4.68 Example of 'W' code

It seems reasonable to assume that these objects are either the similar artefacts acquired by the WWSC to replace borrowed samples, or later additions acquired by the WWSC for the IWM national collection immediately post armistice. As before, the coding sequence of these items does not correspond with the modern day reference numbers, nor are they stored in one site.

Table 4.12 Metal objects bearing 'W' codes

'W' code	Present IWM ref.	Type of object	Location
W101	EPH 8778	Piston (110 h.p. Le Rhône). Part No. 6068	Duxford
W108	EPH 4737	Skid lever	London
W118	EPH 4738	Flap cable pulley bracket	London
W124 (1)	EPH 4739	Metal socket with various size holes	London
W126 (3)	EPH 4745	Metal socket with various size holes	London
W128	EPH 4735	Pulley second elevator	London

W130	EPH 4736	End socket for fairing support tube	London
W132	EPH 4744	Main petrol tank bracket	London
W132 (2)	EPH 4740	Longeron clip	London
W136	EPH 4741	Landing gear guide flange	London
W138	EPH 4746	Strut socket	London
W139 (4)	EPH 4742	Aluminium socket	London
W144	EPH 4743	Rear bracket for carburettor controls	London
W145	EPH 4747	Fish plate	London
W155	EPH 4733	Metal wiring plate	London
W233 (1)	EPH 4095	Fin clip	Duxford
W306	EPH 10201	Chronometer chain	Duxford

All of these items were identified in the IWM's present day catalogue as having originally belonged to the Women's Work Collection, despite the fact that the reference catalogue (IWM, MUN. VI/43, 1917) came from the Ministry of Munition's collection and not from that developed by the WWSC. It appears that the collections were always interconnected and merged over time even if it is unclear whether this occurred in the early days of the IWM or in the decades since.

It is worth noting that the person most closely connected to both assemblages was O. E. Monkhouse (Section 3.3). Not only was she the person responsible for the photography used to identify the objects in this research, but there is evidence that her actions enabled the catalogues from the dilution exhibitions to stay with the Women's Work Collection, rather than the Ministry of Munitions.

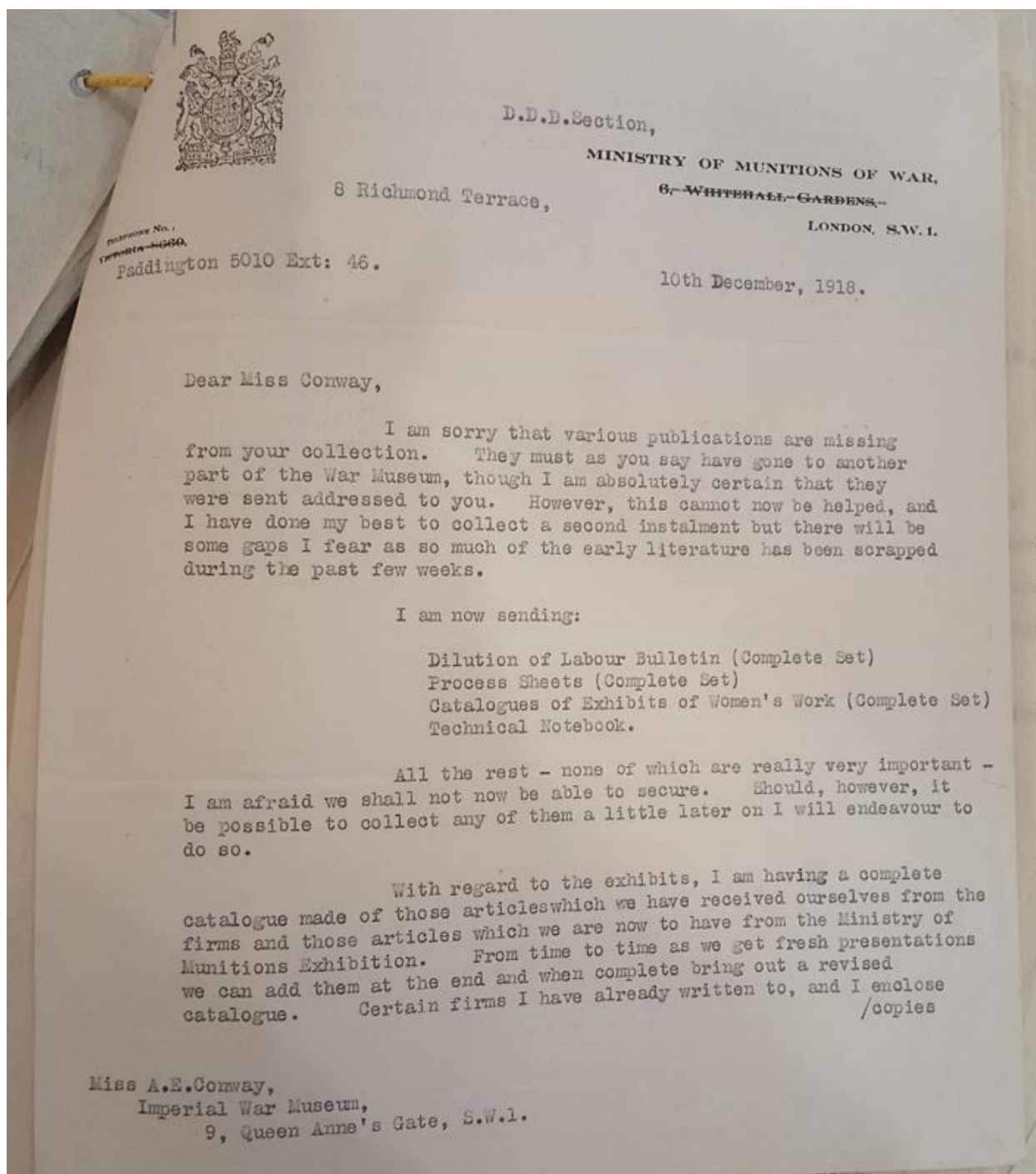


Figure 4.69 Letter from Monkhouse to Conway regarding catalogues 10th December 1918 (IWM, ENI/3/MUN/2/2, 1918)

Miss Monkhouse's letter on the 10th December 1918 (IWM, ENI/3/MUN/2/2, 1918) (Fig 4.4) shows how documents intended for the Women Work Collection had "gone to another part of the War Museum, though I am absolutely certain that they were sent addressed to you". It indicates a sense of her resolve to preserve the gender provenance of these metal objects for posterity.

4.6 The Cunard shells

Amongst the array of objects collected by the WWSC, the 6" and 8" shells made by the Cunard factory require a special consideration because they appear to be the first objects received independently by the WWSC outside of the format set up by the Ministry of Munitions dilution department, and have the unusual distinction of being able to be tracked throughout their entire 'lives' with their gender provenance intact.



Figure 4.70 Image of Cunard shells referenced in (ENI/3/GEN/4, 1917) ©IWM Q 107141

These objects were made in 1915 in the workshop at the Cunard Steamship Company's engineering works in Bootle, Merseyside; in a space specifically cleared for the first women to work on 4.5", 6" and 8" shell production (Hughes-Wilson, 2014, p.134). This initiative was led by Superintendent Engineer Alexander Galbraith, who was put in charge of this new munitions factory where howitzer shells were brought to be finished, checked and varnished before being taken to another factory to be filled with explosive. He pioneered the training of women in

engineering skills, and this factory was the first in the country to be operated entirely by female labour (World War One At Home, 2014). His approach reversed the traditional training sequence, because new recruits would begin by learning the end stage of a production process, followed by the penultimate stage, then the antepenultimate stage, until finally there was a full cohort of women working through all the stages. An image of the Cunard staff canteen from 1917 (Fig 4.6) illustrates the prominent display of the shells, as well as the care with which the plaque has been added, suggesting a pride being taken by the factory about the recruitment and work of women.



Figure 4.71 Staff Canteen at the Cunard Shell Works 1917. Historic England Archive BL24001/032.

The first reference to them in the IWM WWC archive appears in a letter from the House of Commons dated 13th September 1917, written to Lady Norman by her brother, MP Henry McLaren (ENI/3/GEN/4, 1917). The letter references an enclosed photograph showing 8", 6" and 4.5" high explosive shells, and asks if Lady Norman would like it for the Women's Section of the proposed National War Museum (Fig 4.5). The image shows a row of shells on a display shelf, in front of a bespoke plaque explaining that these were "THE FIRST 6" & 8" SHELLS MANUFACTURED IN GREAT BRITAIN BY LADY OPERATORS AT CUNARD S. S. COS SHELL WORKS". It also shows the date "1915", as well as the location "Rimrose Road".

The next reference to the 6" and 8" shells is seen in another letter from September 1917 sent by Henry McLaren to his sister Lady Norman in which he says:

The Manager of the Cunard Works saw me the other day and on hearing that I had sent you the photographs of the shells said that the Company would be prepared, if you wish it, to give you the shells themselves for the Museum. They are absolutely the first ones made by women labour in England.

(IWM, ENI/3/MUN/2/4 Letter from McLaren to Lady Norman, 1917).

In a later letter to Ben Morgan dated 27th September 1917, Lady Norman shows some caution about accepting, saying:

I have had an offer from the Manager of the Cunard Works of the first shells made by women. I do not know whether he is correct in claiming to be the first firm where women accomplished this work, but no doubt you could verify this statement. I have written to Miss Monkhouse asking her whether she would advise me to accept the offer of these shells and I should be very glad of your opinion as to whether you think this proposed gift would fit into your scheme of technical exhibits. I shall not write to accept the gift until I hear from you.

(IWM, ENI/3/MUN/2/4 Letter from Lady Norman to Ben Morgan, 1917)

Miss Monkhouse responds on 1st October 1917.

With regard to the offer from the Cunard Works to present our Section with the actual shells said to be the first shells manufactured by women, I think it would be a very good thing to accept their offer, but we shall of course have to verify their statement with regard to there being the "first shells" before affixing any label to such an exhibit.

(IWM, ENI/3/MUN/2/4 Letter from Miss Monkhouse to Lady Norman, 1917)

In an exchange between Henry McLaren and Alexander Galbraith on 8th October 1917 the offer of the shells is accepted, and McLaren adds that it "would greatly add to the interest of the Shells if full particulars of the circumstance under which they were made were sent with, or engraved on, the Shells" (IWM, ENI/3/MUN/2/4 Letter from McLaren to Galbraith accepting Cunard shells, 1917). Galbraith readily agrees in a correspondence the following month (IWM, ENI/3/MUN/2/4 Letter from Galbraith, 1917), writing again ten days later to apologise for a delay in delivery due to a delay with the engraver. The shells were received by the WWSC shortly after, engraved with

the words, ““THE FIRST 8 [OR 6] INCH SHELL MANUFACTURED IN GREAT BRITAIN BY FEMALE OPERATORS AT CUNARD SHELL FACTORY LIVERPOOL”. This donation was followed by photographs of the women working in the Cunard National Shell Factory. A letter of thanks from Lady Norman on 6th March 1918 references these photographs, saying, “They are of great historic value and will be of permanent interest to future generations” (IWM, ENI/3/MUN/2/4 Letter of thanks Lady Norman, 1918).

On the 11th of December Lady Norman acknowledged receipt of the Cunard shells in a letter to Galbraith, noting that they had arrived in time for the first exhibition, due to be held at Burlington House in November 1917 (IWM, ENI/3/MUN/2/4 Letter from Lady Norman to Galbraith, 1917). However, Burlington House was bombed on 24th September 1917, just a few weeks before the exhibition was due to open. The subsequent difficulties caused by the reduced display space are referred to in minutes of WWSC meetings, yet the Cunard shells retained top billing.

Listed above the now familiar collecting categories, two shells were featured as key exhibits in the catalogue of the Imperial War Museum for the exhibition which opened on 7th January 1918 (IWM, LBY 2240 , 1918, p. 15) (Fig 4.7).

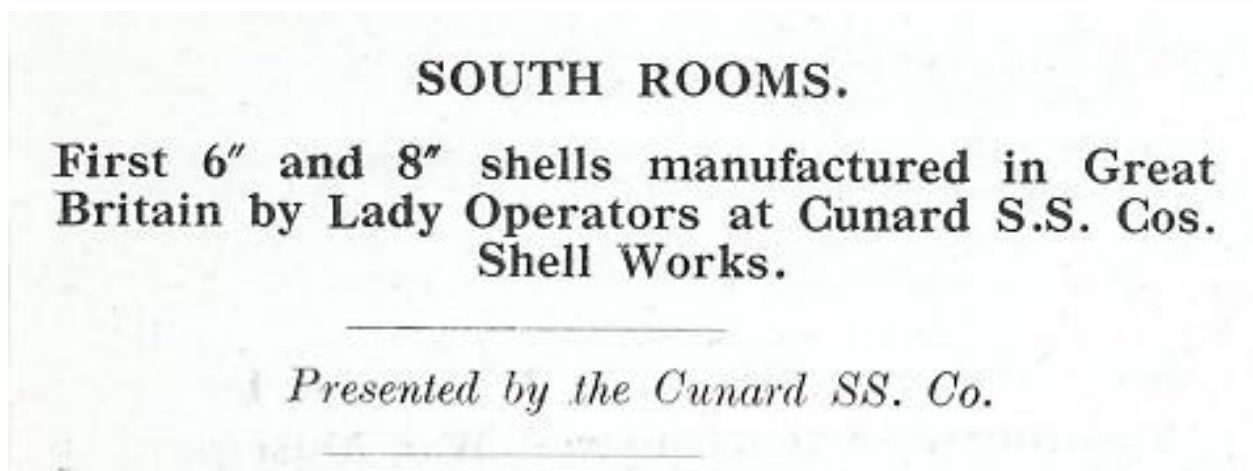


Figure 4.72 (IWM, LBY 2240, 1918, p. 15)

Buck (2015) said of the first exhibition at Burlington House in 1917:

The trade-show paradigm, orchestrated by the Ministry of Munitions, also undercuts the memorial aims. Even the entry for the first shells made by women puts as much stress on the fact that the shells were made at and donated by Cunard S.S. Cos. Shell Works, as on the evidence of women’s technological skill.

(Clare Buck, 2015, p. 183)

However, Buck does not mention the accompanying photographs illustrating the women at work, which arrived too late to be shown at Burlington House, nor the subsequent exhibition at Whitechapel Art Gallery which was more strongly orchestrated by the WWSC themselves. Whilst an element of corporate promotion was certainly at play, it did not contradict the original philosophy for a national war museum conceived just nine months before, nor did it detract from the agenda of those involved in the WWSC around female representation. In any case, the single fact that the Cunard shells were engraved meant that not only the location of manufacture was preserved, but so was the identity of the makers. It is assumed that these shells went on to feature in the main Whitechapel Art Gallery exhibition in November the same year, but for reasons explained in Section 6.4.3 there is no evidence in the form of a relevant catalogue. Beyond this, the Cunard shells are likely to have been displayed at the Crystal Palace exhibition until 1924, and then again at the Imperial Institute at South Kensington until 1936, when the museum moved to its present site at Southwark.

The Cunard Shells' next appearance in the archives is after the Imperial War Museum at Southwark sustained serious bomb damage during the Second World War. In a letter written on 16th July 1941, an unknown author responds to enquiries by Lady Norman (still a Trustee of the IWM) about the condition of the exhibits in the Women's Section following the explosion:

The aeroplane engine was on exhibition in the Air Force Gallery, and although the glass case containing it has been shattered, the engine is quite easily accessible, but, like all the metal objects in the Museum, is at the moment very rusty; this could be remedied by a few hours work. The same applies to the first 6 and 8 inch shells made by women.

(IWM, Documents. 9887, Norman Papers, 1942).

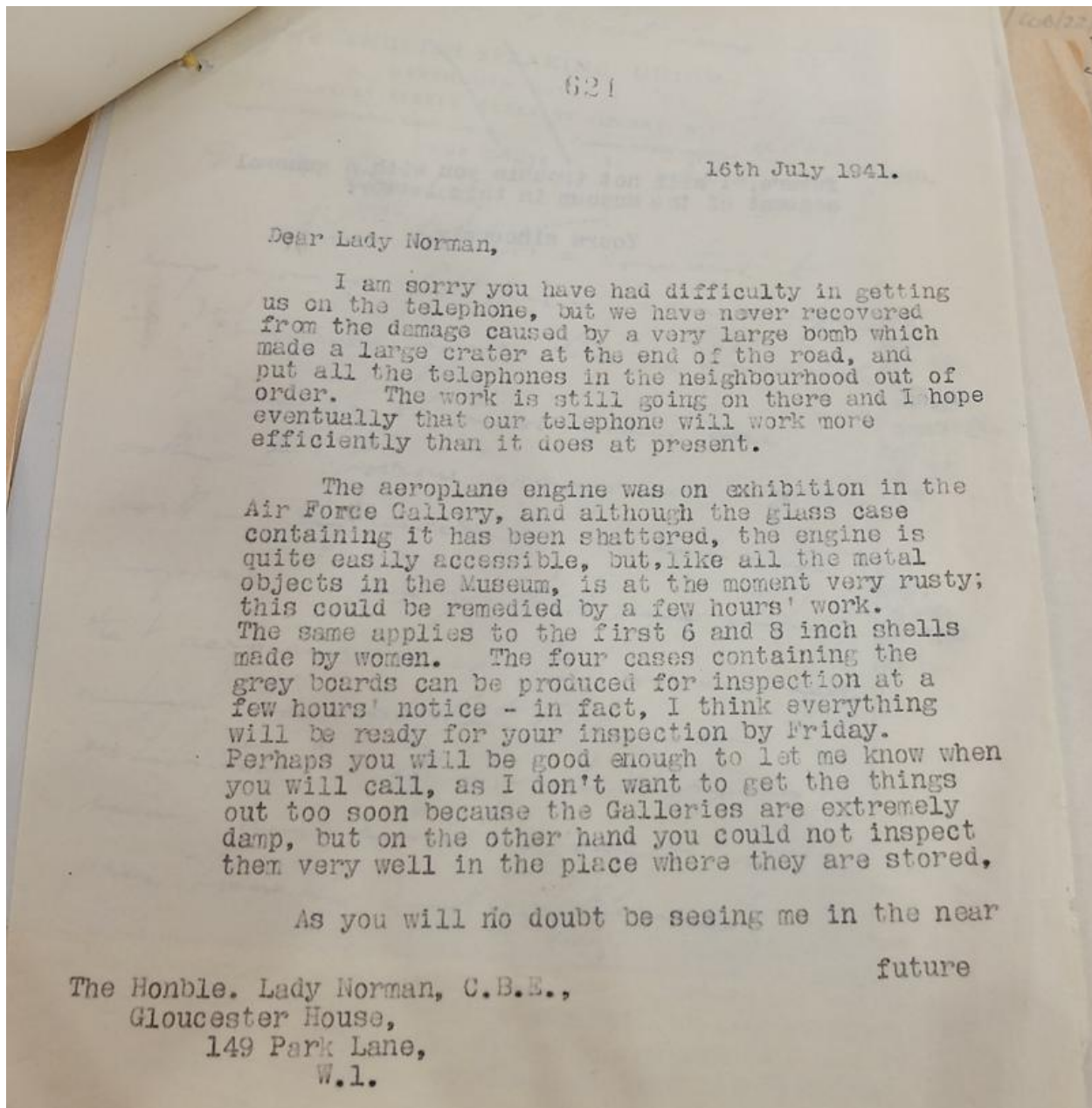


Figure 4.73 Letter to Lady Norman 16th July 1941 regarding Women's Work Collection bomb damage (IWM, Documents.9887, Norman Papers, 1942)

Possibly the most significant moment in the 'lives' of these two shells was when McLaren made his suggestion of engraving them, because this granted them an enduring gender provenance and gave them a unique place in the collection.

These shells were designed to shatter into fragments from an internal rather than external force, so their survival in a collapsed building during a bombing raid is not surprising. What is remarkable is that their identity also survived, and this is entirely due to the fact they were engraved, so that the proof of their makers' identity is part of their material being.

4.7 Discussion

This chapter has shown how this research reconstructed the WWSC's assemblage of metalwork was using evidence from Ministry of Munitions and IWM exhibition catalogues, WSCC minutes and correspondence, the IWM online object catalogue, and the surviving metal items discovered in the IWM's present day collection.

The WWSC's agenda was to create a Women's Section for the IWM which would reflect all kinds of female work during wartime, and they routinely took advantage of existing initiatives, incorporating them into their archives and exhibition spaces.

This study has shown that metal samples originally collected by the Ministry of Munitions for their recruitment exhibitions (to augment information shown in photographs of women metalworkers) were adopted and developed by the WWSC. The original purpose of these metalwork samples had been to provide proof of female metalworking skills to factory owners, and promote the practice of dividing training into small operations as part of the dilution programme. Using the blueprint devised by Monkhouse and Morgan at Ministry of Munitions (Section 3.5), (Section 4.2), the WWSC continued to collect metal artifacts using the same groupings and cataloguing system, which can explain some of the confusion over where certain items belonged and to which collection they should be a part.

Although not particularly obvious at the time, this new custodianship of the Ministry of Munitions' dilution exhibitions metalwork would spell a change in what the objects would come to represent, starting life as proof of skills competency in an industrial expo setting before becoming evidence of 'war service'. This research uncovered differing agendas between the sub committees responsible for gathering material for the new IWM. For example when Col. Stansfeld the Chair of the Ministry of Munitions expressed his preference for all munitions work to be housed within one Munitions Section, his suggested that labels could be added to the exhibits, explaining that they were "made by women". This satisfied his plan to bring together a collection of all similar objects, with additional sidenotes about the makers if required. That this idea was roundly rejected by the WWSC explains how their agenda was to proactive preserve the metalwork as the proof of female ability, and how that message would survive into the future. They were acutely aware that the founding of the

IWM had afforded them a finite opportunity to collect evidence of women's capability and worth and they were mindful to protect this.

In June 1917, agreements were made between the Ministry of Munitions subcommittee and the WWSC that some of the dilution exhibition metal objects could be given on loan for the first Women's Section exhibition at Burlington House in January 1918, to be replaced in phases by identical copies collected by the WWSC. This research now shows that this did not necessarily happen, as a significant number of metal objects identified as being part of the Women's Section in the present day collection are clearly the same objects shown in the 1918 Ministry of Munitions catalogue and not replicas or replacements (Section 4.4). The two collections were either less distinct than previously understood, or were merged intentionally at some point by the museum, or have been grouped together inadvertently since. A lack of any corresponding sequence between the old referencing system and the new EPH numbers suggests the latter (Section 4.4).

The understanding that these metal objects were collected as new was confirmed by this research, because the surviving examples that were examined are still in pristine condition.

In fact the small items that remain in the collection do little to represent the much broader range of metalworking activities that women were engaged in during the First World War, described in the Dilution Bulletins. These issues contain articles and photographs showing much bigger operations than small lathe work, including operations on large forge presses (IWM, MUN. VI/17, 1916, p. 13) and work on roll buffing machines (IWM, MUN. VI/17, 1917, p. 63). Later editions described women work in forges (IWM, MUN. VI/17, 1917, p. 69), (IWM, MUN. VI/17, 1917, p. 78) foundries and smithies (IWM, MUN. VI/17, 1917, p. 95), (IWM, MUN. VI/17, 1917, p. 95), (IWM, MUN. VI/17, 1917, p. 136). None of this kind of metalwork translated to exhibits shown in the IWM's Women's Section.

Research into the IWM archives also showed how the WWSC had foreseen a phased plan of acquiring objects, intending to obtain larger exhibits in time to illustrate how entire machines were being made by women, rather than just component parts. Attempts to acquire big guns were unsuccessful, and there were difficulties over establishing the ownership of a lathe and an aeroplane engine, as discussed in Chapter 6. Therefore, partly because of availability and partly because of space constraints (Section 3.6), small component munition parts would

eventually make up the bulk of the WWSC's metalwork collection and in turn represent the women working in this sector.

This research discovered more about the types of metalworking operations undertaken by the women through examining the data contained with the exhibition catalogues, rather than discovering new information by examining the objects themselves. The assemblage that has been reconstructed by this study identified 1539 munitions items, of which 1082 objects were made of metal - although only 86 metal items had additional notes about the kind of metal used. Very few had measurements, although those that exist are within the range expected from bit piece single lathe operations. The catalogue descriptions of the metal objects are rich in their detailing of the stages and making processes involved in the manufacture of the items, with an emphasis on the skills the women makers had. The objects themselves had lost most of their context because these details had parted company with the items over the intervening decades, but they were reunited by this study.

This research has also shown how strong the partnership was between two representatives of the Labour Supply Department at the Ministry of Munitions, B.H. Morgan and Miss O.E. Monkhouse, and members of the WWSC. Monkhouse in particular played a key role in enabling this research to rediscover and identify the women's munition work, because she organised for much of the collection to be photographed to such a high standard that details like casting flaws and tiny lettering could be seen. She also ensured that the catalogues from the dilution exhibitions were lodged with the Women's Work Collection by sending them once and then twice when the first consignment failed to be delivered to the WWSC (IWM, ENI/3/MUN/2/2, 1918). She demonstrated an understanding that evidence about women's metalworking and engineering needed to be proactively included and preserved to prevent the story of their gender provenance reverting to a masculine narrative.

This is why the Cunard shells are such a special case. That fact that Alexander Galbraith agreed to engrave the shells with the simple words "THE FIRST 8 [or 6] INCH SHELL MANUFACTURED IN GREAT BRITAIN BY FEMALE OPERATORS AT CUNARD SHELL FACTORY / LIVERPOOL" connected them permanently to their factory of origin but, more pertinent to this research, embedded the identity of the makers into the fabric of the objects. They did not lose their

labels. Their maker's identities endured Second World War bombs. They could not be misattributed. Their gender provenance survived intact.



Figure 4.74 Cunard Shell Showing Engraving IWM (MUN 3281) © IWM

5 Chapter Five: Visual representation

5.1 Introduction

Just as the metal objects originating from the Ministry of Munitions became key elements in the Women's Work Collection, so too did the photographs of munition workers, also shown in dilution exhibitions between 1917 and 1919. Although these images were also adopted by the WWSC, other photography and artwork joined the collection through different initiatives, and this research has looked into what forms those depictions took and what they were intended to represent.

5.2 Use of photography in dilution exhibitions



Figure 5.1 The Ministry's Exhibition at Manchester (IWM, MUN. VI/17, 1918. Fig. 45)

As shown in Sections 2.3 and 4.2.1, the Shell Crisis of 1915 set into motion the changes in munitions production that brought many more women into metalworking and engineering trades. In support of the recruitment drives carried out by newly enlisted dilution officers, the Ministry of Munitions set up a series of exhibitions across the country, demonstrating the benefits and efficiency of dilution to would-be clients. Although supplemented by written

reports and charts, the exhibitions initially showed only photographic evidence of women engaged in metalworking tasks, such as forging, casting and general machine work. These pictures were also sent to private factories by dilution officers in support of their campaign for a higher takeup of female employees, as well as being published in the Dilution Bulletins where they were found and examined as part of this research (IWM, MUN. VI/17, 1917, p. 46). Even though metal samples were added to the exhibitions from May 1917 onwards, the framed photographs still played a prominent role in the expo format, providing both a backdrop and context for the artefacts displayed on trestle tables in the galleries (Fig 5.1) (Fig 5.2).



Figure 46.—View of Gallery in Manchester Exhibition.

Figure 5.2 View of Gallery in Manchester Exhibition (IWM, MUN. VI/17, 1918, Fig. 46)

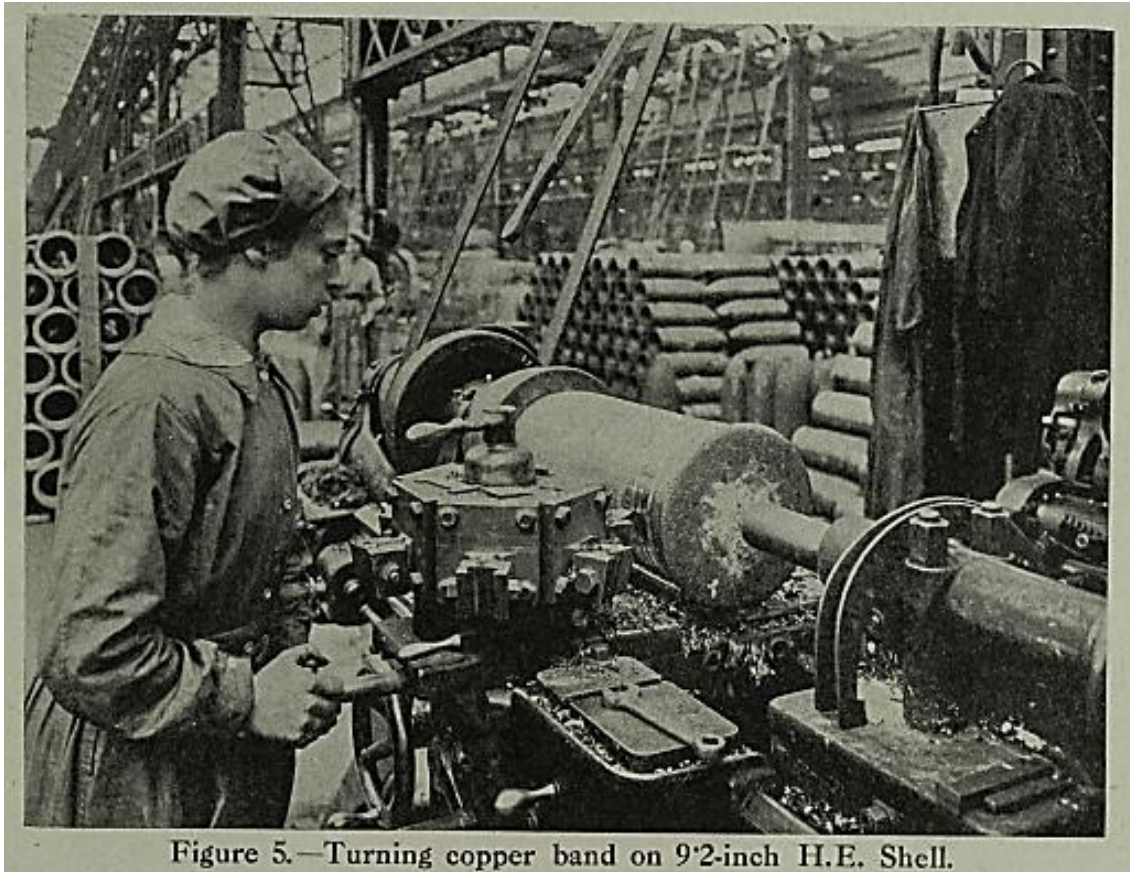


Figure 5.3 Turning copper band on 9.2-inch H.E. Shell (IWM, MUN. VI/17, 1917, Fig. 5)

Photographs generated by the Ministry of Munitions were designed to illustrate the competency of female metalworkers and reassure their would-be employers, the aim being to introduce a level of normalcy about seeing women in these roles. Furthermore, the message now being conveyed to an invited audience of factory owners was that women's inclusion into this workspace was not only normal but desirable, in stark contrast to the imagery of female metalworkers seen less than a decade before (Section 2.2). Here, the women shown in the Ministry of Munitions photographs are tidy, serious-looking, and their surroundings are ordered (Fig 5.3). The subjects in these photographs look like ordinary women and are shown focusing on their work. This photographic imagery, conceptually blended with accompanying productivity data, encouraged prospective employees to envisage how effective the use of a previously unconsidered workforce might be.

Many photographs show women making components on lathes, consistent with the metal objects that came into the Women's Work Collection (Fig 5.4).

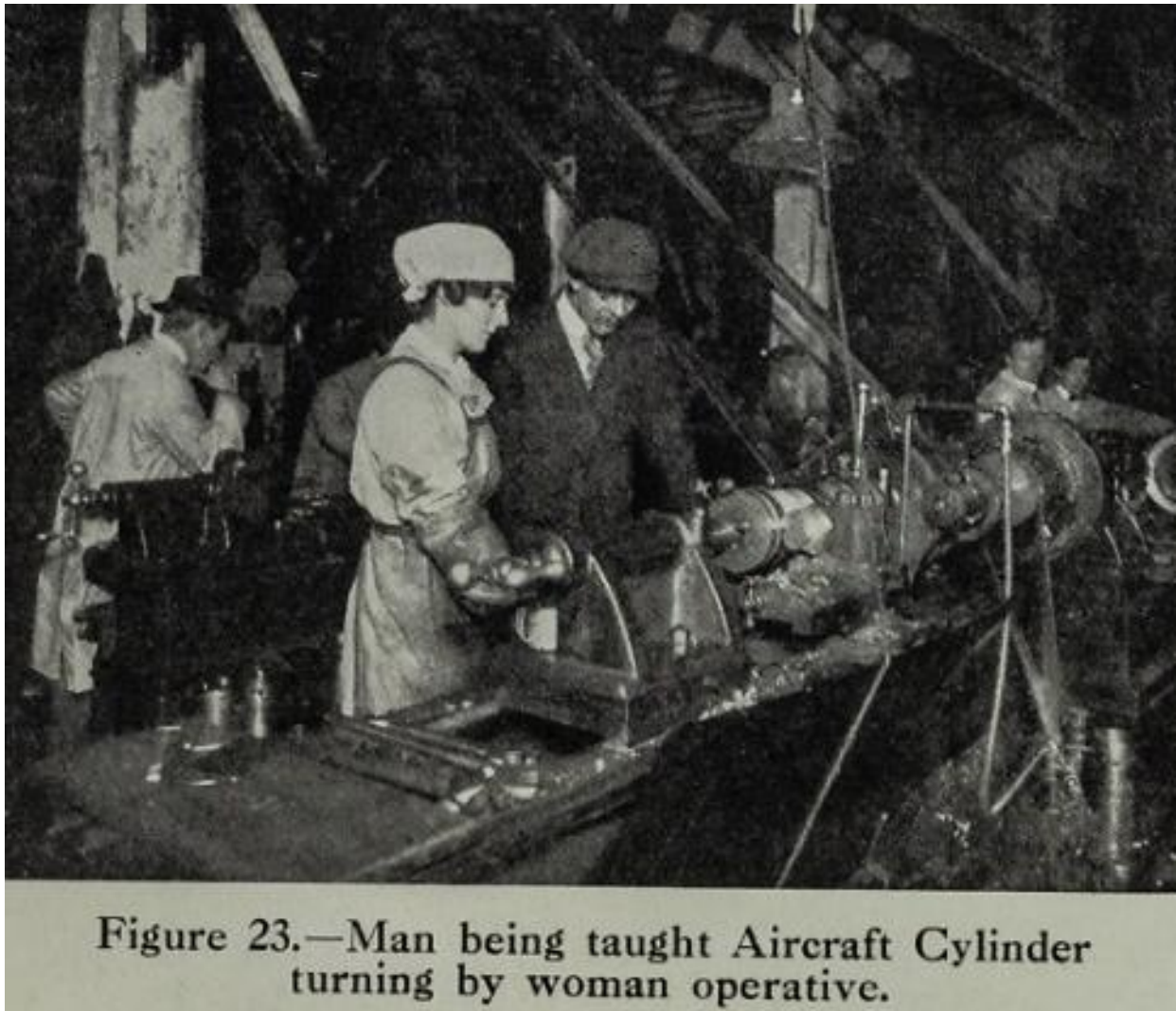


Figure 5.4 Man being taught Aircraft Cylinder turning by woman operative (IWM, MUN. VI/17, 1917, Fig. 23)

However, other images gave an insight into the range of heavy metalwork women were engaged in, but which could not be translated into exhibitable sized samples, such as hydraulic riveting on boiler flues (Fig 5.5). Artefacts found in the Women's Work Collection and researched in this study represented only a small percentage of the metalworking practices engaged in by women during the First World War, when compared to the evidence found in the Ministry of Munition Dilution Bulletins and the exhibition images. If the metal samples represented a proof of ability, then these numerous images of the women metalworkers were important in conveying the concept of dilution itself.

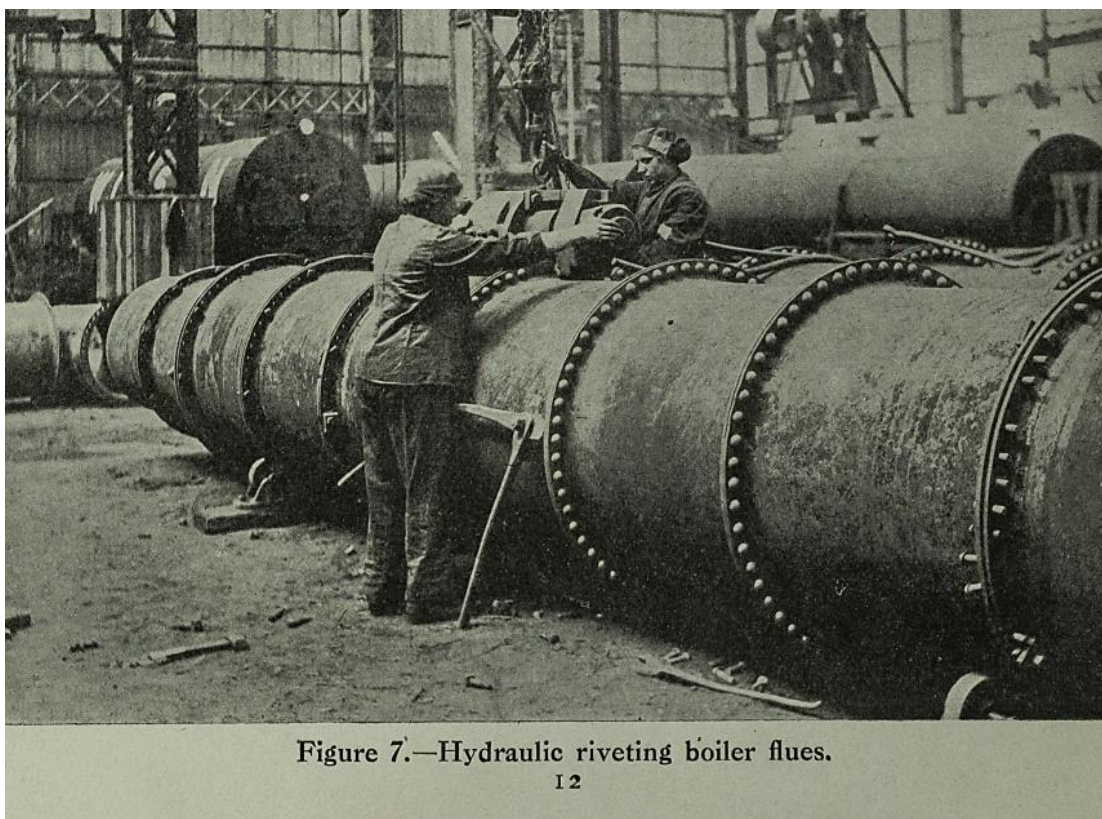


Figure 5.5 Hydraulic riveting boiler flues (IWM, MUN. VI/17, 1918, Fig. 7)

5.3 Use of photography by the WWSC

1917 saw a change in the use of these images, from a means of communicating with managers, supervisors and captains of industry, to a way of directly messaging the general public. Dilution, now at the end of its second year, was a proven success that had become more widely understood. At the same time, plans for a national war museum were being mooted, bringing with them ideas about memorialising war service in all its forms.

When the WWSC acquired the metal exhibits from the dilution exhibitions they also adopted the Ministry of Munition's photographs under the same agreement; of initially borrowing the images before replacing them with copies in stages (IWM, MUN. 1/2 Letter from Lady Norman to Col Stansfeld 26th November, 1917) (Section 4.2.2) (Section 6.3). This arrangement was referred to again in the reply to Lady Norman from Stansfeld;

As regards the supply of photographs, permission has been given for the prints you require to be supplied to you. I have been in communication with Captain Bell of the Labour Supply Section, and he informs me that he has some 2,000 photographs capable of reproduction. Probably you will only want a proportion of these and I

suggested to Captain Bell that perhaps the best course would be for you to see him and select those that you thought should be reproduced for the purpose of the Exhibition.

(IWM, ENI/1/COM/24/2 Letter to Lady Norman to Col. Stansfeld 3rd December, 1917)

However, there is no mention of photographs in the catalogue from the Burlington House Exhibition of January 1918 (IWM, LBY 2240, 1918) and so it has not been possible to establish how and when they were used in the WWSC's IWM exhibitions.

What has been better remembered is the imagery created by official war photographers Horace Nicholls and G.P. Lewis, who according to Bowen (2008) were commissioned by the Ministry of Information in 1917 to take pictures of women working in all sectors, having been seconded to the WWSC (Bowen 2008, p. 36). By October 1918, Nicholls and Lewis had over 1300 photographs, some of which would be shown at the Whitechapel Art Gallery exhibition later the same year (Bowen, 2008, p. 6). These images differed in style to the pictures featured in the dilution exhibitions in a number of ways. Although the dilution images were certainly posed, they conveyed a moment of metalworking, in surroundings which clearly showed other work taking place in the background. The women are ordinary looking, have uncoiffed hair, and tend to be looking at the task in hand rather than at the viewer. In contrast to these, Nicholls and Lewis' later images are also posed, but are often staged in a way that is more sensitively lit and give fewer clues to the viewer about the work taking place. The women's hair is often tidy, their overalls are clean, and their faces more clearly visible (Fig 5.6).



Figure 5.6 Munitions production on the home front, Nicholls (IWM, Q30040) ©IWM

If this kind of imagery shifted the focus away from the kind of work being done and back to the woman in the scene, it succeeded in a developing agenda by the WWSC to make their exhibitions more visually engaging to the general public, whilst conveying a sense of national service represented by the women's work.

An example of a piece of graphic art which embodied this shift in objective can be found in a series of charts that were designed to visually express the increasing number of women in 19 sectors, and which are referred to in the 1918 Burlington House exhibition catalogue (IWM, LBY 2240, 1918, p. 16) and (Fig 5.7).

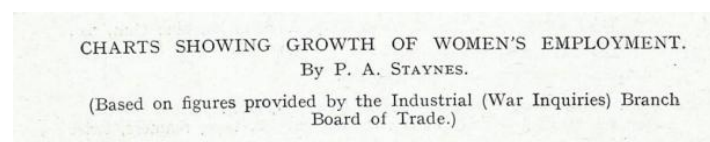


Figure 5.7 Reference to charts showing growth of women's employment (IWM, LBY 2240, 1918, p. 16)

These charts were commissioned by the WWSC, evidenced in the minutes of their meeting on 22nd November 1917:

Miss Conway reported that several artists had been invited to send in sketches for pictorial charts illustrating these graphs. She was authorized to continue negotiations and was asked to write in the name of the Committee to Professor Chapman thanking him for his cooperation.

(IWM, ENI/3/GEN/10, 1917, p. 2).

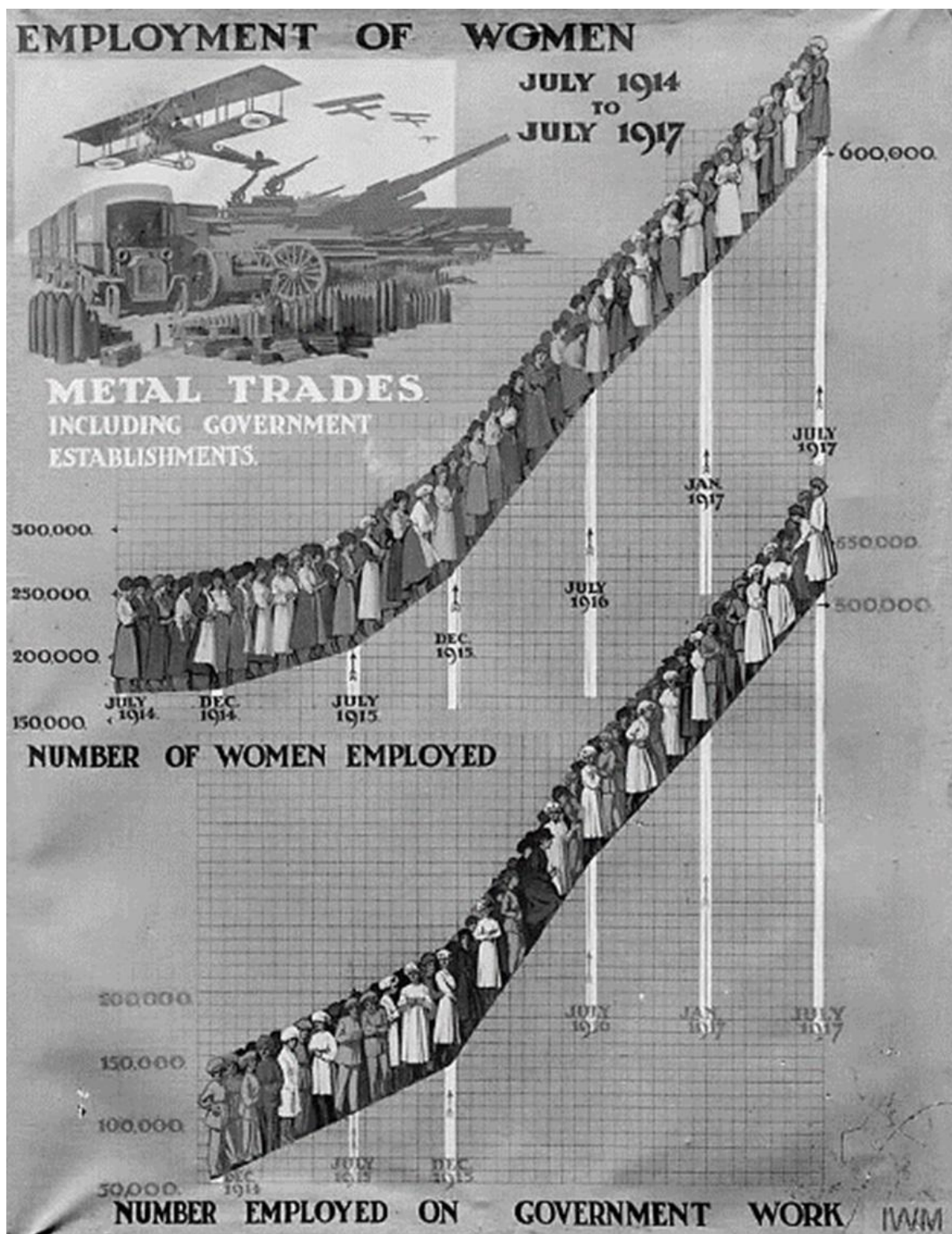


Figure 5.8 Chart showing statistical diagrams of women's employment in metal trades (IWM, Q 30610) ©IWM

These charts were unusual because rather than being populated with data points, the graphics consisted of paintings of women ascending the chart. Each woman in the picture was

shown as an individual and dressed differently to the others, to create a highly relatable blend of data and illustration. Furthermore, these depictions of progress were evidently valued by the WWSC, as one chart in particular, showing statistical diagrams of women's employment in metal trades (Fig 5.8), became the subject of an ownership dispute with the officer of the dilution exhibition at the Leeds Castle Art Gallery (Section 3.6) (IWM, ENI/3/COR/2/1 Letter from Agnes Conway to Charles ffoulkes 19th July, 1918).

5.4 War art



*Figure 5.9 The Acetylene Welder 'Britain's Efforts and Ideals'; Making Aircraft Image,
(Art.IWM ART 693) ©IWM*

The idea to collect and commission war art for the IWM was initiated and led by the IWM's General Director Sir Martin Conway, a former Slade Professor of Fine Art at Cambridge University who had previously published a book on the history of art with his daughter, WWSC Hon. Sec. Agnes Conway (Conway and Conway, 1935). Subjects depicted in the earliest war art tended to focus on life in the trenches and medical responses, and only to a lesser extent

the life on the home front. The first notable depictions of women working with metal came in the form of art generated by the Ministry of Information for their project *The Great War: Britain's Efforts and Ideals* in 1917. This War Propaganda Bureau commissioned eighteen well known artists of the day to produce lithographs to be distributed and sold as a morale boosting exercise. C.R.W. Nevinson and Archibald Standish Hartrick both produced work showing women working in munitions as part of this initiative.



Figure 5.10 On munitions skilled work, (Art.IWM ART 712) ©IWM

C.R.W. Nevinson's lithograph *The Acetylene Welder 'Britain's Efforts and Ideals'* (Fig 5.9) contrasted starkly with his more well known paintings such as *Path of Glory*. His treatment of women in this study was in keeping with his illustrations of men engaged in similar work. Two lithographs of Archibald Standish Hartrick presented images of strong capable-looking women, who appeared at ease in the workshop setting. Both *On Munitions; Skilled Work* (Fig 5.10) and *On Munitions; Heavy Work* (Fig 5.11) show women working with metal, their tools and machinery easily identifiable from the studies.



Figure 5.11 *On Munitions; Heavy Work*, (Art.IWM ART 714) ©IWM

Early on in its formation, the WWSC was keen to acquire its own artwork for the Women's Section from women artists. The subcommittee purchased *The Ladies' Army Remount Dépôt* (Art.IWM ART 3094) from Lucy Kemp-Welch and a series of pencil and watercolour studies from Victoria Monkhouse. Flora Lion's *Women's Canteen at Phoenix Works, Bradford* (Art.IWM ART 4434) and Olive Mudie-Cooke's famous *In an Ambulance: a VAD Lighting a Cigarette for a Patient* (Art.IWM ART 3051) were procured. Ursula Wood's pencil and chalk studies of Land Army girls was also purchased, although at a reduced price (Speck, 2014, p. 25). Anne Airy, one of the first ever official female war artists, was commissioned by the WWSC to paint four large pictures of interior scenes in munitions factories, namely *Shop for Machining 15-inch Shells: Singer Manufacturing Company, Clydebank, Glasgow* (Art.IWM ART 2271), *Women Working in a Gas Retort House: South Metropolitan Gas Company, London* (Art.IWM ART 2852), *The 'L' Press. Forging the Jacket of an 18-inch Gun: Armstrong-*

Whitworth Works, Openshaw (Art.IWM ART 2272), and *A Shell Forge at a National Projectile Factory, Hackney Marshes, London* (Art.IWM ART 4032). These large dramatic canvases emphasised heavy machinery, fire and heat, but the figures are indistinct, illustrating the environments rather than the work. The work of the individual is not explored, in contrast with the work the WWSC commissioned from Clare Atwood. In these images, *Victoria Station 1918: The Green Cross Corps (Women's Reserve Ambulance) Guiding Soldiers on Leave* (Art.IWM ART 2513) and *Devonshire House 1918: VAD Workers Filing Papers in the Ballroom* (Art.IWM ART 2514), women are shown organising and managing projects. The ink and watercolour images purchased by the WWSC from Nellie Isaac illustrate the social activities engaged in by the large female workforce at Gordon, Watney & Co., Aeronautical Engineers, Weybridge, but although uniformed, they are not engaging in any workshop tasks.

5.5 Dioramas

This move by the WWSC towards using art together with exhibited artefacts and photographs progressed alongside a now developing theme of memorialisation and the need to preserve women's war work for posterity. Aware of how the public should receive and understand the Women's Work Collection, the WWSC tried different ways to contextualise the objects and illustrate the extent of women's service. The notion of making plaster models of women working in these novel roles was an extension of this idea (Hayashida, 2021 p.61). At this time, the use of dioramas to visually explain military operations and events was already widely in place (Ludwig, 2017, p. 13), providing a function similar to virtual reality today in that it allowed the public to explore a scene from all sides; an example being *Diorama of Troops Landing from the SS RIVER CLYDE at 'V' Beach, Cape Helles, Gallipoli, 25 April 1915* (IWM Q 63667). The idea of creating dioramas to illustrate activity on the home front, although not previously used by the IWM General Committee, was seen by the WWSC as a useful way of helping the public understand the extent of the contribution of women workers across all sectors.

The earliest reference to model making appears in WWSC minutes from the 10th May 1917, when eminent artist and theatre-set designer Charles Ricketts advised Director General Sir Martin Conway against displaying uniforms on dummies for fear of moth damage in the long term. He suggested instead:

...to have figures modelled in canvas supported by plaster which could then be painted, by which means they would “last for ever”.

(IWM, ENI/3/COR/1 WWSC Minutes 10th May, 1917, p. 1).

Ricketts also suggested that surroundings could then be painted onto the background, adding to the overall aesthetic look of the tableau and contextualising the activities of the women. The suggestion was accepted, and a £1000 budget put in place according to progress reports made on the Women’s Sections from 1st May 1917 to 20th September 1917 (IWM, ENI/3/COR/24/2 Report from Women’s Section May 1st to September 20th, 1917, p. 2). Visits were then made to the studios of several women artists to see how these models might be produced. Ricketts remained connected to the project, and by July 1918 he was being referred to as “the honorary technical advisor for models”. His advice related to making appropriate payments to the artists and raising concerns about underpayment, as materials grew more costly during wartime. As these ideas developed, WWSC minutes filed between 1st May 1917 and 23rd February 1918 show that a decision had been made to only commission female artists and sculptors.

A series of models, made by women sculptors, and illustrative of different forms of war-work is being formed. Four models have been completed and nine others are on order; of these, four may be finished by March 31.

(IWM, ENI/3/COR/24/2 Report from Women’s Section May 1917 to February 1918, 8, p. 1)

According to minutes from a meeting in February 1918, the popularity of one particular diorama created by Nell Foy appears to have added momentum to this project. Entitled *Sergeant-Major Flora Sandes and troops in Serbia* (IWM MOD 109), it was later purchased by the WWSC for the Women’s Section. WWSC minutes from the following months show considerable activity taking place in order to produce more models the collection. According to minutes from meetings between April and July 1918 two artists, “Miss Callard” and “Miss Winsor”, were approached by the WWSC to create pieces depicting Woolwich Arsenal and a ploughing scene. At the same time, a model of a tannery had already been commissioned from “Mrs Gilbert Bayes” and another artist, “Miss Pye” appeared to be being commissioned to make figures for a model of a YMCA hut (IWM, EN1/3/GEN/10 WWC Minutes 12th Sept, 1918). Concerns about the durability of the dioramas and models is implied in WWSC minutes

from August 1918, showing a sense of wanting to create more permanent memorial objects, rather than exhibition items to inform the public in that moment:

...the chairman reported that Lady Feodora Gleichen had mentioned Mrs Jenkin as an artist whose work would be suitable for the Imperial War Museum and that Lady Feodora Gleichen had offered to experiment with a view to finding a more durable material than at present used.

(IWM, EN1/3/GEN/10 WWC Minutes 15th Aug 1918, 1918)

The WWSC began to expand the model making scheme, and decided in October 1918 to use the medium to illustrate and represent a far wider range of women's activities than before (IWM, EN1/3/GEN/10 WWC Minutes 9th Oct, 1918) (Table 5.1).

Table 5.1 Proposed subjects for WWSC models (verbatim) (IWM, EN1/3/GEN/10 WWC Minutes 9th Oct, 1918)

Work of women in Remount Depots
Nursing scene in hospital
V.A.D. Subject
Women engaged in explosive factory
Heavy labouring work in connection with the Munitions Inspection Department
Belgian Refugee Creche
A marching group of the Q.M.A.A.C.
W.R.N.S. Subject
Land Army; hay pitching
Timber Supply Department; felling
Women in Army Kitchen under Women's Legion
A Forage Department Subject

Further sectors were added later, according to minutes from the 14th December (IWM, EN1/3/GEN/10 WWC Minutes 14th Dec, 1918) (Table 5.2).

Table 5.2 Further subjects for WWSC models (verbatim) (IWM, EN1/3/GEN/10 WWC Minutes 14th Dec, 1918)

Communal kitchen
Women Police searching munitions workers. Mrs Gilbert Bayes
Royaumont. Miss Morgan?
Remount Depot.
Cooks. Women's Legion. Summerdown Camp
Group of the Q. M. A. A. C. marching
AW.R.N.S. Subject. Carrier pigeons?
AW.R.A.F. Subject.
A voluntary canteen in France. Women's Emergency Canteens?
V.A.D. Rest station
A motor convoy under Mrs Harle
A Gas, Light and Coks Co. subject
Hospital scene. Clemens?

The first list (Table 5.1) was drawn up at the end of the exhibition in the Whitechapel Art Gallery (Section 6.4), where the original set of models were well received by the public. The second list (Table 5.2) was written after the war ended, possibly in anticipation of the planned permanent IWM exhibition at Crystal Palace. Although it is difficult to assess just how many dioramas were made in the end, photographs taken by Horace Nicholls still remain in the IWM collection showing twelve different models that illustrate women's work in general. Seven models appear to have survived to the present day, namely *Dr Elsie Inglis Tending the Serbian Wounded at the Scottish Women's Hospital* (IWM MOD 34), *Five Females in White Overalls Hay Baling* (IWM MOD 53). *Sergeant-Major Flora Sandes in Serbia*"(IWM MOD 109), *Model of Victoria Station Buffet* (IWM MOD 366), *Woolwich Arsenal Canteen* (IWM MOD 1058), *Munition Workers Making Brass Rifle Cartridges* (IWM MOD 107), and *Women Stacking Tank Chains At The Newbury Depot* (IWM MOD 29).

Armistice Day was declared in November 1918 during the WWSC's exhibition at the Whitechapel Art Gallery, bringing about a shift in what the objects in the Women's Section

now represented. The context and meaning of the plaster models and dioramas began to alter as these once familiar scenes started to symbolise a time which was passing.

When, during a meeting in September 1919 (IWM, EN1/3/GEN/10 WWSC Minutes 23rd Sept, 1919) Martin Conway asked the WWSC if a selection of models could be shown in a new exhibition of war art at Burlington House, the resulting exhibition was to become the first time the Women's Section had been represented entirely by art. Taking place in the same building which had been used to display the metal objects of the dilution exhibitions just eighteen months earlier, it illustrated the shift from using artefacts to represent ability, to using art to memorialise service. The catalogue for the *Imperial War Museum: the Nation's War Paintings and Other Records* (RA, MLPAM C8926 A21429, 1919, p.67) shows that eighteen plaster models were exhibited, all of which were made by ten female sculptors and artists (Fig 5.12). Later, in July 1919, the Imperial War Museum obtained a four year lease for the Crystal Palace, where from 1920 to 1924 the models would feature for the final time, alongside other artefacts collected by the WWSC in the Women's Section.

EXHIBITION OF WAR PAINTINGS.

MODELS.

LEATHER TANNING.	MRS. GILBERT BAYES.
POLICE WOMEN INSPECTING MUNITION WORKERS.	MRS. GILBERT BAYES.
SPLINT MAKING.	MISS NEIL FOY.
LADY HELENA GLEICHEN AND MRS. HOLLINGS TAKING RADIOGRAPH FOR BRITISH RED CROSS.	LADY FEODORA GLEICHEN.
X-RAY AMBULANCE ON THE ITALIAN FRONT.	LADY FEODORA GLEICHEN.
LACING UP AIRSHIP ENVELOPE.	MRS. VEREKER HAMILTON.
ALMERIC PAGET MESSAGE CORPS.	MISS ETHEL PYE.
FRUIT PACKING.	MISS ROCK.
PACKING FOR PRISONERS AT CENTRAL P.O.W. DEPOT.	MISS ROCK.
INITIAL CANTEEN EFFORT AT WOOLWICH.	MISS ROCK and MISS OLVER.
W.R.N.S.	MRS. WALLACE.
SOLDIERS' AND SAILORS' BUFFET, VICTORIA STATION.	MRS. MEREDITH WILLIAMS.
HAYES FILLING FACTORY.	"
TIMBER CUTTING.	"
TIMBER CUTTING.	"
HAY BALING.	"
STACKING TANK CHAINS.	"
PLOUGHING.	MISS WINSER.

Figure 5.12 List of WWSC models at Imperial War Exhibition (RA, MLPAM C8926 A21429, 1919, p. 67)

5.6 Studying the surviving models

Very few of the models commissioned by the WWSC have survived, although this research located three at IWM Duxford. No longer on public display due to their great fragility, they were viewed still in their crates, so inspection and photography was limited to top and side views.

5.6.1 IWM MOD 1058 First Voluntary Works Canteen at Woolwich Arsenal



Figure 5.13 First Voluntary Works Canteen at Woolwich Arsenal by Nicholls, (IWM Q 31417)

©IWM

The model of the canteen at Woolwich Arsenal (Fig 5.13) by artists Helen Rock and Kate Oliver (originally titled *Initial Canteen Effort at Woolwich*) is made of wood and plaster, measures 23" x 28" x 25" and weighs 49kg. Like other models of the time, this scene depicts a specific scenario based on an earlier part of the war. In May 1915, Lady Lawrence had organised the Munition Workers Canteen Committee to provide light refreshments in support of the work undertaken by the expanding number of munitions workers. This operation was extended to create 500 canteens for munitions and dock workers, involving the efforts of 40,000 women volunteers. The piece consists of two women giving out orange juice to a group of fifteen males, all looking eagerly on in anticipation of their turn. It is a strikingly detailed study, with

each individual showing a different character. It has a lot of movement and easily invites the onlooker to imagine being part of the scene.



Figure 5.14 IWM MOD 1058

This diorama was made in 1919, some years after these scenes had taken place and after the war had ended. It was made knowing that a gallery would be the context for public interaction and shows an accurate scene in a pleasing way, designed to resonate with the many thousands of people who had experienced a similar moment during the war. As well as being exhibited at the *Imperial War Museum: the Nation's War Paintings and Other Records* exhibition at Burlington House, it was also shown at the IWM in Crystal Palace (See Chapter 6), and was recorded by Horace Nicholls (Fig 2.13).

5.6.2 IWM MOD 29 Women Stacking Tank Chains at the Newbury Depot of the Central Stores of the Ministry of Munitions

This large diorama made by notable sculptor Alice Meredith Williams in 1918 consists of fourteen figures, each engaged in different tasks involving stacking tank chains in the Newbury depot. It is made of wood and plaster, measures 50.8cm x 91.5cm x 49.5cm, and weighs 57 kg. The quality of execution is refined and detailed. Close examination shows a highly animated scene with individual characters interacting in different ways, both with their tasks and one another. There are no male figures, and the hierarchy in the workforce appears to be denoted by costume type. As before, the viewer is drawn into a live and active scene which can be viewed from many angles, unlike photographs or painted studies. The medium has the odd effect of making the scenario more believable, demonstrating to the viewer an ordered and structured operation, and may have been a reason why the WWSC made so many dioramas as a means of demonstrating female competence. It is hard to appreciate just how engaging these scenes are until one has viewed the actual piece and looked at all the tiny faces.



Figure 5.15 IWM MOD 29



Figure 5.16 IWM MOD 29 detail (a)



Figure 5.17 IWM MOD 29 detail (b)

5.6.3 IWM MOD 107 Munition Workers Making Brass Rifle Cartridges

This vertical bas relief image is made from wood and plaster in a similar manner to the dioramas, but sits within a frame like a painted picture. Its dimensions are 63.5cm x 53.3cm x 7.6cm. It was difficult to examine because it was too fragile to move out of its crate and had to be photographed from above. There were no accompanying labels, and the IWM catalogue described both the date and artist (most certainly a woman) as “unknown”. This piece does not appear in any of the contemporary catalogues. It depicts two female munition workers, wearing long blue dresses and blue or green headscarves. They are seated, filling brass machine gun belts with ammunition. The rotating machines are connected to unseen engines (presumably steam powered) via belts that vanish upwards.



Figure 5.18 IWM MOD 107

More than the other dioramas examined, this piece sits more in the realm of art, instead of being a means of recording a scene or portraying technical information. It is highly crafted, and the machines are shown in some detail, but sensibilities around composition and colour are reminiscent of religious imagery, in particular the use of blue paint for the women's clothes and gold for the cartridges. A close examination led to the surprising conclusion that these colours may have contained lapis pigment and even gold leaf. Chemical analysis could not take place, but the colours were surprisingly bright considering their age and the gilt reflected torch light brightly from every angle.

Although this piece serves to inform the viewer about the work taking place, it appears to be doing something else too. It is beginning to make women's war work look iconic.

This diorama is distinctly different to the others in the original Women's Work Collection, and this research did not succeed in tracing its origins and it may be that this was a private commission later donated to the IWM.

5.7 Discussion

The earliest imagery of First World War female metalworkers found in the Women's Work Collection came from the original collection created by the Ministry of Munitions to promote dilution practices. These first pictures (exhibited in shows and published in the Dilution Bulletins) were serious portrayals of women carrying out metalworking operations in workshops, showing ordered backgrounds and identifiable operations. With further research it would be possible to match these images with information from exhibition catalogues and the surviving metal objects to complete the picture of the work these women were engaged in. Here, their competency is being demonstrated for the benefit of an audience of business owners and factory managers considering adopting dilution practices. Visually, the female subjects of these pictures seem quite ordinary, and in most cases are looking at their work rather than at the lens.

These photographs were adopted and added to by the WWSC, which also commissioned new work from Horace Nicholls and George P. Lewis, as the war was coming to an end. Their images appear more staged in terms of lighting, and the women appear more posed and less engaged in the metalworking, often looking directly at the observer. The photographs are more portraiture than study, their purpose being to commemorate a time that was passing

and would soon be consigned to history. Historians such as Thom (2003) considered these images to be problematic, in the sense that the women somehow look less plausible as metalworkers. Furthermore she argued that:

...also encouraged was the idea that war was a distinct period in which women did factory work, as though they had not done it in the past. Rarely had working women been portrayed with such skill and to such an artistic effect before, and they were rarely seen in this way later.

(Thom, 2003, p. 58)

These are the images that have lived with us over the last century, feeding into the notion that female metalworking is an atypical occupation, necessary only in times of crisis.

Under the directorship of Sir Martin Conway, the General Committee of the IWM introduced the new idea of official war art. Most of the subject matter concerned portrayals of the theatres of war and of the lives of soldiers on the front. However, studies by Nevinson and Hartrick for the 1917 project *The Great War: Britain's Efforts and Ideals* were unusual in that they depicted women metalworkers within a suite of studies of all war workers, without creating a sub category of their female subjects or treating them in a different way visually.

The WWSC went on to commission the first ever female war artist, Anne Airy, to produce a series of large paintings that focused on the factory environment and settings for munitions work. The WWSC also commissioned a large series of dioramas entirely created by women sculptors. This was a conscious decision (minuted in meetings), demonstrating another clear example of the WWSC's material activism, both in terms of their support for female artists and their desire for self-representation. The use of dioramas to explain scenarios on the home front was innovative, as this a technique more commonly associated with military scenarios, and so it elevated the status of the women's work to war service, by association of the media.

The rare opportunity to view three of the surviving dioramas came as part of this research, giving an insight into how the public might have responded to an interaction with them. Considerably more engaging than photographs might suggest, MOD 1058 in particular expressed the surprisingly touching and human moment of women supplying refreshments

to male munitions workers. MOD 29 visually explains a dynamic and complex scene in a tank chain stacking depot, where each woman was represented as a believable individual.

It is useful to pause and reflect upon the changes in the portrayal of female metalworkers that the war brought about in such a short timescale. The social campaigning and the Cradley Heath chainmakers' strike (that had taken only taken place in 1910) provided an unusually sizable body of female metalworking imagery (Section 2.1.2). Piffard's illustrations from *The White Slaves of England* (Sherard, 1897), that accompanied Sherard's accounts of industry in the Black Country, were designed to shed light on the appalling conditions and poverty endured by workers operating from home, and elicit a public response. The most stark example is the study entitled *Done to Death*, of Elizabeth Ryan's body lying in the Newcastle Workhouse (1897) (Figure 2.1). Piffard's studies of the women chainmakers similarly detailed and carry equally emotive quotes from the text. One image shows a young girl operating bellows with the accompany line "A particular and pitiful sight was that of a sweet little lass - such as Sir John Millais would have liked to paint - dancing on a pair of bellows for threepence a day" (1897, p. 231) (Figure 2.3). Other illustrations show women smithing in their backyard forges with the words, 'A woman plying her task in a cell-like shed, silent, absorbed and alone' (1897, p. 221) (Figure 2.2) and 'For forging these dog-chains, and attaching the swivels and rings, the girl receives three farthings apiece. They sell for eighteenpence. Working 10 hours a day she can manage six chains in the day' (1897, p. 237) (Figure 2.4).

These particular images were designed to express the worst aspects of the lives of female metalworkers and elicit public sympathy and outrage, but questions about their abilities as smiths do not arise. This is different to the images that appear less than twenty years later in the form of the photographs used to convince factory owners of women's ability in the context of dilution tasks (Section 5.2). The point of Piffard's pictures is to illustrate degradation rather than occupation.

When activist and artist Sylvia Pankhurst engaged with the same subjects ten years later, during a tour of the industrial areas of England and Scotland in 1907, her intention had been to travel "as an artist and writer intent on recording significant details about working people and sought to do so with sympathy, but without sentimentality, rhetoric, or invective"

(Pankhurst and Pankhurst, 1979, p. 75). Her recently rediscovered work called “The Chainmaker” (Figure 2.5) utilised a similar composition to that observed in Piffard’s work, of a solitary woman, her hammer and anvil hidden behind her. It is consistent other portraits in her series, where women were central to the composition, but viewed from behind or from the side, their tools often obscured by their body. Kristina Huneault (2002) wrote about the social importance of these pieces, saying that in Pankhurst’s work “the image of women’s labour posed an intrinsic challenge to the restrictive codes of femininity promulgated by so much Victorian visual culture. Her challenge was not simply celebratory of female employment. Pankhurst’s images are sensitive to the hardships experienced by working women in employment... nevertheless for Pankhurst women’s employment was also a potential means for gender equality. In her contacts with Black Country chain makers she found that work was an important source of self-esteem among women whom the media presented only as victims” (Huneault, 2002, p. 3). If Piffard’s work spoke of degradation and poverty, Pankhurst replied a decade later with ideas of female stoicism.

Photographic images of female metalworkers had also come to the fore just before the advent of the First World war. In 1906 chainmakers were photographed for a handbook to accompany the “Daily News” Sweated Industries’ Exhibition” in London. Here again, images of the working women are composed in a similar manner to those painted by Piffard and Pankhurst (1906, p. 60) (Figure 2.6). Furthermore, they were accompanied by photographs of the women’s working spaces (1906, p. 58) (Figure 2.7). In these images the barred windows of home forges created a striking visual metaphor about the poverty trap and the “slavery” alluded to by Sherrard, nine years before, and evocative rows of workshops at Anvil Yard become symbolic of imprisonment (1906, p. 64).

A year later in 1910, leader of the National Federation of Women Workers Mary Macarthur, who was directly involved in this campaign, coordinated strike action at Cradley Heath. Leading a delegation of twelve women chainmakers to London to raise awareness and funds, she tightly oversaw and managed the way in which these women would be visually represented (Section 2.1.2). In contrast to the piteous imagery that had gone before, Macarthur sought to elicit respect and empathy in the imagery she contrived. She insisted that the women wore their best clothes to London, taking with them the chains that they had made, to be symbolically draped around their necks and shoulders (Figure 2.8). This concept

blend of fragile yet dignified women, wearing both their Sunday best and the chains they had made for the nation, served its purpose well, bolstering both funds and support for their cause. Visually, the photographs of the event did not question the women's ability to smith, or show them exhausted in a dirty forge. The focus was on the indignity of their poor pay and working conditions, and the union action taking place to address these issues.

In all these examples images female metalworkers are made by others and used to convey ideas such as poverty and degradation, or female strength, or industrial inequality. Self-representation or firsthand accounts by female metalworkers are harder to find. In fact, this research could not uncover examples earlier than two documentaries from the 1970s. The first film shows chainmaker Lucy Woodall, still smithing in her old age (*Lucy Woodall*, 1971). She narrates her life against a backdrop of footage of her forging chains. Although the narration shares general anecdotes from her life, little information is offered about her craft skills and metalworking ability. The high quality fire welding she demonstrates in the film is not even mentioned in the narrative. Another film from 1976 contains interviews with women who actually participated in the 1910 strike (*Nothing to Lose - The Women Chainmakers Strike of 1910 Cradley Heath*, 1976). They speak directly about their own work, about how they came to be chainmakers and about their own involvement in the strike action. All the participants discuss the difficulties of the work and the poor remuneration, but there is a stated pride in the work and the craft, together with a strong sense of identity as a smith. If the imagery of Piffard and Pankhurst expressed ideas that female metalworking was synonymous with degradation and failed to showcase their extraordinary skill sets as metalworkers, the dialogue in "Nothing to Lose" at least highlighted the women's ability as smiths and their pride in their work.

In this small comparison, it would be wrong to draw conclusions about whether the gender of the artist informs representations, but because the imagery of industrial reform movements was made so closely in time to the imagery of the First World War dilution, propaganda and memorialisation campaigns, observations can be made about how women metalworkers are shown in different contexts.

Piffard was a commissioned artist whose studies illustrated Sherard's reports that made a political position clear throughout (Sherard, 1897). When Sylvia Pankhurst painted the same community women chainmakers, her work accompanied lengthy observations on their living

conditions and low wages in comparison to men. According to her son Richard, she, “travelled as an artist and writer intent on recording significant details about working people and sought to do so with sympathy but without sentimentality rhetoric or invective” (Pankhurst and Pankhurst, 1979, p. 75). She was certainly campaigning for women’s rights during this tour, and these portrayals are made by an empathetic female artist, but the women do not represent themselves.

Just eight years later, following the Shell Crisis of 1915, the proactive recruitment of women into munition and metalworking occupations was supported by hundreds of images for exhibitions, taken by male photographers. (This research has been unable to identify any female photographers working in this area at this time.) Although not self-representative, the pictures were designed to illustrate the competency of the women workers, the agenda being to show would be employers the extensive range of tasks in which the women’s labour could be used.

Members of the WWSC, many of whom had a history in suffragist activism, adopted these images and later the metal samples (Section 4.4) and developed this representation further, inviting women to imagine themselves in new roles, to normalise the range of occupations women could engage in, and eventually to memorialise their service in wartime.

Later on, when the WWSC commissioned photographers Horace Nicholls and G.P. Lewis, the style of the images became visually different to those used for dilution recruitment. Nicholl’s pictures in particular are skilfully lit and the women pose as if working, although they clearly are not. Their hair for example, is often suspiciously tidy. However, if not strictly informative about the work these women engaged in, they are pleasing images in their own right and have endured just as much for their aesthetic qualities. Many were taken after the armistice, and they commemorate the work of these women.

The WWSC was keen to acquire the work of female artists and commissioned the first official female war artist Anne Airy. Here at last, working women began to be represented and portrayed by women artists, commissioned by an all-female subcommittee.

As the war progressed and then eventually ended, the context in which portrayals of female metalworkers were shown shifted. For example, the dilution exhibition held at Whitechapel Art Gallery in May 1918 was designed to set out proof of competency, whereas the IWM exhibition organised by the WWSC at the same venue five months later added a sense of

memorialisation the displays. This was done partly by creating a shrine to women who died as a result of their war work (Chapter 6), and also by adding female art.

This was to form part of the WWSC's material activism, as they adopted a range of representations - commissioning plaster models being most notable. In creating dioramas to show women working on the home front, the WWSC had referenced familiar scenes of servicemen portrayed in battle by using the same media, thus raising the status of the scene. Furthermore, specific individuals were being immortalised in this artwork, including "Sergeant-Major Flora Sandes and Troops in Serbia" (IWM MOD 109) and "Dr Elsie Inglis Tending the Serbian Wounded at the Scottish Women's Hospital" (IWM MOD 34). Other figures were also recognisable in the dioramas. In Horace Nicoll's photograph of the model of women filling INT containers at Woolwich Arsenal (Q 31473), Supervisor Lilian Barker (whose work was described by Mitchell (1966)) can be spotted. As well as memorialising female ability, the WWSC was also memorialising individual achievement.

Data was being recontextualised as art and displayed as such in galleries. Was more art being commissioned because it was more likely to be retained than the metal objects in the collection? This may certainly have been a consideration as display space for the Women's Section became increasingly limited, whereas art could be displayed in a number of different settings over many years to come.

The WWSC must have been aware of the lack of opportunities for women to retain their wartime jobs and careers after the conflict had ended. If an attempt had been made to hold on to and preserve the gains made for women during the crisis by creating a wide range of imagery, problems come when those same artworks become dated. Preserving historical scenes in this manner can perpetuate an idea that women working in metal and munitions were an atypical event of a bygone age. Art as activism becomes less effective the moment it becomes romanticised, a dilemma which may never arise if metalworking had remained a normal occupation for a woman.

Examples of female metalworkers from this time representing themselves, their skills and their work appear to be rare. The only example which came to light in the research for this study was the work of Ursula Birnstingl (née Carr), who illustrated her work in munitions for her friend Peggy Hamilton's memoirs of their war service together (Hamilton, 1978). Her work provides a rare example of visual self-representation in the First World War, and it may be

significant that it was only published in the latter part of Peggy and Ursula's lives, in the same decade that the striking chainmakers of Cradley Heath were recorded on film. Possibly enough time had elapsed for their effort to be recognised as significant and that there was only finite time remaining to capture their verbatim accounts.

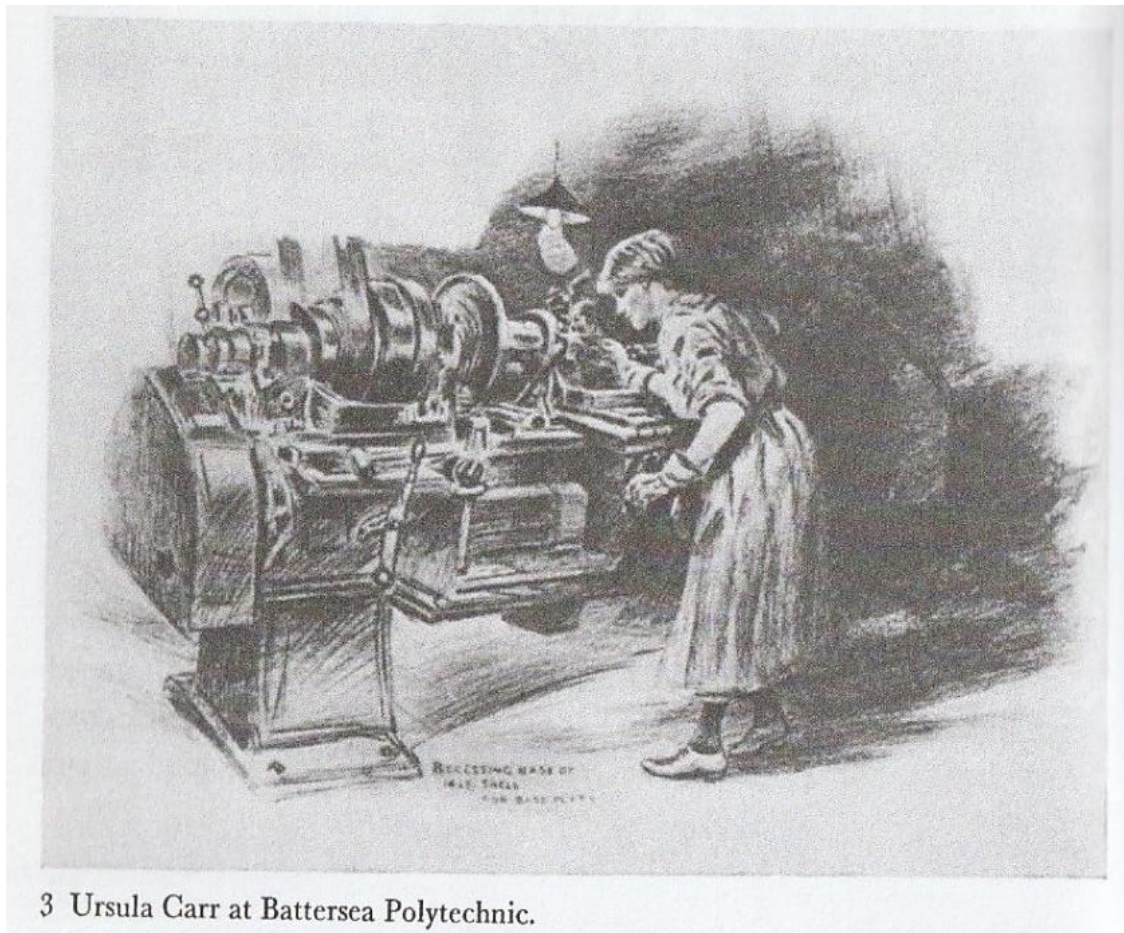


Figure 5.19 Ursula Carr at Battersea Polytechnic (Hamilton, 1978)

The imagery and art used and commissioned by the WWSC charted an evolving agenda from normalisation to memorialisation. During the war itself, the photographs adopted from the dilution exhibitions served as proof of ability, whereas post war the imagery generated by the WWSC attempted to provide a reminder of that ability to subsequent generations. In many ways the art was serving to supplement the metal components in the Women's Work Collection, attempting to create a bigger expression of the women's contribution than small samples ever could. Furthermore, the dioramas illustrated the group activities that the women were engaged in as part of the larger community effort of war service.

6 Chapter Six: Curation, exhibition and dispersal of metalworking material

6.1 Introduction

This chapter sets out to address the degree to which the WWSC successfully defined and curated ideas of female achievement within the narrow time frame its members were afforded.

When the decision was made to create a national war museum in 1917, a General Committee was formed to oversee a group of collecting subcommittees, of which the WWSC was one (see Section 3.3). Each subcommittee had a simple agenda: to collect the records, imagery and material objects that represented their own section for a series of temporary exhibitions, eventually leading to the creation of a museum at a permanent venue. Each subcommittee was expected to define its own collecting plan and was given an open mandate on content, as long as display space limits were adhered to. According to the General Committee's report on the Women's Section from 1st May 1917, the aims of the WWSC were simply "the collection of exhibits" and:

(the) formation of a record of the war-activities of women by means of a collection of photographs, pamphlets and manuscript reports from all women's organisations and outstanding private individuals.

(IWM, ENI/3/COR/24/2 Report from Women's Section May 1917 to February 1918, 8, p. 1). Furthermore, their task, according to IWM librarian Sarah Paterson was:

(to) make sense of and record the vast variety of female activity that had taken place since 1914; ensure that they were aware of and had details about all organizations that had developed during the war; acquire objects, photographs, and artwork that demonstrated this; and consider how these could be displayed in an engaging way that would allow visitors to understand just how extensive and vital women's work had been.

(Paterson, 2018, p. 534).

The task of creating a repository of the evidence of women's war work was a straightforward assignment, but the manner in which its meaning was communicated to the wider general public was more subjective and revealing of the material activism demonstrated by the WWSC.

6.2 Defining the Women's Section

Unlike the other subcommittees which were formed to focus on a specific sector, the WWSC was unique because its collecting agenda was spread over so many subject areas; the only criteria being that the represented work had to have been done by women. Defining what was actually meant by men's work and women's work, and how it should be divided, was debated at length during the earliest days of the subcommittee, not least because the war itself had redefined many categories. At times there would be an inevitable duplication of the collecting areas of other subcommittees and so an acceptance (or otherwise) of these intersections had to be negotiated.

An example of this kind of debate came about when deciding how the work of the Red Cross should be recorded. A resolution was passed by the General Committee during a meeting on 17th May 1917, in response to a motion that stated:

It was agreed that the Women's Work Section should deal with Relief Work, Red Cross, etc., which was carried out by women and men in addition to work by Women alone, the reasoning here being that female participation in areas such as nursing and organising supplies had formed the higher percentage of labour

(IWM, ENI/3/COR/1 WWC Minutes 17th May, 1917).

This definition (or possibly redefinition of male/female work) gave clarity to the collecting areas of relief, aid and nursing being overseen by Lady Mond. The WWSC then went on to draw up their own collecting plans in other areas, namely the following: models, charts, photographs, badges, munitions, relief of allied refugees, women's employment, munitions, education, national economy, agriculture, women's honours and memorials, and journalistic records (also listed in the same minutes) (Section 4.2).

The same minutes from the General Committee also gave an indication of some other constraints the WWSC faced, in terms of exhibition space allocation - also referenced by

Paterson (2018, p. 535). In drafting a proposal for an eventual and permanent museum, the chairman had used the floor dimensions of existing museums (i.e. British Museum Reading Room 42,000 sq. ft., Victoria and Albert Museum 330,000 sq. ft.), and from this estimated that 300,000 sq. ft. would be appropriate for a National War Museum. He then offered the following space allowances to the following sections:

Table 6.1 Estimated allocated floor space for IWM

Navy	127,000
Army	65,000
Munitions	60,000
Trophies	10,000
Records	12,000
Women's Work	5,000
Total Floor Space	279,000

This allocation of 5,000 square feet for the eventual Women's Section, which amounted to less than 2% of the museum space, was discussed in a confidential report submitted to the General Committee:

In further reference to the exhibits of munitions made by women, it was suggested that an interesting one would be an aeroplane entirely made by women, not merely parts, but the assemblage of the same. Mr B.H. Morgan is considering the advisability of ear-marking these and other exhibits of interest for the museum. It may be noted here that the space allocated to the Women's Section is 5,000 square feet, and would be insufficient to house any but a very few large specimens; whereas it is intended to exhibit a collection of types only of smaller exhibits of munitions so that they would not duplicate those in the space allocated to the Ministry of Munitions.

(IWM, ENI/3/COR/24/2 Report from Women's Section May 1st to September 20th, 1917)

By drafting the report in this way, the WWSC acknowledged the space constraints imposed upon them, while still making clear their preference for larger and more significant objects to be included in the Women's Section. Just why the Women's Section had been allocated such a small percentage of the museum is open to debate. An overlap with other sections and duplication of artefacts might have been assumed, or it may have been that the objects from

the home front drew less interest, despite the aspirations of Mond, ffoulkes and especially Martin Conway to create a war museum which would reflect the efforts of the entire population. In any case, the report did shed light on the idea that the women of the WWSC were attempting to procure large entire objects that could be credited as a whole to female competency, in the way that single components are not.

6.3 The Imperial War Museum at Burlington House

The first time any iteration of the Women's Work Section was shown to the public was at the interim IWM exhibition hosted by the Royal Academy of Arts at Burlington House in January and February 1918, arguably a cultural continuance of the Arts and Crafts exhibitions at the same gallery (Haskins, 2005). Although it was intended that proceeds would go towards supporting the British Red Cross and Order of St John, the project was beset with difficulties and eventually made a loss (Kavanagh, 1988, p. 89). Space constraints were an ongoing issue, further worsened when a bomb fell shortly before the opening event and damaged the gallery (Wilkinson, 1991, p. 4). According to its accompanying catalogue (IWM, LBY 2240, 1918) the exhibition included items such as "Ministry of Munitions exhibits", "relics and documents from the Committee of the Imperial War Museum", official photographs from New Zealand, Australia and Canada, "the work of the Navy", "the work of the Army", German engines, model aeroplanes and trophies and (housed in the two South Rooms of the building) the Women's Section (Imperial War Museum (Great Britain) and Royal Academy of Arts, 1918). Of the catalogue's eighty-eight pages, twenty-seven were dedicated to the lists of munition components on display, in the same item order and categories as those shown in the Ministry of Munitions dilution exhibitions of the same year. The entirety of the Women's Section's exhibits consisted of these 1171 items (all but 63 of which were made of metal) and the 6" and 8" Cunard shells (Section 4.5).

A letter written by Lady Norman to Col. J.R. Stansfeld (of the General Committee) on the 26th November 1917 indicated the short notice afforded to the WWSC to participate in this exhibition. In it, she accepted the temporary loan of exhibits and photographs from the Ministry of Munitions:

Our intention is to retain these objects for a month during which time we shall have amassed a considerable quantity of permanent exhibits of similar nature which will be

the property of the Women's Section of the National War Museum, and these will replace the temporary loan exhibits.

(IWM, MUN 1/3 Correspondence Re Burlington House, 1917)

Having set out a detailed timeline for this, Lady Norman explained how the exhibition was also intended to be a means of recruiting women from educated classes into munition work - namely to do with aircraft – and that literature from the Ministry of Munitions would be dispersed there. This supports the idea of an overlap between the dilution exhibitions and WWSC exhibitions shown in this research (Section 4.2.1). This element of recruitment may have been part of the conditions attached to the loan. It is clear that this exhibition functioned in a comparable manner to the dilution exhibitions, and it is reasonable to believe that the metal objects were displayed on rows of tables in a similar style. There is no mention of accompanying photographic images, and no pictures of the exhibition have come to light, although Mercer (2013) referenced a description in a contemporary publication saying how well received the Women's Section was, and the rooms “filled with war material exclusively the work of women - work of such excellence it evokes admiration”. She also noted that:

This recruitment element not only reinforced the need for participation among the larger female population, but also changed the dynamic of exhibitions from being spaces where members of the public visited for enlightenment, to places where content informed audience members of current events and asked for their participation in return.

(Mercer, 2013, p. 7).

The Cunard shells received a prominent place in the exhibition and top billing in the accompanying catalogue (IWM, LBY 2240, 1918, p. 15). This was noted by Buck (2015, p. 182), who made a useful distinction between the metal objects on loan from the Ministry of Munitions and the Cunard Shells. In the catalogue they are listed in bold as the “First 6” and 8” shells manufactured in Great Britain by Lady Operators at Cunard S.S. Cos. Shell Works” and Buck states that “This emphasis on the unique history of these particular shells invokes the logic of the souvenir”. The collection was shifting from the use of metal artefacts as proof

of the concept of dilution, to becoming objects that could be used for the memorialisation of an unusual time.

6.4 Whitechapel Exhibition 1918

The next exhibition of work from the Women's Section came later in the same year and was held at the Whitechapel Art Gallery, following an approach in April 1918 from Mr J. Campbell Ross, the gallery secretary (IWM, EN1/3/GEN/10 WWC Minutes 25th April, 1918). This idea may have developed after the gallery hosted a dilution exhibition between May and June 1918 (IWM, MUN. VI/42, 1918). Campbell Ross offered the lower gallery for a six-week exhibition of items from the Women's Work Collection, with autonomous curatorship being given to the WWSC. Later minutes from 17th May 1918 show the WWSC accepting the offer, which included additional support such as "the expenses of transport, insurance and labour" (IWM, EN1/3/COR/1 WWC Minutes 17th May, 1917). Paterson (2018, p. 8) noted these arrangements, quoting a later letter from Lady Norman to Sir Edward Wallington, which describes the intentions of the WWSC in curating this exhibition (IWM, EN1/3/EXH/3, 1918). It was "arranged with a view to its being the first comprehensive representation of the various aspects of women's war work"; that it should have a shrine in the centre "with the photographs of those who have lost their lives", and that a Roll of Honour containing some five hundred names had been prepared "as a tribute to the memory of those women who have sacrificed their lives in the service of their country." This letter revealed two key points which would mark the difference between the agenda of the early displays of metalwork in the dilution exhibitions (and by extension their use in the IWM Burlington House displays) and the wider ethos and identity of the IWM's Women's Section under the ministration of the WWSC. Firstly, the letter coins the phrase "women's war work," and secondly it refers to the creation of a shrine.

The exhibition at Whitechapel Art Gallery ran from 8th October to 20th November 1918 and received 82,000 visitors, including the Queen and Princess Mary. Less than a fortnight before the exhibition ended, the Armistice was declared.

6.4.1 Women's war work

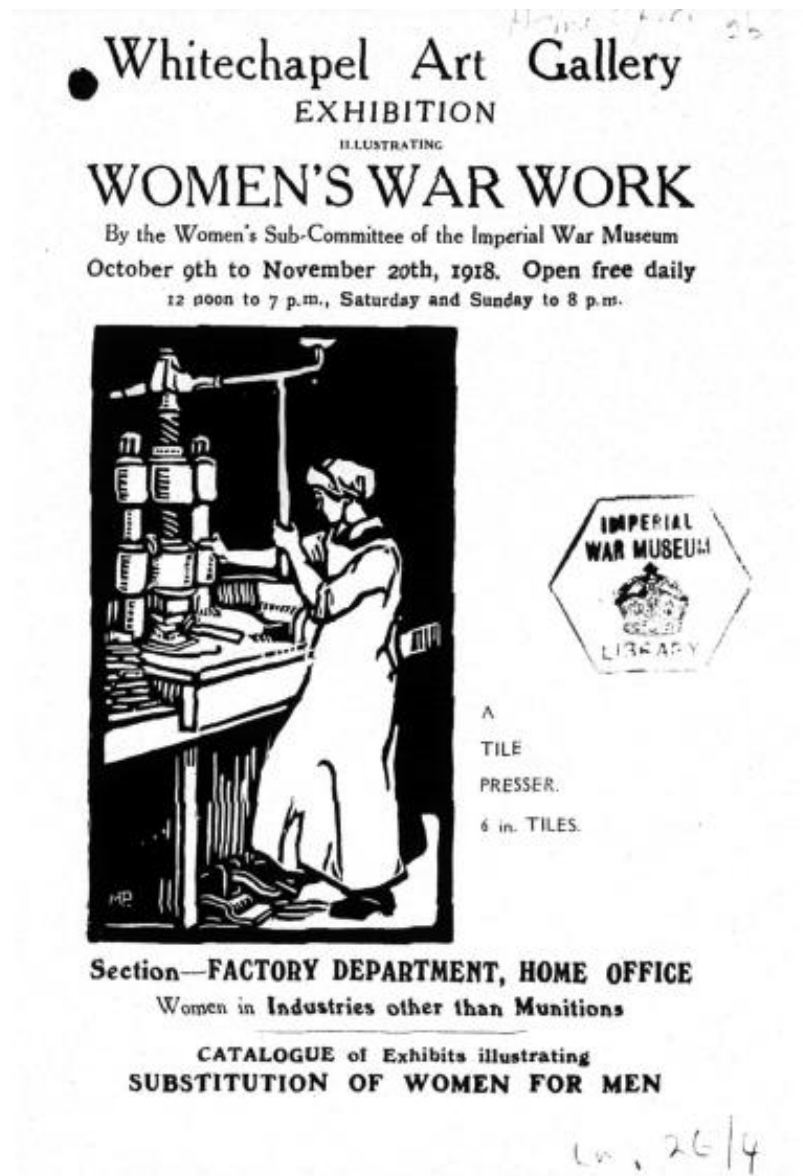


Figure 6.1 Catalogue cover for Whitechapel Art Gallery exhibition brochure (IWM, EMP. 26/4, 1918)

Unlike the exhibition at Burlington House in early 1918, the Whitechapel Art Gallery exhibition covered an extensive range of women's activities, with different sections being organised by different WWSC members (Paterson, 2018, p. 10). A considerable amount of the lower gallery was used to illustrate the work carried out by nurses, with exhibits relating to the work of individuals such as Edith Cavell and Sergeant-Major Flora Sandes, as well as the Women of Pervyse. There were also smaller sections "devoted to munitions, hospitals, substitution in industry, canteens, honours and memorials" (Wilkinson, 1991, p. 4). Organised by the Ministry of Labour, the top gallery showed the work of the various services including "the Women's Forage Corps, the Women's Land Army, Queen Mary's Army Auxiliary Corps, the

WRNS, and the WRAF, with the proviso that all items exhibited should thereafter become the property of the Museum” (Wilkinson, 1991, p. 4). Although an implicit aim of the exhibition would surely have been recruitment, this does not appear to have been a primary objective. However, a culture of encouraging women to explore their own potential was certainly in place.

Unlike the dilution exhibitions which were primarily directed towards captains of industry, or the Burlington House exhibition with its limited range of artefacts, the Whitechapel Art Gallery provided women with an opportunity to see their own work publicly displayed and acknowledged. This display of material evidence, together with a sense of pride, goes some way to explaining the extraordinary number of visitors that this exhibition attracted. Considering again the individuals who were part of the WWSC and their messaging and activism around women’s suffrage prior to the war, along with Agnes Conway’s professional experience with understanding material culture as an archaeologist, it is easy to conclude that their sensibilities in engaging with the public were particularly skilful.

This was to be the only time that the Women’s Section was displayed as a single collection, featuring only the work of women. In later exhibitions, the work would be allocated much less space, subordinate to all other sections and only shown within side rooms (Paterson, 2018, p. 10). It is also worth noting that from the Whitechapel Art Gallery exhibition onwards, the collection of items in the Women’s Section began to be described as “women’s war work,” a term debated by historians ever since. This shift in phrase, from women’s work to women’s *war* work, has the power to elevate mundane objects by imbuing them with ideas of duty, patriotism and even sacrifice. Buck suggested that the WWSC’s job was “to provide new interpretive contexts to establish the proper value of women’s war work, so easily overlooked as neither sufficiently heroic nor likely to provide visual interest to a museum visitor” (2015, p. 179). She quoted Lady Norman’s comment: “men will perhaps say that our section of the proposed Museum won’t be of much spectacular interest - that women will have little to show of personal interest for all their hard work.”

This deliberate way of framing the activities represented in the Women’s Section risked unintended consequences with regard to the longer term ideas about female capability and the appropriateness of certain kinds of work. It suggested that the idea of women working in

metal industries was a gender anomaly, only appropriate because it was operating within the atypical space of wartime (Chapter 7). Nevertheless, by framing the work as being special because it was war work, and exhibiting it in a separate section, the WWSC represented the efforts and abilities of women more strongly at Whitechapel than at any other time.

6.4.2 The shrine



Figure 6.2 The shrine at Whitechapel Art Gallery exhibition (IWM, Q 31113) ©IWM

In addition to bringing together a diverse range of objects to represent the war work being done by women, the WWSC also considered the long term remembrance of the war and the contribution made by women. The notion of memorial does not appear in the earliest documents found in the IWM's Women's Work Collection, and only begins to emerge later in 1917 - the first instance being found in a draft letter which was later sent to companies and publications, entitled *Permanent Memorial To Women's Work On Engineering Munitions* (IWM, ENI/1/COM/24/2 Draft of letter to firms on list, 1917). The use of this word indicated an emerging sense of purpose and an idea about the intended longevity of the collection and what it may come to represent in the future, adding additional gravity to the work of the WWSC.



Dorothy Ling, Munition Worker,
who was accidentally killed
on duty. 9.6.17

IWM

Figure 6.3 Dorothy Ling IWM WWC M34 © IWM

Memorials to women at this time were rare, either in terms of acknowledgment of their service, or in remembrance of lives lost, and very often the deaths of women killed through industrial accidents or in munitions factory explosions were actively concealed from the public for fear of lowering morale (Woollacott, 1994, p. 86). The unusual decision taken by

the WWSC to create a shrine within the exhibition was certainly responding to an existing need for recognition of female loss and sacrifice, but was never recreated. When the Whitechapel Art Gallery exhibition opened, the WWSC was inundated with photographs of young women who had died as a result of their war work, and this escalated during the weeks that the exhibition was open. These images were displayed with the name of each woman and her cause of death, and poignantly, candles and fresh flowers on the shrine at the end of the gallery were tended to each day (Buck, 2015, p. 185).

The decision to memorialise these deceased women drew attention to female losses at a time when they were rarely acknowledged. Although there was a high level of public understanding of the male losses in the armed forces, little was known of the nurses succumbing to diseases or encountering minefields as part of their duties, or of the munition workers who risked their lives daily in their dangerous work. Furthermore, as Paterson (2018, p. 540) noted, the roll of honour was by no means complete, because unlike men who died in similar circumstances, the deaths of women who died of influenza were not recorded. The WWSC went on to create a female counterpart to what became known as the Bond of Sacrifice, which had been an attempt made by the IWM to create a collection of photographs of the men who had died or been decorated, by placing advertisements in ration books. The WWSC amassed their own collection of 397 images of the women who died conducting war work, although some were added after the Whitechapel exhibition (Paterson, 2018, p. 11). In contrast to the photographs of munition workers taken in the previous year, the pictures of these women were being used to represent ideas around sacrifice rather than achievement.

6.4.3 Metalwork at Whitechapel

Locating information about any kinds metal artefacts displayed at the Whitechapel Art Gallery has proved to be a challenge in this research. Few, if any images exist of the exhibition, and these mostly show the shrine. Wilkinson (1991, p. 4) alluded to bays in the lower gallery being dedicated to different subjects areas - including munitions - but no further information is available. A working assumption would be that a selection of metal samples and photographs were shown on display tables, in the way they had been at Burlington House and earlier dilution expos (Fig 5.1) (Fig 5.2). As Buck (2015, p. 183) noted, the IWM did not produce a guidebook for the Whitechapel exhibition, but in November 1918 the Ministry of Munitions

Labour Supply Department did publish a comprehensive catalogue listing all the samples of women's work, in the same month that the Whitechapel exhibition was still running, and the Armistice was declared (IWM, LBY 16242, 1918). This would appear to be the concluding act of the dilution recruitment operation, and the photographic illustrations within it confirm that some of the objects that survive in the present day collection are the same as those found in this assemblage - and may have featured in both Ministry of Munitions and WWSC exhibitions.

6.4.4 Plaster models

Better remembered than any of the metal items on display at the Whitechapel Art Gallery were the plaster models of women engaged in different scenarios of war work (Section 5.5). This marked a shift away from acquiring artefacts for the collection as proofs and began the movement towards the use of imagery that would frame the way in which women's work would come to be remembered. The art that had now become easier to acquire than large exhibits such as aeroplane engines and big guns started to present women's war work as an ideal, moving the focus away from the relationship between women and their skill sets, particularly in metalwork. The same could be said for the photographs being produced by Nicholls and Lewis (Section 5.3). The imagery was beginning to solidify the novelty aspect of women working in 'male' occupations, freezing them in a specific time and place rather than normalising the activities in the longer term.

The plaster models and dioramas were popular with the public and so more were commissioned, and they were exhibited again the following year at another IWM exhibition at Burlington House. In the catalogue of *The Nation's War Paintings and Other Records* which took place between December 1919 and January 1920, eighteen models were listed (RA, MLPAM C8926 A21429, 1919, p. 67). No other items from the Women's Section were displayed at this exhibition.

The months between the end of the Whitechapel Art Gallery Exhibition in November 1918 and the next display of the Women's Section at Crystal Palace in June 1920 represented a time of high activity for the WWSC, which was mindful of the finite opportunity to record women's war work now that the conflict was over. From the moment the war ended, women were obliged to begin stepping away from their roles to make way for returning soldiers to

resume their jobs. In response, the WWSC redoubled their determination to record for posterity the work of the women and make sure their efforts would be remembered. Agnes Conway in particular understood this, and her efforts to bring together and process all the documents that accompanied the collection were acknowledged in a letter to Lady Mond from Lady Norman (IWM, 01/15/3&3A Letter to Lady Mond 15th Dec, 1920, pp. 1–2).

In the biography she wrote from her friend Agnes' diaries, Joan Evans noted, "The day after the Armistice Agnes wrote: 'Spent the day at the office trying to think of all the work that would close down immediately, of which I *must* get a record at once...'" and "It was uphill work; some people were unwilling to hand over their records, many were indifferent to the claims of history, and a few resented the importance of women's work and wished to minimize it" (Evans, 1966, p. 233). By the time an interim home for the IWM had been decided on, the collection of objects for the Women's Section was concluded and the WWSC was coming close to being disbanded – a situation confirmed by Lady Norman in a letter of thanks to Miss Monkhouse in December 1920 (IWM, 01/15/3&3A, Letter to Miss Monkhouse 16th Dec, 1920).

6.5 The Imperial War Museum

The series of small exhibitions organised by the various sub-committees of the early IWM were intended to lead to the formation of a single institution based at a permanent site. Initial plans to create a bespoke building from scratch were shelved over time, and the General Committee set about finding a suitable space to house the national collection. Despite having dismissed the Crystal Palace as an unsuitable location in 1917, the IWM General Committee eventually accepted a tenancy to lease part of the building from its trustees. In the absence of other options, they signed the agreement in April 1920, despite the fact that the building was not an adequate space for displaying the collections well, and that the damp conditions posed a genuine threat to the art work (Kavanagh, 1988, p. 92).



Figure 6.4 Imperial War Museum Galleries At The Crystal Palace, 1920-1924 by Nicholls (IWM, Q31412) © IWM

At the same time moves were being made to form a permanent body to administer the IWM. Kavanagh (1988) noted that it was Sir Alfred Mond who raised this question with the cabinet in March 1920 because he “considered that the task of collecting had almost reached its end”, and he argued that it was now necessary to create a corporate and legal body for the IWM. He submitted with his memo a draft bill, prepared in consultation with Martin Conway and the Treasury, based “on the lines of that dealing with the national collections” (1988, p. 92). The Imperial War Museum Act was passed in July 1920 and a governing Board of Trustees appointed, including Lady Norman (who would eventually become the longest serving trustee). This would mark the dissolution of the all the sub committees.

The WWSC’s involvement in the display of the Women’s Section continued at the IWM’s new home at the Crystal Palace. Here, the Women’s Section was afforded little space and a diminished profile, with some material even being dispersed from the assemblage: “The collection on exhibition was much reduced. Arrangements for the disposal of some of the collections began as early as 27 November 1919, when the Treasury approved the sale of toys from the collection” (Kavanagh, 1994, p. 146). This research has been unable to discover

information about any displays of metalwork at the Crystal Palace, and so some of the only remaining information about the Women's Section comes from the visual record provided of Horace Nicholls' photography, including a set of ten pictures showing the plaster dioramas, which continued to attract the interest of the public (Fig. 5.13).

When the agreed four year lease at the Crystal Palace came to an end in 1924, the IWM was obliged to find a new location in which to house the collection. It moved first to a new venue at the Western Galleries of the Imperial Institute in South Kensington (Buck, 2015, p. 164), which according to the IWM's own history, represented a further dramatic downsize to a display space which amounted to less than a quarter of the area previously allocated at the Crystal Palace. The entire aircraft collection was loaned to the Science Museum and a huge proportion of the IWM exhibits were disposed of, including considerable amounts of the Women's Work Collection. The new galleries at the Imperial Institute opened on Armistice Day 1924 and remained at this site until 1935. The Women's Section was much reduced, and many artefacts were dispersed into other sections such as uniforms and munitions. Object records and other documentation were moved to the museum library by Agnes Conway.

In 1936 the IWM finally moved to its present location in Lambeth Road, Southwark, to a building which had previously been the Bethlem Royal Hospital. Here, a 'Women's Service in War' section was created. However, when the Second World War ended ten years later, little effort was made to collect an equivalent women's war work collection from this more recent conflict, although Lady Norman did make attempts to commission new artwork. A letter addressed to her from an unknown author on 13th December 1939 appears to explain that women workers would be included in an overall project to commission war art, rather than being treated as a discrete subset:

I took an opportunity of writing to the Secretary of the Artists' Advisory Committee of the Ministry of Information to mention your interest in making a pictorial record of women's war work, and I have his assurance that the Committee has already arranged that the artists who will be employed will be given an opportunity to draw and paint pictures of land work and munitions done by women, as well as the work of women's services such as the Auxiliary Territorial Service. I think, therefore, that the side of the

war in which you are particularly interested, so far as the museum is concerned, will not be overlooked.

(IWM, 01/15/3&3A, Letter to Lady Norman 13th Dec, 1939)

Paterson highlighted a letter written by the Director of IWM a year later on the 14th May 1940, concerning the acquisition of examples of Second World War women's work (Paterson, 2018, p. 544). He wrote:

When this museum was originally founded in 1917, the active participation of women in many forms of war activity was considered a more unusual phenomenon than it is now.

(Letter from L. R. Bradley, 1940 cited by; Paterson, 2018, p. 544).

This decision not to focus separately on the war work conducted by women was seen by Paterson as evidence that the women had proved their worth, and so when war broke out again in 1939 plans were automatically in place for women to play an integral part. In fact, when the IWM First World War galleries were redeveloped much later in 2014, they were designed so that the war front and the home front would run parallel to each other so that the efforts of those on the home front were not seen to be separate (Paterson, 2018, p. 544). Mercer (2013), in her research about how female participation in wartime was visually represented through uniform displays, highlighted the only two occasions when the subject of women's war work was revisited. These took the form of exhibitions at the IWM London - namely *Women at War, 1914 -18* which ran for seven months in 1977, and *Women and War* which ran for six months between 2003 and 2004.

The person most strongly connected with the Women's Section was Lady Norman, whose ongoing concerns about the Women's Work Collection and female representation in general was the linking thread between the original collecting ideals of the WWSC in 1917 and the modern iterations of the museum. Initially serving as the Chair of the WWSC, she went on to become the longest serving Trustee, eventually resigning in 1962, just two years before her death (Mercer, 2013, p. 7).



Figure 6.5 Lady Norman riding her Autoped 1916, Paul Thompson/FPG/Archive Photos/Getty Images

The archive of her own papers gives an insight into how meaningful the objects collected by the WWSC still were to her many years later, not least those that were affected by a series of bombings during the Second World War.

A letter received by Lady Norman dated 26th September 1940 said:

I am glad to say that only two "Women's Work" models were damaged; Miss Wallace's WRNS model most severely and the Miss Lilian Barker one less so, but neither are by

any means beyond repair. Most of the pictures were blown from the wall but have not been damaged, though the glass of course, was smashed. It was, in fact, the fall of a picture on it that damaged Miss Wallace's model. The glass of one of the uniform cases is smashed but the contents are unharmed.

(IWM, 01/15/3&3A, Letter to Lady Norman 26th Sept, 1940)

Another letter from the Director-General in February 1941 informed Lady Norman of a serious bomb strike on the museum that also affected objects from the Women's Section:

The damage is very great, almost all the naval exhibits including the whole collection of ship models, the Jutland seaplane, many aeroplane models, and some women's work models being affected. Most are beyond repair.

(IWM, 01/15/3&3A, Letter from Bradley 1st Feb, 1941)

A further letter to Lady Norman on 16th July the same year reported another strike and more damage:

The aeroplane engine was on exhibition in the Air Force Gallery, and although the glass case containing it has been shattered, the engine is quite easily accessible, but, like all the metal objects in the museum, it is at the moment very rusty; this could be remedied by a few hours work. The same applies to the first 6 and 8 inch shells made by women.

(IWM, 01/15/3&3A, Letter to Lady Norman 16th Jul, 1941)

Finally, a later paper from the following year, found in the IWM's Norman archives, references further bombing and is clearly replying to Lady Norman's concerns (or even anger) about the curation of objects from the original Women's Section. This letter from 26th February 1942 says:

I am sorry, too, to deduce from your letter that you are not at all pleased with arrangements that have been made concerning the exhibits in which you have always taken such particular interest. I must, however, point out to you that your models were extremely fragile, and in many cases were falling to pieces from age, quite apart from the effect of blast, against which no protection could be availed. I do not think it

can be suggested that we did not do all that was possible in the way of protection, and I hope you do not consider that any negligence has been permitted.

It was unfortunate that the Museum is located in one of the most badly bombed districts in London, and considering the devastation that has taken place within yards of us, I think we have so far been extremely lucky that so little has been damaged in the building, and perhaps you are unaware of the fact that on at least three occasions it was only the efforts of our staff that prevented the burning of the building.

(IWM, 01/15/3&3A Letter to Lady Norman 26th Feb, 1942)

Lady Norman's concerns and her vested interest in the Women's Work Collection continued until the very end of her tenure as Trustee. A letter from an anonymous writer (possibly the incumbent Director- General) responded to a recent visit she appeared to have made to the Museum:

My own general feeling is that at present we are trying to show too much in too little space - not just in the Women's Work Section but in the whole Museum. Secondly, I believe that we should aim to regroup the exhibition around recognisable and major themes such as, to mention only three examples, the development of trench warfare the submarine threat, and social revolutionary factors (for example women in the war effort). Thirdly, I think we now have to recognise that there is a practically adult generation which has never heard of Edith Cavell and can scarcely even recognise the difference between Hitler and Mussolini!

(IWM, 01/15/3&3A Letter to Lady Norman 23rd Nov, 1960)

The point at which her influence or control over the women's work collection relinquishes is when she resigns. Another (handwritten) letter from 2nd September 1962 shows her replying to the IWM Director Anthony Noble Frankland, thanking him for the offer of naming a gallery after her, and accepting the suggestion. She adds, "I am satisfied to keep things as they are, as long as the gallery devoted to Women's War Work is maintained as a memorial to the Women who worked during the 2 great wars" (IWM, 01/15/3&3A, Letter to Frankland 2nd Sept, 1962). Confirmation of the decision to create The Lady Norman Gallery comes in a more official declaration found in a letter in the IWM Norman archives, when Noble Frankland says that "At a meeting of the Board which was held yesterday, it was unanimously resolved that the title of "The

Lady Norman Gallery” should be given to the Women's Service in War section of the Museum”

(IWM, 01/15/3&3A, Letter to Lady Norman 12th Mar, 1963).

After Lady Norman died, a letter of sympathy written by the Chairman of the Board of Trustees Sir Algernon Willis and sent to unknown recipients confirmed that “The Norman Gallery” had been established (IWM, GB62 Letter re Lady Norman’s death 13th March, 1964). Confirming how long this gallery survived is problematic. There is a reference to a Women’s Service in War gallery (though not a Lady Norman Gallery) in the 1968 guidebook, but not in the edition from 1976.

By exploring the relationship between Lady Norman and the Women’s Work Collection it is clear that this project represented a meaningful form of activism to her, and by extension to other members of the WWSC. Mercer (2013, p. 334) suggested that members of this subcommittee “wanted to be certain that they were not perceived as outsiders looking in at the war effort”. She noted that many of the members of the WWSC had a previous history of activism, referring to Lady Norman as a “devoted suffragette turned war worker” and highlighting Agnes Conway’s earlier work as Voluntary Aid Detachment worker (for which she had already been awarded an MBE). Another member, Lady Askwith, received a CBE for her work with the Ladies Auxiliary Committee (Munitions Section) for the YMCA. Mercer went on to observe that “None of the committee were professionally trained in museums or exhibition design, but all were the wives (or daughters) of well-connected politicians, high-ranking military personnel, and other members of the elite classes, which inevitably facilitated their appointment to the project.” This may apply to some members, but Agnes Conway was undoubtedly an exception, considering her professional training as an archaeologist. Her skills were invaluable when she designed the collecting plan for the WWSC and orchestrated the comprehensive letter writing campaign (Section 3.4). Although Lady Norman was known to have been the Hon. Treasurer of the Liberal Women's Suffrage Union, her activism was political, not militant. To make detailed connections between the WWSC’s work forming the Women’s Work Collection and wider issues around women’s suffrage is too complex for this thesis. However, other historians have highlighted the problems with the notion that women were somehow rewarded for their war work by being given the vote, when the Representation of the People Act of 1918 only applied to around two-thirds of the female

population in the UK. Braybon was among those challenging the idea that the war was some kind of watershed for women. In her essay *Winners or Losers: Women's Role in the War Story* she took issue with this, noting that:

...a succession of writers have failed to define progress, let alone set women's lives in the context of debates to do with class, age, region, developments in industry, health insurance and so on. This has duly separated the experience of women in 1914 – 1918 from the rest of twentieth century history, leading to neglect of all other influences, good and bad, on women's lives during the first few decades of the century. The concept of the war as a watershed has become a cliché and one which has been accepted and unthinkingly by many historians who should know better.

(Braybon, 2005b, p. 93)

She considered the entire questioning of gendering in wartime (Braybon, 2005b, p. 99), quoting Higonnet:

As a first step, war must be understood as a gendering activity, one that ritually marks the gender of all members of a society, whether or not they are combatants. The implications of war for women and men are, then, linked in symbolic as well as social and economic systems. During total war, the discourse of militarism, with its stress on 'masculine' qualities permeates the whole fabric of society, touching both women and men. In doing so, it draws upon pre-existing definitions of gender at the same time as it restructures gender relations. When peace comes, messages of reintegration are expressed within a rhetoric of gender that established the postwar social assignments of men and women.

(Higonnet, 1987, p. 4)

Braybon suggested that museums became the very places where differences were emphasised, and drew attention to the photographs taken of very feminine looking women working in extensively male roles to overemphasize the point (Braybon, 2005b, p. 88). This observation could be levelled at the later IWM commissioned photographs by Nicholls and Lewis (Section 5.3), but less so at earlier imagery used to promote dilution, which, to a

practicing metalworker, appear to show a more authentic representation of women operating machinery in workshops.

In developing the Women's Work Collection, the WWSC was recording how the events of the First World War affected the lives of women, as well as effectively making a dossier of proof of women's ability. Self-representation, visibility, capability and proficiency were high on the list of their aims, to which later were added memorial and recruitment – and these ideals can indeed be understood as material activism, given that they are bonded to an agenda of collecting evidence in the form of objects and records. Thom considered this act to be a process of “formal memory making” (Braybon, 2005).

6.6 Discussion

The IWM began in 1917, before the First World War had ended and long before victory was assured. The founding General Committee identified collecting areas for the future museum and created sub committees to oversee acquisitions and curation. The Women's Work Sub Committee (WWSC) was formed of a number of highly educated women, many of whom had connections with the government of the day. Many too had previous histories of activism concerning women's rights and suffragism, and also in volunteer sectors such as refugee and medical relief.

The members of the WWSC immediately understood that a finite opportunity had been afforded to them to collect and display women's work and curate an archive for posterity. Their process of gathering records and exhibits involved an organised campaign of letter writing and networking overseen by WWSC Honorary Secretary Agnes Conway, her agenda being to capture as much evidence as possible of female war work before the mechanisms of wartime were dismantled. One of the first tasks of the WWSC was to actually define the term ‘women's work’ and seek agreement on the specifics of the classification from the General Committee. This early motion suggests how the members of the WWSC were defining their own representation from the earliest days.

Work from the Women's Section was shown to the public for the first time in January 1918 at Burlington House and this original iteration of the collection consisted entirely of the metalwork acquired from the Ministry of Munitions dilution exhibitions and a significant

donation of two shells from the Cunard factory. Organised in only two months, this exhibition announced the Women's Section to the public at the first possible opportunity, by utilising an existing display collection and capitalising on the momentum of the dilution exhibitions that had gone before.

This sense of proactive opportunism developed further when the WWSC received an offer directly from the Whitechapel Art Gallery to hold an exhibition there from the 9th October to the 20th November 1918. This became the only exhibition to feature just the Women's Section; a collection which now represented every sector of female endeavour. The 82,000 visitors who came to view the exhibition over six weeks gives an indication of its popularity, offering clues about the level of work involved in curating, staffing and publicising such an undertaking. In addition to presenting this evidence of female capability to the public, the WWSC also devised a sense of sacred space by the inclusion of a shrine to the women who had died as a result of their work. It reframed dilution as war service and industrial fatalities as sacrifice. The WWSC had created a memorial.

This reconceptualisation of women's work developed further, as art commissioned by the WWSC was added to the collection, proving easier to acquire than the large exhibits of aeroplane engines and big guns that were originally hoped for. Although imagery in the form of paintings, photographs, models and dioramas presented women's war work as an ideal, it also began to move the focus away from the relationship between women and their skill sets, particularly in metalwork. As such, the metal objects themselves moved to the background, and representations - in particular the plaster models - took centre stage, proving popular with the public as they enabled visitors to envisage how women engaged in these new roles. As more of these models were commissioned, the WWSC (erroneously) believed that they were creating permanent memorials, but the sculptures deteriorated within a few years because of their fragility and exposure to damp - and later by damage caused by Second World War bombing.

The imagery of metalworkers made its way more successfully to the first iteration of the entire IWM at Crystal Palace in 1920 than the actual metal objects themselves, and surviving photographs by Horace Nicholls show the plaster dioramas on display there. Whilst the art stayed prominently in the national collection, the metal objects have been harder to trace in

the present day collection, with no evidence being found of their storage or dispersal in the interim years.

The importance of art and imagery to tell a story appears to have been well understood by the WWSC, reinforcing the idea of a previous experience in activism. The women seemed familiar with the problem of who owned the narrative around female skill sets, and the role of the public exhibitions in managing this. They were unsuccessful in acquiring the large and complete objects they wanted for their displays, and were mindful perhaps of women's service and experience being diminished by association with small components. The archive showed evidence of this concern, particularly when their aeroplane engine was transferred to the Air Force Section (Section 3.5), (Section 4.2.3) and later recovered from the bombed-out IWM during the Second World War (Section 6.5).

7 Chapter Seven: Discussion and conclusion

7.1 Introduction

Between 1917 and 1920 the WWSC collected and curated an immense array of objects, images and records for the proposed Women's Section of the nascent Imperial War Museum. This large assemblage covered the wide range of occupations and sectors that women had been involved in throughout the First World War. Within this, a collection of metalwork was developed by adopting elements of the Ministry of Munitions exhibition collection that had been gathered to promote dilution practice to factories from April 1917 onwards, and other larger objects such as machinery. These metal artefacts were supplemented by data charts, photographs and artworks, to enhance the IWM exhibitions and inform the public about the work.

This research has sought to better understand the work of the Women's Work Sub Committee, by considering how it collected and curated objects, and how it commissioned the imagery of the female metalworkers. It looked into the question of how gender provenance is determined, retained and represented within metalwork, and how material activism manifested in the actions of the WWSC during a hiatus in suffragist activity during the First World War. It asked about the meaning of the surviving objects of the metalwork collection.

The metal objects found within the assemblage collected by the Women's Work Sub Committee represent an important and overlooked resource in the study of female metalworking and the way it is recognised and recorded, as it is a rare example of a metal assemblage made, collected and curated entirely by women. By charting the movement and survival of this collection and examining records of debates and tensions in the archive, it has been shown how the same metal objects were used as proxies to represent different ideas at different times whilst revealing the intentions of the WWSC. Since the gender provenance of the metalwork in this collection is assured, this case study is an appropriate way of looking at how female metalworking is reported and represented, and why it matters.

7.2 How did the Women's Work Sub Committee collect and curate objects, and create imagery of female metalworkers?

This research showed how the WWSC demonstrated an awareness of the finite opportunity to create and curate a unique and comprehensive archive of evidence of female capability that was afforded to them by the inception of the IWM. As well as adopting an organised approach of rapidly gathering and appropriating existing objects for the Women's Section, the WWSC understood the urgent need to engage with the public through exhibitions and how to present evidence of female capability to a wider audience. The first opportunity came in January 1918, when metal objects from the Ministry of Munitions dilution exhibitions were procured to provide a display at the IWM exhibition in Burlington House (Section 4.2.2). This was the first time any part of the Women's Section had been shown to the public, and the WWSC capitalised on the momentum of the dilution exhibitions that had gone before by extending these illustrations of the abilities of women metalworkers into a newer context of war service. As well as acquiring display items from the dilution exhibitions, the WWSC also adopted the same collecting scheme, and capitalised on an established template (Table 4.5). Although the categories represented by this assemblage showed a very narrow sample of the metalwork being carried out by women working in the sector, they became the main metal exhibits of the Women's Section, partly because of their immediate availability and partly because they were easily accommodated in the limited exhibition space afforded to the Women's Section, because they were so small. Although this assemblage became the core component of the metalwork collection, this research has shown how small items were never intended to become a full representation of female metalwork, only adding to the evidence that showed how members of the WWSC would maximise even the most limited opportunity. In fact many unsuccessful attempts were made by the WWSC to procure much larger metal items for their section, supported by B.H. Morgan from the Labour Supply Department and evidenced in correspondence found in the IWM archive (Section 3.5). Bigger exhibits were not forthcoming for reasons of logistics and conflicts of interest. Ideas of assembling entire items like tanks, purely for exhibition purposes rather than war use, were roundly rejected, particularly when the manufactured components came from a large number of sites across the country. Furthermore, the Ministry of Munitions Sub Committee raised objections to the Women's Section displaying any fully assembled machinery because of perceived competition

with the Munitions Section. Both sub committees had distinct agendas and specific ideas about the messages they wanted their sections to convey to the public. While the Ministry of Munitions Sub Committee intended to use their munitions exhibits to showcase the best and latest warfare technology and engineering, the WWSC saw its collection of similar objects as manifest evidence of female metalworking and engineering ability. The former sought exhibits to exemplify engineering and technological advances, whereas the latter sought representations of the person and her capabilities (Section 3.5).

The collection grew dramatically before the following exhibition at Whitechapel Art Gallery ten months later, largely thanks to a focused activism in the form of prodigious letter writing campaigns by WWSC Honorary Secretary Agnes Conway (Section 6.4). This event differed to the one before, and illustrated the WWSC's proactive opportunism and developing agenda of self-representation. It was the only exhibition to feature the Women's Section in isolation, and showed displays from every sector of female work rather than just metal munitions. The fact that 82,000 visitors attended during its six week run offers a clue as to the kind of effort made by the WWSC to curate, staff and publicise the event. As well as presenting a large and impressive range of examples of female capability to the general public, the WWSC set the narrative, introducing its own notions of patriotism, sacrifice and memorialisation into the space. It reframed dilution as service, recontextualised industrial fatalities as war casualties, and went as far as to create a shrine to the women who had died making munitions and undertaking nursing duties (Section 6.4.2).

Imagery became increasingly useful to the WWSC, and it adopted photographs of women metalworkers from earlier dilution exhibitions in the same way they had the metal artefacts. These pictures, which also been published in the Dilution Bulletins, showed competent and able looking women carrying out a wide range of metalworking operations in workshops, and although copies of these were requested by the WWSC for the national collection (Section 4.2.2), it was impossible to establish whether these appeared in the Whitechapel Art Gallery exhibition or subsequent shows. However, when official war photographers Horace Nicholls and George P. Lewis were seconded to the WWSC at the time of the Armistice, both the agenda and the imagery altered. Nicholls and Lewis' photographs became less about recording how metalworking was undertaken, and more about memorialising the women who had undertaken it. The making processes represented in these photographs are harder

to discern, even to a metalworker, but the posed and aesthetically pleasing images of women had taken the visual away from documentation and closer towards to an artistic study (Section 5.4). It raised dilemmas for this researcher, because the style of representation made the women look somehow less plausible as metalworkers than those shown in the dilution exhibitions imagery. As Thom (2003) argued, when Nicholls was put in charge of the IWM archive in December 1918, his 2,300 negatives of the home front became a core component of the image collection and has since then been the visual reference for historians (Thom, 2003, p. 58). As part of an enduring record housed in a national collection, these images have risked solidifying a notion that female smiths and engineers are an atypical element only connected to the special circumstance of war, like conscripted men taking up arms for the duration of a conflict.

Beyond acquiring photographs, the WWSC developed its curation of imagery by appointing the first female war artist, Anne Airy, to produce large paintings of factory environments. Her work treated the home front subject matter in a visually dramatic way, comparable in colour and tone to portrayals of the trenches. The WWSC also commissioned a large series of dioramas to be made entirely by women sculptors, which illustrated scenarios on the home front in a medium more commonly associated with military situations; and by association, elevated their importance. As well as introducing this element of self-representation by commissioning an all-female cohort of artists, the WWSC demonstrated a practical activism by directing their funding to these more overlooked artists. Their portrayals were popular with the public, and so this may have been a conscious way of enabling some kind of representation of female war workers to continue in the public space of the IWM, particularly when their artefacts from munitions factories were afforded so little gallery room. In doing so, the WWSC had moved their focus away from the objects originally collected to represent female metalworkers.

After the Whitechapel Art Gallery exhibition the WWSC commissioned many more models and dioramas, which would be shown at a later Burlington House exhibition of war art and again later, at the first entire iteration of the IWM at Crystal Palace. The women of the WWSC invested heavily in this popular media to convey its message of female war service, erroneously believing that these models would become permanent memorials. However, most dioramas deteriorated within a few years because of their fragility, their exposure to

damp in substandard storage, and finally during German bombing raids during the Second World War (Section 6.5).

7.3 How was female activism and politics manifest in the people and actions of the early Imperial War Museum ?

The founding of the Imperial War Museum, coming at the start David Lloyd George's tenure during the First World War in 1917, was significant politically. At a time of low morale caused by the political uncertainty of a new cabinet and recent heavy military defeats (Section 2.3), Liberal MP Sir Alfred Mond, imagined a public space where the events of the conflict would be commemorated. The War Cabinet approved the proposal in March 1917, and Sir Martin Conway was appointed the first Director General. This Liberal hub would frame the political network of participants in the project, and the propaganda potential of the project was not incidental.

The ethos of the museum was influenced by the IWM's first curator Charles ffoulkes, who advanced political ideals of commemorating battles and displaying technology of conflict along with an intention to represent the home front and experiences of individuals. Although the inclusion of a Women's Section seems inevitable from this distance, given the political backdrop of suffragism which the Prime Minister supported, the notion appointing an all-female subcommittee to carry out tasks of collection and curation was not. That the WWSC was offered this opportunity to identify the term "women's war work", create an archive of records, and independently design self-representing displays for the public to engage with, suggests a sense of political encouragement from the founders of the IWM. In fact most members of the WWSC were well known to the IWM General Committee through political networks and familial connections. Chairwoman Lady Pricilla Norman's father and two brothers were Liberal politicians, as was her husband Sir Henry Norman. The WWSC Hon. Sec. was Agnes Conway (Martin Conway's daughter) who, like Lady Norman, was a supporter of the National Union of Women's Suffrage Societies (Braybon, 2005, p. 54). Other members of the WWSC had political connections both to the Liberal Party and the women's rights movements, and included Lady Mond (wife of Alfred Mond) and Lady Olwen Carey Evans, daughter of David Lloyd George.

Just as striking as their social and political connections was the level of engagement of members of the WWSC in the voluntary organisations tending to the injured and displaced during the first part of the war. Lady Norman had already been awarded the 1914 Medal for running a hospital in France, Lady Askwith had received a CBE for working with the YMCA, and Agnes Conway had received an MBE for work as a Voluntary Aid Detachment worker, caring for wounded Belgian soldiers and refugees (Section 3.3). As well as being educated and well connected, these women were proactive volunteers and campaigners, and they came to the task of creating the Women's Work Collection with experience and energy. This was evident in the rapid way the group identified the finite opportunity that had presented itself, and the speed with which they organised both an agenda and collecting plan for their section and identified possible exhibits. As well as recognising the need for exhibits, Agnes Conway sought women's published literature and first-person accounts of events for the museum's archive, capturing as much evidence as possible of female war work before the mechanisms of wartime were dismantled.

The WWSC was enabled in its agenda by support from colleagues and allies. Sir Martin Conway's contribution appears to have gone beyond a personal interest in his daughter's position in the project, and he acted as a go between among the subcommittees. When the WWSC were not included in a royal visit at Burlington House, Conway's indignation is evident and his alliance with the women is clear:

This was a serious omission, and it should be noted that on any occasion whatever, when members representing other Committees are invited, the Women's Work Branch must be treated on absolute equality with the other branches.

(IWM, ENI/3/COR/2/1, Memo to ffoulkes from Conway 6th Jan, 1918)

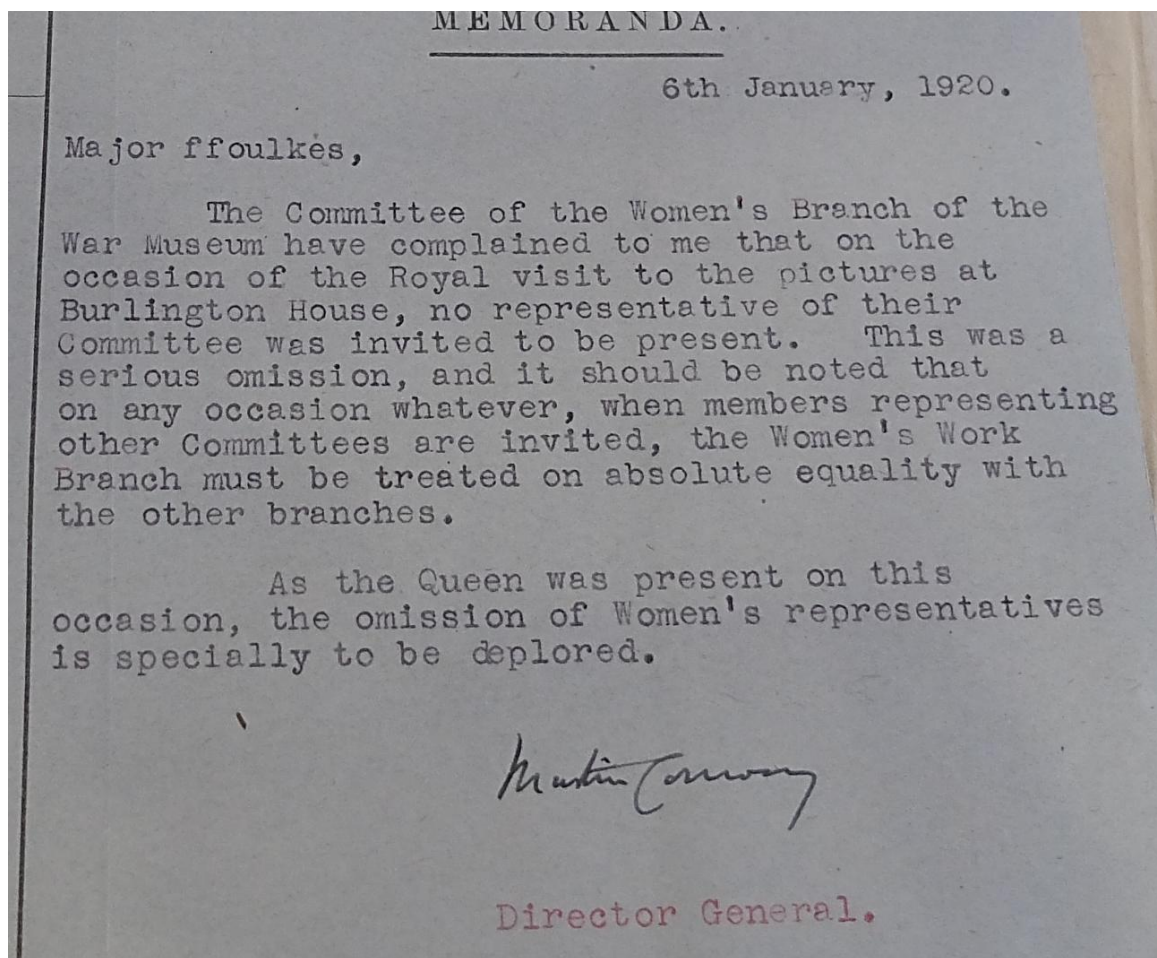


Figure 7.1 Memo to ffoulkes from Conway (IWM, ENI/3/COR/2/1, Memo to ffoulkes from Conway 6th Jan, 1918)

Lady Norman's brother, Henry McLaren, was another supporter whose initiative led to the acquisition and engraving of the Cunard shells (Section 4.5). Cunard's engineer Alexander Galbraith appears to have been allied to the women's cause prior to the war, and he was known for promoting female engineering. While his motivation for donating the shells may have been to promote the Cunard company, which certainly had top billing at the 1918 Burlington House exhibition, these same shells had nonetheless been prominently displayed in the company canteen since 1915 (Section 4.5). Two other supporters played significant roles in the aims of the WWSC; B.H. Morgan, the Technical Advisor to the Labour Supply Department encouraged the WWSC's attempts to acquire larger objects and was clearly sympathetic to their aims (Section 3.5). Olive Monkhouse (also seconded to the WWSC) deserves special attention for her foresight in photographing the metal assemblage, which was highly significant in this research. It safeguarded the gender provenance of the metalwork

and allowed positive identifications. This utilisation of close political and social networks played a key role in allowing the WWSC to successfully and efficiently achieve its objectives.

It would be wrong to imagine that the activism engaged in by the WWSC was operating in a closed circle, and this research found interactions between them and other campaigners for social reform at the time. B.L. Hutchins, whose work still provides such a large percentage of information about female metalworkers prior to the First World War, was involved in the Exhibition of Sweated Industries in 1905 and a year later, along with Mary MacArthur, in the formation of Britain's Anti-Sweating League (Section 2.2). Both names appear in the handbook accompanying the *Sweated Industries Exhibition* (Mudie-Smith, 1906, p. 4). Mary MacArthur's association with the Cradley Heath chainmakers connects her to the representation made of those same women by suffragist Sylvia Pankhurst, although MacArthur's visual treatment of the subject in 1910 was new. Her notion of concept blending - of showing women metalworkers wearing their smartest clothing and the chains they had made (Fig 2.8) - took debates away from whether this was an appropriate occupation, or whether the women were competent, clearing the way for conversations about fair treatment and decent remuneration (Section 5.2). Mary MacArthur is listed as an invited guest in Lady Norman's account of the Queen's visit to the Whitechapel Art Gallery exhibition, suggesting that these political worlds were interconnected.

The WWSC curated its visual representations with similar intent, attempting to make connections in the public mind about the critical importance of the munitions being made by women, and the skillset they had to do so. However, because the forums for these artworks and images were settings such as galleries and exhibition spaces, the paintings, photographs, models and dioramas increasingly presented women's war work as a romanticised ideal. The metal objects themselves played less and less of a role in representing the women who made them.

7.4 What evidence was there of material activism on behalf of the Women's Work Sub Committee, particularly in relation to the women munition workers and metal objects?

The Women's Work Sub Committee's intention was to record and self-narrate women's experiences during wartime, and preserve for posterity the proof of their abilities and a record of their achievements. They set their own agenda in terms of defining what was meant by women's work and how it would be represented.

7.4.1 Organisation and opportunism

Organisation and opportunism were two of the key activism traits exemplified by the WWSC. By apparently drawing on the members' collective experience of prior campaigns and projects, the WWSC was able to devise a rapid plan for collecting objects and data, to which they had adhered. Despite having only a small collection, which then consisted only of examples of munition work, they agreed to the first opportunity to exhibit at Burlington House in early 1918. By adopting these items and using the format of the earlier Ministry of Munitions shows, the WWSC was quickly able to utilise them to represent its own ideas, whilst capitalising on the recent interest in the dilution exhibitions and registering the Women's Section in public minds as an integral component of the emerging IWM. Although this initial collection would represent only a narrow set of examples of the metalwork being carried out by women working in the sector, the advantage was that these were small objects that could nonetheless be displayed in restricted exhibition space.

Under the curation of the WWSC, the meaning of the metal objects would alter. Beginning as sample proofs intended to demonstrate how substitution was a successful if temporary war strategy, the WWSC would present them as illustrations of female ability in sectors where women were now being permitted, having previously been underrepresented. It was also the start of a movement to frame this kind of work as war service and present to a far greater audience, using innovative forms of display and communication in order to chart the progress of women into male spaces.

This research did not ascertain whether artefacts from other sectors, such as agriculture and nursing, were being reframed and reappropriated in a similar manner, but it appears that this was not so. The idea that the narrative of women should be defined and represented by other

women featured heavily in the approach taken by the WWSC across all aspects of making a Women's Section. No evidence could be found in the IWM General Committee minutes of any suggestions made to the WWSC about commissioning women artists only. This appears to have come from the WWSC itself, as it scoped its own agenda. It is significant that the first ever official female war artist, Anne Airy, should have been commissioned by this group, and that the plaster dioramas and models would also be made only by women.

Such activism operated on at least three levels. It raised the profile of those artists, directed funding towards them, and offered a visual narration of female experience from a fellow woman. Furthermore, the idea of presenting scenes from the home front to the public in a format that emulated the manner in which male war service was portrayed, invited a certain reappraisal of the importance of the work and brought it visibly into the public space. It elevated the status of the women's work by an association of the medium used. There is also evidence that the WWSC sought female authored accounts of the war too (Section 3.4).

7.4.2 Duplication of exhibits and labels

Insights into the extent to which such examples of activism were consciously planned can be gained by examining specific moments in the WWSC's history. For example, the tensions that rose between the WWSC and the Ministry of Munitions Sub Committee concerning which exhibits each should own and display, illustrates how each section believed their collections should be represented. The Munitions Section was intended to display items showing technological advances and engineering. The WWSC's collection of metal objects was illustrative of women's metalworking and engineering ability. The Ministry of Munitions Sub Committee expressed fears that metal exhibits in the Women's Section would merely be duplicates of those shown in their own displays. They suggested that any metal artefact made by women should be included in the Munitions Section, but could be labelled to indicate who had made it. The WWSC defended their decision not to comply, raising concerns that objects inevitably become parted from labels over time. This insistence reveals a strong sense of the WWSC's need to proactively preserve these objects with their gender provenance intact, and an unease about how work is misattributed in the longer term. This concern was vindicated in the case of the Cunard shells which, because they were not labelled but engraved, could never have been parted from their makers' story, unlike other metal items in the collection. This idea of claiming the evidence of women's achievements for posterity is clearly seen in

the letter Lady Norman wrote to A.D. Mearns at Cunard, thanking him for photographs of women working in their National Shell Factory: “They are of great historic value and will be of permanent interest to future generations” (Norman, 1918).

The very act of insisting on replication between the two collections is surely a political one. It provided proof that women’s work was literally the same quality as men’s work, whilst inviting the public to consider just how many other objects were made by women metalworkers.

7.4.3 Acquiring large exhibits

Despite the exhibition space constraints imposed by the IWM’s General Committee, the WWSC did make attempts to procure larger and more dramatic metal exhibits for their section, using a phased plan of acquiring objects through appeals and letter writing to various companies. Here was another example of an attempt to influence the visual culture of the exhibition space, by trying to demonstrate how the piecemeal components associated with women’s work were precisely what made up the large war machines. It was an attempt to reframe the perception of the work. Despite the support of Ben Morgan in this aim, attempts to acquire items such as big guns were unsuccessful. An aeroplane engine was acquired by the WWSC, but following a dispute documented in the archives, was commandeered by the Air Force Section, because only 33% of the work had been done by women (Section 3.5).

7.4.4 Memorialisation

Over the course of the lifetime of the WWSC, the way in which the metal artefacts in the collection were used changed, as did their significance and the meaning invested in them. At the beginning, these were the metal samples that represented dilution as a proof of concept, adopted for the first exhibition at Burlington House in January 1917, in part because of their availability. Those few metal items that were displayed in the Whitechapel Art Gallery from October to November 1917 were fast becoming redundant, as a sense of memorialisation entered the agenda of the WWSC and its activism moved further in that direction.

Evidence of this shift is found in a draft letter from the archive, at the time when the WWSC were still appealing for much larger metal exhibits (IWM, ENI/1/COM/24/2 A1/4, 1917). This letter gives a brief overview of the aims of the WWSC in creating the Women’s Section of the new “National War Museum”, saying that the collection is intended to “constitute a record of

the manner in which women adapted themselves to work which was previously considered beyond their powers.” However, the revised letter that was actually sent did not contain this sentence. This letter, entitled *Permanent Memorial To Women’s Work On Engineering Munitions*, included the additional words: “It is hoped that firms employing women on engineering work in connection with the making of war material will be willing to contribute specimens which will constitute a permanent memorial and record of the work women have done in the war”. This introduction of the idea of memorialisation marked a transfer in meaning of what the objects in the Women’s Section were now being asked to represent. They were no longer demonstrative of ability, but were national mementos of war service.

Yet this research shows that these objects failed in this role, because the interest in them from an audience of factory owners during the dilution expos did not translate to a general public of exhibition goers. However, the art and imagery introduced by the WWSC that showed women engaged in munitions work was both popular and successful, and in some senses problematic. It moved the representation of women’s metalwork away from them being objects that verified the quality of making, and towards more romanticised notions of war work and service. It fed a sense that women would be as likely to return to these professions now that the war was ending, as men would be to return to the trenches. For the vast majority of the female munitions workforce this return to a previous normality would no doubt have been welcomed, but for the women engineers who believed that the doors into the profession had been permanently opened to them, disappointment would surely come.



Figure 7.2 A model of female workers in a shell filling factory, Hayes. (IWM, Q 31416) © IWM

Memorialisation, as a concept enforced by the WWSC, brought about more romantic representations of female metalworkers through art and portraiture. Most of the dioramas were commissioned after the war had ended, and these were the objects that were displayed in *The Nation's War Paintings and Other Records* exhibition at the end of 1919 and again at Crystal Palace from 1920 to 1924. This research has attempted to locate all the official photographs of the Women's Section from the IWM Crystal Palace exhibition, and it is telling that the dioramas feature in this portfolio, whereas the metal objects do not.

It is clear from the archives that the WWSC had believed their commissioned dioramas and models would represent long lasting memorials to women's war service and match the recognition of male service, albeit on a minuscule budget. The discovery of the fragility of these plaster representations and their ephemerality shocked and disappointed the members of the WWSC. The realisation that many of the dioramas would not survive to tell their story would have been difficult to reconcile with the subcommittee's aims.

7.4.5 Use of exhibition space

Evidence of activism can be found in the areas in which the WWSC had some control, particularly when located within wider areas where they had none. For example, they were required to curate their exhibitions in very limited display spaces and were therefore obliged to consider carefully how to use the resource. The first offer of an exhibition opportunity at Burlington House was accepted in order to give the Women's Section an early visible presence – even if the display was similar to the previous dilution exhibitions. The greater area afforded to them at the Whitechapel Art Gallery (which far exceeded the space allocated at the Crystal Palace and subsequent venues) allowed the women of the WWSC to be more innovative. As well as using charts, pictures and models to augment the displays of artefacts and ephemera, the WWSC stepped out of the realm of informative presentation and into an area of sacred space, by creating a shrine.

This act can be interpreted in several ways. As a political moment it responded directly to the lack of any roll of honour afforded to the women who had died participating in war service, but also elevated exposure to the dangers of the work on the home front to the category of *sacrifice*. As well as dramatically making this point to visitors to the exhibition, it provided a much needed place of acknowledgment for the grieving families, many of whom were suffering not only from the bereavement but from a loss that was silent and unacknowledged, caused by the news blackouts associated with home front munitions disasters put in place for propaganda reasons. It became somewhere for grieving relatives to go, and many brought with them written memories as well as photographs to add to the display. The fresh flowers that were added daily to the shrine were a humane and dramatic touch.

7.5 How are the surviving objects of the metalwork collection still meaningful?

Part of this research involved compiling a database of the metal objects made by women and collected by both the WWSC and the Ministry of Munitions for their exhibitions. This was done to better understand the extent of the collection and to find out what kinds of objects were in it and what had survived. These items were identified by using Ministry of Munitions and IWM exhibition catalogues from 1916 to 1918, WSCC minutes and correspondences, newspaper cuttings, the IWM object online catalogue, and surviving metal items in the IWM's present day collection. The research showed how the metalwork in the IWM collection did

not illustrate a particularly broad range of the work done by women, but instead was a representative sample of work done through the implementation of dilution practices.

The database identified 1530 munition items in this assemblage, of which 1082 objects were made of metal. It included entries in the catalogues that were marked as 'missing' or 'no exhibit' because the information about the manufacturing processes that came with the listing was useful. Although these resources gave insights into the women's skills, material data about the objects were limited, as only 86 of the metal items had any information about the kind of metal used, and only 44 objects had any measurements.

What remains unresolved is which of the surviving objects had come from the Ministry of Munitions dilution exhibitions, which ones were from the replica collection supposedly ordered for the 1917 Burlington House exhibition, and which objects were separately collected by the WWSC (Section 4.6). Identification of individual metal items from the original collection was impossible from the descriptions found in the catalogues, but 21 absolute identifications could be made from the images instigated by Miss O. E. Monkhouse. These were published by the Ministry of Munitions, yet Monkhouse was representing the WWSC at the time (IWM, LBY 16242, 1918). Whether this meant that the Ministry of Munitions' collection became absorbed into the Women's Section, or that the assemblage became part of a mutual resource, is impossible to say from this research. Nonetheless, it gives a good insight into the legacy of Monkhouse's due diligence and activism, because it meant that over a century later, this female metalworker could pick up these metal objects and know for certain that they had been made by other women, unlike the items that had parted company with their labels over the intervening decades. The protected space of the WWSC ultimately safeguarded the gender provenance of these particular items, but a further investigation into all the munitions artefacts at the IWM could well identify other objects separated from the collection.

The ongoing value of the remains of the collection is open to debate, and certainly the pristine condition of the few metal items examined in this study, together with the knowledge that no one has asked to see them before, suggests a lack of interest in them as objects *per se*. As working proofs or mementos of a moment in history, they are unremarkable as they do not easily translate into display objects and were superseded by more romanticised

representations of female metalworkers through art and portraiture. As a representation of the range of metalwork in which women were skilled practitioners, this tiny sample is problematic because it is limited to mechanised component production and does not reflect the much larger picture. However, what makes this small collection incredibly valuable is that this metalwork was irrefutably been made by women, and their work has not been misattributed to others. If for no other reason it is important that these items remain together and are reunited with the data rediscovered through this research. Their potential to tell us more about the women who made them has not yet been fully realised.

7.6 Conclusions

One of the insights provided by this research was how limited the self-representation of female metalworkers has been. Neff (1966) identified the historical problem as literacy, explaining how the first self-represented occupations of women to appear in literature were professions such as teaching, where the ability to read and write were a given. Women metalworkers of the nineteenth and early twentieth century had neither the resources nor ability to leave personal accounts of their lives and work. It has been difficult to find (from the years preceding the First World War) any account of female metalworking that has not been written by an activist of some kind, most of whom were commentators advocating for better conditions for women in industrial settings. Campaigners such as B.L. Hutchins (Section 2.2) described the work of women newly working in factories, and exposed the conditions and low pay, evidenced in safety reports and tribunals. Later Sherard (1897) wrote about female metalworkers in the style of a journalist, then in 1910 Mary MacArthur represented women chainmakers during their strike, coordinating their actions and speaking on their behalf. Has the narration of female metalwork only come from social reformers, rather than from the women themselves?

The danger with third person social commentary is that female metalworking and degradation appear to be synonymous, and the emphasis on poverty and living conditions obscures any insights into the skills and abilities of the women metalworkers. When contextualised by an agenda for social reform, the female metalworker can never be an aspirational figure, and her abilities remain unappreciated or misunderstood. First person accounts of women smiths describing their own craft are so rare, that the two films uncovered in this research, (*Lucy Woodall*, 1971) and (*Nothing to Lose - The Women Chainmakers Strike*

of 1910 Cradley Heath, 1976) feel particularly precious. In amongst the discussions of family life, strike action and hardship, these women also describe their metalworking skills and demonstrate to this coppersmith just how good they were at the job. The absence of these kinds of accounts skews the relationship between women smiths and our own craft abilities.

The way in which the Women's Work Collection and the endeavours of the WWSC fed into this narrative is complex. Their project was to create a national archive of the work that women were doing throughout the war, and also to devise a collection for exhibitions. The former produced an invaluable resource; particularly the minutes from the meetings and the correspondence between sub committees that give such candid insights into the times and challenges of war. The agenda to bring this information into the public arena, with engaging exhibits and art, meant that the meanings of certain objects changed in this context, as well as their value. As an interest in the models and paintings of munition workers grew, and the appetite to see samples of metalwork waned, ideals outlived the proofs of women's abilities in the workshop. Over the intervening decades the imagery of women metalworkers found in the IWM has appeared more novel to present day viewers than to the public of the day, who must have become increasingly familiar with factory work and the advances in mechanised processes over the 1800s and early 1900s. However, the patina of nostalgia that forms across the intervening years, when scenarios are locked into a museum format, will tend to bond ideas to a specific time and so the notion of women working en masse in the metalworking industry becomes allocated to the past, to an atypical social space, forever to be associated with the crisis of war.

The small number of metal items that survived the years since the WWSC collected them are precious emissaries from another time. Now reunited with their data through this research, they carry information about their material, geographical and temporal origins, as well as their protected gender provenance. They illustrate the paradox of making separate collections of women's work, especially when it is just the same as men's work. The 'othering' of these metal objects in the demarcated space offered by the Women's Section protected their gender provenance, preventing them from defaulting to the predominantly masculine view of metalwork.

7.7 Further research

This research was intended to take me on a journey into archaeology from my homeland as a craftsperson and coppersmith. Ultimately, it charted the less familiar waters of social history, gender studies, museology and suffragism, which were no less fascinating and have certainly set the scene for future exploration. I have as many unanswered as answered questions and sincerely hope that opportunities for further research come into view, as the voyage continues.

I would like to devise a means of comparison between the metal objects in the Women's Work Collection and similar male-curated assemblages, to investigate the extent to which female curation protects a narrative, or even ghettoizes women's achievements. In particular, the paradox of curating identical objects in separate collections (Section 6.2) raised interesting questions about the motives of the curators. Was this a help or a hindrance in investigating a craft that is traditionally understood in a gendered way?

I would welcome the opportunity to do much more research into the IWM collection, now using my reconstructed inventory and O. E. Monkhouse's photographs to positively identify other metal artefacts from the original Women's Work Collection. I believe that these in turn could be matched to images from the Dilution of Labour Bulletins and then even reconnected to the names of their original makers.

How is it possible to engage with much older metalwork and are there any other metal assemblages in the deeper historical record that can also be shown to have been made by women? How do the mechanisms of their gender provenance compare to the case study in this thesis? Is it possible to pinpoint women's metalwork by other means, for example by mapping events which remove men from the forge onto contemporary assemblages; as in the case of the armourers during the Hundred Year's War (Kirkland, 2015). Is the idea of grouping assemblages into single gendered groups the very artifice that conceals the work of women?

A prevailing interest throughout all of these studies has been the relationship between craftspeople, their practice and how this defines their personal identity. Finding first person accounts by women smiths (Nothing to Lose - The Women Chainmakers Strike of 1910 Cradley Heath, 1976) felt important because it offered verbatim accounts of how metalwork had shaped the lives, minds and bodies of the women, shifting the importance of their identity

away from the chainmakers and strikers that others had defined. Their place in social history is extremely important, but so is an understanding of their accomplishments as smiths.

The transmission of these skills, particularly between women in metalwork, is a significantly underrepresented study area which requires more investigation, especially if men are generally perceived as the bearers of that culture (Morgan, 2001, p.84). In 2019 I represented GB at UNESCO's First International Festival of Handicrafters in Uzbekistan, in my capacity as a coppersmith listed on the Red List of Endangered Crafts (Bertram, 2017). Through this I have gained an understanding of the UNESCO Convention for the Safeguarding of Intangible Cultural Heritage 2003 and the significance of how craft skills can be transmitted and preserved within this format. I hope that in the longer term my research can contribute to a better understanding of good skills transmission practice within metalwork and the part that establishing gender provenance can play within this.

7.8 Afterword

The motivation for this research came from a profoundly personal place, beginning almost 35 years ago at the start of my apprenticeship as a coppersmith. I knew other women working as smiths, yet my presence in the forge was frequently remarked upon, partly because it was a little unusual, but more often as an expression of surprise that I had the ability to work large metal projects. The skills which I and many other women have are so strongly associated with men, that it seeps into the ways that found metal objects are interpreted. I hope I have brought a better understanding into the field about how metalwork is made by sharing my knowledge of practical smithing and showing how anyone can do it.

This matters because my own work has already been misattributed. It matters because girls should not feel like outsiders or newcomers in the world of metalwork, engineering or technology. It matters because the service of Sheffield's Women of Steel during the First World War deserves to be commemorated and not forgotten (Section 1.1).

8 Appendices

8.1 Appendix One: Metal Objects from the WWC Examined and Recorded

8.1.1 EPH 4087



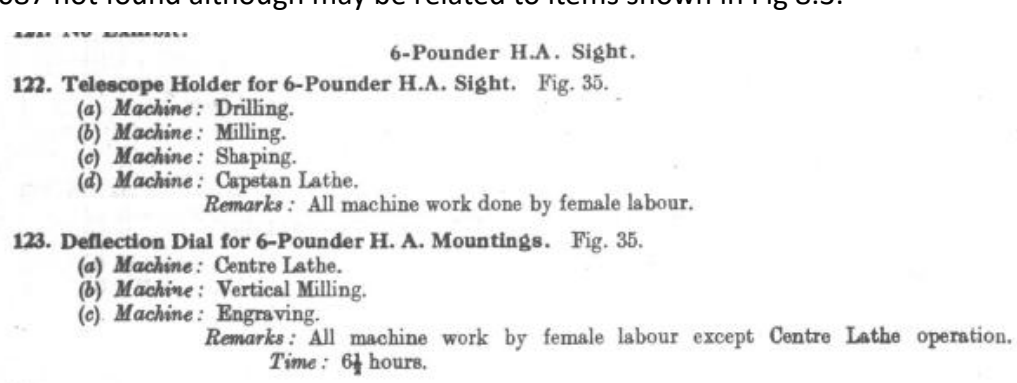
Figure 8.1 EPH 4087 (IWM Duxford)



Figure 8.2 EPH 4087 (IWM Duxford)

Modern Reference EPH 4087

Location IWM Duxford

Date viewed 16/11/2021
Modern description Telescope holder for 6PDR HA Sight
Online catalogue location https://www.iwm.org.uk/collections/item/object/30083625
Online catalogue description <p>A metal telescope holder comprising a flat silver-coloured metal lozenge shape bearing two circular apertures of the same diameter.</p> <p>History note: Original caption: Telescope holder for 6-pounder H. A. Sight. All machine work done by female labour.</p> <p>Inscription: FUZE TIME & PERCN.NO.80 MKS. V & VI/L/ DIA. OF RING ILS 434.J P.M.C. L. 4/13 NP BOTTOM NO.91 30.W. H.2.228 L.2.220</p> <p>Dimensions: L: 18cm W: 10cm D: 1cm TELESCOPE HOLDER FOR 6PDR HA SIGHT</p>
Corresponding references in 1917 catalogues <p>EPH 4087 not found although may be related to items shown in Fig 8.3.</p>  <p style="text-align: center;"><i>Figure 8.3 IWM, MUN. VI/43, 1917, p.64</i></p>
Made by
Noteworthy traces of making <p>Metal machining – it appears to have been formed from a single piece (i.e., the raised ‘rings’ around the holes have not been inserted but machine formed).</p>
Interpretation EPH 4087 has not be identified from the 1917 catalogues
Also see

8.1.2 EPH 4088



Figure 8.4 EPH 4088 (IWM Duxford)



Figure 8.5 EPH 4088 (IWM Duxford)

Modern Reference EPH 4088

Location IWM Duxford

Date viewed 17/11/2021

Modern description Deflection dial (engraved) for 6pdr HA mountings

Online catalogue location

<https://www.iwm.org.uk/collections/item/object/30083626>

Online catalogue description History note: Original caption: Deflection Dial (engraved) for 6-Pounder H. A. Mountings. All machine work by female labour except centre lathe (first) operation in 61/2 hours.

Stamped: RIGHT DEFLECTION 6 POR H A MKIV. LEFT DEFLECTION

Corresponding references in 1917 catalogues

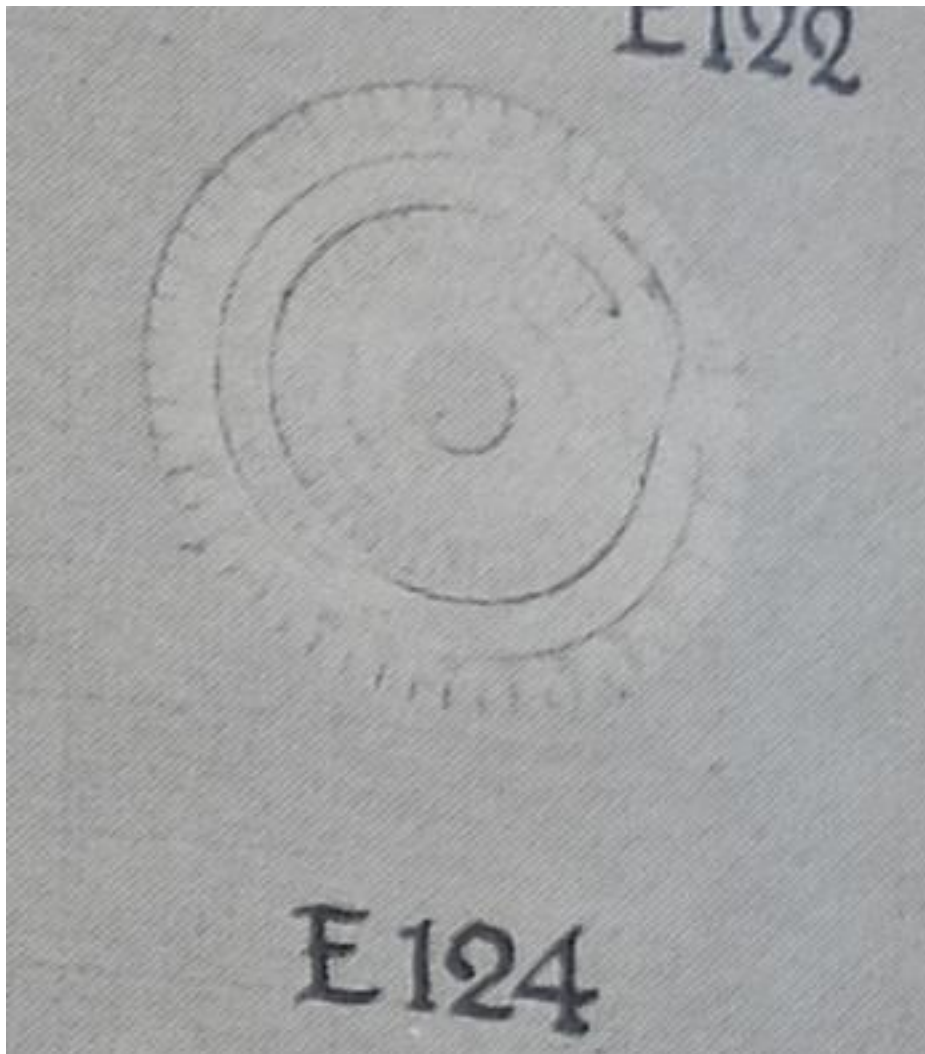


Figure 8.6 E124 (IWM, LBY 16242, 1918, Fig.35)

Notes regarding identification

<p style="text-align: center;">GROUP E—<i>continued</i>. (GUNS AND COMPONENTS—<i>continued</i>.) (6 POUNDER H.A. SIGHT—<i>continued</i>.)</p> <p>124. Deflection Dial (engraved) for 6-Pounder H. A. Mountings. Fig. 35. (a) <i>Machine</i>: Centre Lathe. (b) <i>Machine</i>: Milling, Vertical. (c) <i>Machine</i>: Engraving.</p> <p><i>Remarks</i>: All machine work by female labour except Centre Lathe operation. <i>Time</i>: 6½ hours.</p> <p><i>Note to Exhibits 108 to 124</i>: In the works where these articles are manufactured, the extent to which female labour has been utilised on non-repetition work of very high class may be gauged by the following facts. The milling machines are operated by 24 girls under the supervision of 2 skilled men. There are 23 girls on Capstan lathes with two skilled men supervising. Of six shaping machines, five are operated by girls and the other by a man who also gives the girls any assistance they may need. Eight girls are working universal grinders and two are working surface grinders, all under supervision of one man. There are six girls operating engraving machines and these are supervised by a woman. Fourteen girls are working centre lathes, doing screw-cutting both internal and external, &c. Their lathes are situated alternately with lathes operated by skilled men who give the girls such attention as they need.</p> <p>In the tool room a girl works a Universal grinder, and another a Universal miller, while a female tool fitter backs off formed cutters by hand.</p> <p>There are thirteen girls fitting gunsights at the bench, doing all work except that demanding the highest degree of skill, which is left to experienced male fitters.</p> <p>(IWM, MUN. VI/43, 1917, p. 65)</p>	<p>Made by</p> <p>Noteworthy traces of making Turning and machine marks – possibly made from brass, but hard to tell in artificial light. It has a yellow tinge, but the bash marks could also be consistent with steel. The numbers could be etched, but online catalogue says engraved.</p> <p>Interpretation EPH 4088 has been identified from the 1917 catalogues as E124</p> <p>See also Section 4.43</p>
--	--

8.1.3 EPH 4089a & EPH 4089b



Figure 8.7 EPH 4.89a & 4089b (IWM Duxford)



Figure 8.8 EPH 4089a (IWM Duxford)

Modern Reference EPH 4089a & 4089b

Location IWM Duxford

Date viewed 17/11/2021

Modern description Obturator pad (in two parts)

Online catalogue location

<https://www.iwm.org.uk/collections/item/object/30083627>

Online catalogue description Physical description: An obturator pad comprising metal disc and a sewn canvas cover, both bear circular holes in the centre

History note: Original caption: Women's Work: Teasing and mixing asbestos and mutton suet; sewing canvas cover but not working of hydraulic press for the final operation of pressing.

Corresponding references in 1917 catalogues

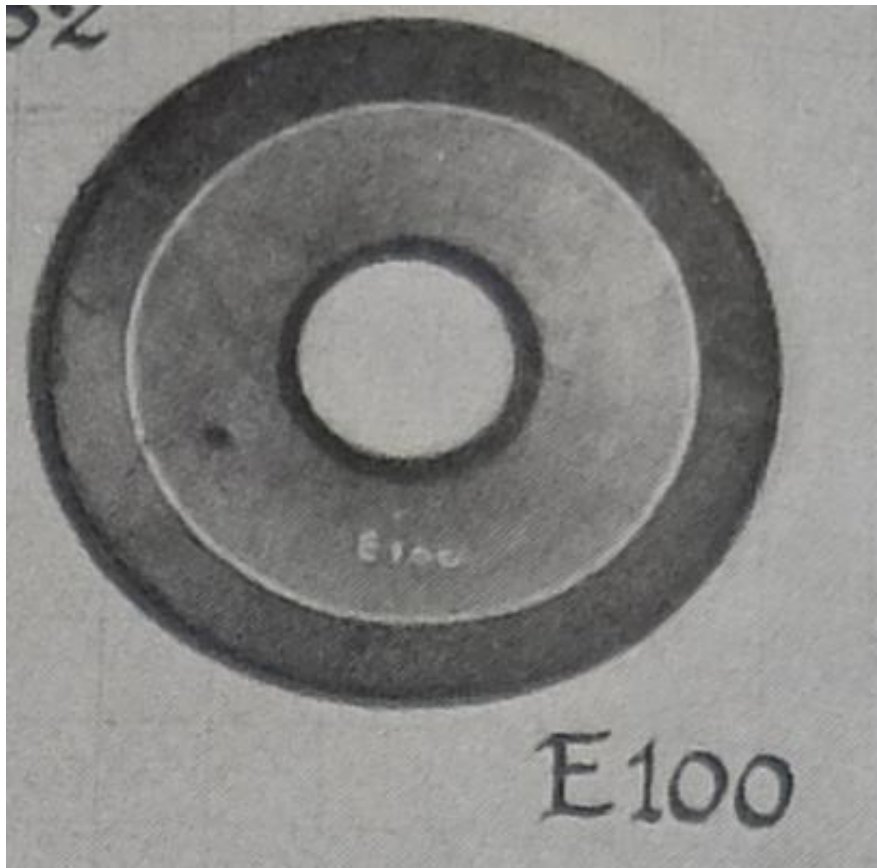


Figure 8.9 E100 (IWM, LBY 16242, 1918, Fig. 36)

Notes regarding identification EPH 4089a has E100 still painted on it.

<p style="text-align: center;"><i>Remarks : All work done entirely by women under male supervision.</i></p> <p>100. Obturator Pad. Fig. 35. (a) Teasing and mixing asbestos and mutton suet. (b) Sewing canvas cover. (c) Pressing in Hydraulic Press. <i>Remarks : All operations done by women, with the exception of working of hydraulic press.</i></p> <p>101. Obturator Rings. Fig. 35. (a) Turn and grind on 8-inch Lathe. (b) Scarf on milling machine. <i>Remarks : All work done entirely by women. Limit : Plus or minus 0.002 inch.</i></p> <p>(IWM, MUN. VI/43, 1917, p. 62)</p>
<p>Made by Unknown</p>
<p>Noteworthy traces of making A stamp on it appears to say 'Co 1916' Part 'a' is made from a copper alloy – it has a green patina on the underside. It looks spun (there are ridges) – or possibly pressed. There are some stamps: 'B.L. RON'.</p>
<p>Interpretation EPH 4089a has been identified from the 1917 catalogues as E100</p>
<p>See also Section 4.43</p>

8.1.4 EPH 4095



Figure 8.10 EPH 4095 (IWM Duxford)

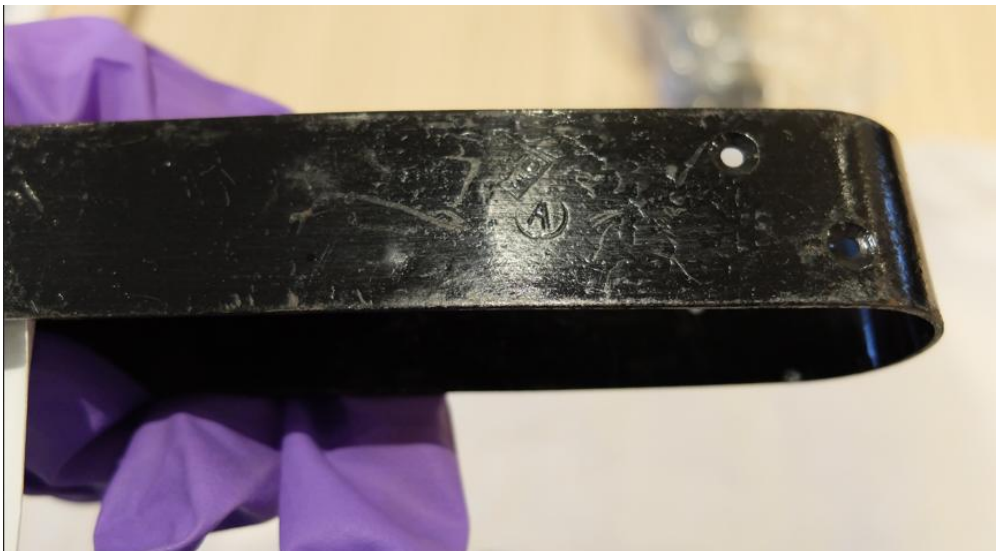


Figure 8.11 EPH 4095 (IWM Duxford)

Modern Reference EPH 4095

Location IWM Duxford

Date viewed 17/11/2021

Modern description Fin clip for tail unit

Online catalogue location

<https://www.iwm.org.uk/collections/item/object/30083633>

Online catalogue description Fin clip for tail unit - First World War period British-made aircraft component.

The fin clip was made by women workers of the Phoenix Manufacturing Company Limited of Bradford, West Yorkshire

Corresponding references in 1917 catalogues

42. Trailing Edge Clips. Fig. 57.
(a) Operation : Bending.
(b) Operation : Drilling.

(IWM, MUN. VI/43, 1917, p. 62)

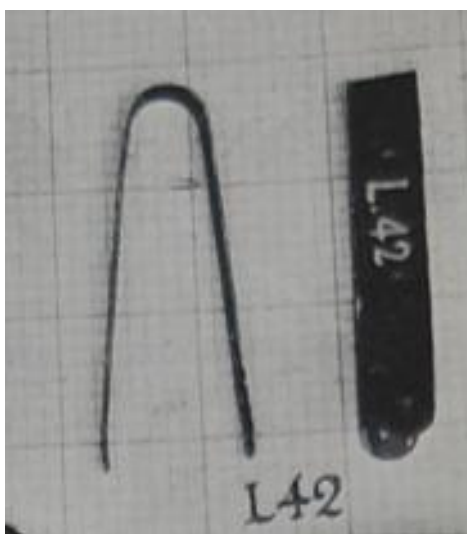


Figure 8.12 L42 (IWM, LBY 16242, 1918, Fig 57)

Notes regarding identification

EPH 4095 appears to be one of the clips listed in the 1917 catalogue (IWM, MUN. VI/43, 1917, p. 62).

Made by Phoenix Dynamo Manf. Co. Ltd.

Noteworthy traces of making Flat strip of metal bent into 'hairpin' shape with drilled holes. Cut sheet pressed with some stamping obscured by Hammerite type paint.

Interpretation EPH 4095 is likely to be one of the L42 clips listed in the 1917 catalogue, but this cannot be decided for certain.

See also Section 4.4.6

8.1.5 EPH 4101



Figure 8.13 EPH 4101 (IWM London)



Figure 8.14 EPH 4101 (IWM London)

Modern Reference EPH 4101

Location IWM London

Date viewed 06/10/2021

Modern description clip for frame ('aeroplane part')

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30083639>

<p>Online catalogue description Physical description: An 'L'-shaped metal bracket (L 6.5cm x W 6.5cm) with three holes; the object is coated in black paint.</p> <p>Label: British aircraft component (bracket-like 'clip for frame') made during the First World War. Acquired in October 1918 as part of the original Imperial War Museum's 'Women's Work' collection.</p> <p>Inscription: EA</p> <p>Inscription: AID PAT962</p>
<p>Corresponding references in 1917 catalogues None found</p>
<p>Notes regarding identification</p>
<p>Made by Ransome, Sims and Geoffries at the Orwell Works, Ipswich</p>
<p>Noteworthy traces of making Not obvious because the item has been heavily covered in black (Hammerite type?) paint. Cannot tell if the washers were welded on before the holes were drilled or after. The inner surface of the hole appeared smooth.</p>
<p>Interpretation EPH 4101 cannot be found in the 1917 catalogues</p>
<p>Also see</p>

8.1.6 EPH 4104



Figure 8.15 EPH 4104 (IWM Duxford)



Figure 8.16 EPH 4104 (IWM Duxford)

Modern Reference EPH 4104

Location IWM Duxford

Date viewed 17/11/2021

Modern description Vent bolt nut, 6-inch howitzer breech mechanism

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30083642>

Online catalogue description Physical description: Vent bolt nut, 6 – inch Howitzer breech mechanism.

History note: A vent bolt nut for a 6 inch Howitzer, comprising silver-coloured metal cylinder with large hole through the centre and engraved inscription on one side

Dimensions: Dia: 7.5cm D: 4cm

Corresponding references in 1917 catalogues

6-inch Howitzer Breech Mechanism.

93. Vent Bolt Nut. Fig. 36.

(a) Turn, bore and screw—8-inch Lathe. *Limit* : Plus or minus 0.002 inch.

(b) Mill toe and slot.

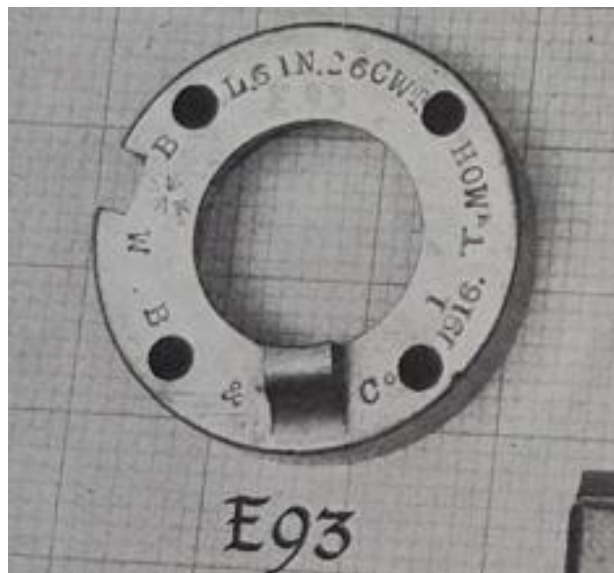
(c) Drill 4 holes.

Remarks : All work done entirely by women under male supervision.

(IWM, MUN. VI/43, 1917, p. 61)

Notes regarding identification

1918 Catalogue Image:



(IWM, LBY 16242, 1918, Fig. 36)

Made by Stamp says W.B. & Co.

Noteworthy traces of making Heavy steel (?) bolt with internal cut thread to halfway. Four drilled holes on upper surface. Stamped lettering in top surface

Interpretation EPH 4104 has a matching dent to E93 on the bottom right hand corner and the stamped no. "2" of "26 CWT" is worn in the same way.

See also Section 4.4.3

8.1.7 EPH 4733



Figure 8.17 EPH 4733 (IWM London)



Figure 8.18 IWM (EPH 4733) ©IWM

Modern Reference EPH 4733

Location IWM London

Date viewed 06/10/2021

Modern description metal wiring plate

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30084668>

Physical description Metal wiring plate (L 9cm x W 6cm x H 4.5cm); the component bears the serial number '4319 42'.

Label: British aircraft component (metal wiring plate) made during the First World War by women employees of the firm Ransome, Sims and Geoffries at the Orwell Works, Ipswich. Acquired in October 1918 as part of the original Imperial War Museum's 'Women's Work' collection.

Materials: whole metal

Dimensions whole 4.5, 6.0, 9.0

Made by Ransome, Sims and Geoffries at the Orwell Works, Ipswich.

Noteworthy traces of making Not obvious because the item has been heavily covered in black (Hammerite type?) paint

Interpretation EPH 4733 cannot be found in the 1917 catalogues. It has 'W155' painted on it

Also see

8.1.8 EPH 4735



Figure 8.19 EPH 4735 (IWM London)

Modern Reference EPH 4735

Location IWM London

Date viewed 06/10/2021

Modern description Pulley, second elevator

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30084663>

Online catalogue description

Physical description: Metal circular pulley (diameter 10cm x D 3cm). Opens into two halves; inside is a disc with holes around and also a small ring.

Label: British aircraft component (pulley, second elevator) made during the First World War by women employees of the firm Ransome, Sims and Geoffries at the Orwell Works, Ipswich. Acquired in October 1918 as part of the original Imperial War Museum's 'Women's Work' collection.

Materials whole: metal

Dimensions whole: Dia: 10cm D: 3cm

Corresponding references in 1917 catalogues

(b) *Operation* : Complete assembly of all parts.
70. Pulley Case and Bracket. Fig. 58.
Operation : Complete assembly.
71. Pulley Case and Bracket. Fig. 58.
Operation : Complete assembly.
72. Pulley Wheel. Fig. 58.
(a) *Operation* : Turning.
(b) *Operation* : Drilling.

(IWM, MUN. VI/43, 1917, p. 95)

Notes regarding identification It has 'W128' painted on it

Made by Ransome, Sims and Geoffries at the Orwell Works, Ipswich.

Noteworthy traces of making The inner rivets looked hand finished. There were non-matching (but very neat) hammer marks on one end of each rivet. The rivets on the outer circumference were more uniform and could have been machine finished.
The case itself looked as if it had been formed in a fly press or similar. I could not see any signs of spinning.

Interpretation L70 and L71 are similar but not likely to be EPH 4735 in the modern IWM collection. It has 'W128' painted on it.

See also Section 4.4.6

8.1.9 EPH 4736



Figure 8.20 EPH 4736 (IWM London)



Figure 8.21 EPH 4736 (IWM London)

Modern Reference EPH 4736
Location IWM London
Date viewed 06/10/2021
Modern description end socket for fairing support tube
Online catalogue location https://www.iwm.org.uk/collections/item/object/30084664

Online catalogue description

Physical description: Metal object with a circular socket one end and a square clip at the other (L 8cm x W 4cm x D 5cm). The square clip has four holes. Stamped with the number 4265 14.

Label: British aircraft component (end socket for fairing support tube) made during the First World War by women employees of the firm Ransome, Sims and Geoffries at the Orwell Works, Ipswich. Acquired in October 1918 as part of the original Imperial War Museum's 'Women's Work' collection.

Materials whole: metal

Dimensions whole: L: 8cm W: 4cm D: 5cm

Corresponding references in 1917 catalogues None found

Notes regarding identification EPH 4736 has 'W130' painted on it

Made by Ransome, Sims and Geoffries at the Orwell Works, Ipswich.

Noteworthy traces of making

Interpretation EPH 4738 cannot be found in the 1917 catalogues but has a different code on it 'W130' from another collection.

Also see

8.1.10 EPH 4737



Figure 8.22 EPH 4737 (IWM London)



Figure 8.23 EPH 4737 (IWM London)

Modern Reference EPH 4737

Location IWM London

Date viewed 06/10/2021

Modern description Skid lever (SE5)

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30084665>

Online catalogue description Physical description: Metal lever in a flattened delta, near 'boomerang' shape, with a tube through the centre (L 21.5cm x W 5cm x D 3cm).

Label: British aircraft component (skid lever for an SE 5 fighter) made by women employees of the Davidson Aviation Company. Acquired in October 1918 as part of the original Imperial War Museum's 'Women's Work' collection.

Materials whole: metal

Dimensions whole: L: 21.5cm W: 5cm D: 3cm

Corresponding references in 1917 catalogues
None found
Notes regarding identification
EPH 4737 has 'W108' painted on it
Made by Davidson Aviation Co Ltd.
Noteworthy traces of making
Interpretation EPH 4737 cannot be found in the 1917 catalogues. It has 'W108' painted on it
See also

8.1.11 EPH 4738



Figure 8.24 EPH 4738 (IWM London)



Figure 8.25 EPH 4738 (IWM London)

Modern Reference EPH 4738

Location IWM London

Date viewed 06/10/2021

Modern description Flap cable pulley bracket (SE5)

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30084666>

Online catalogue description

Physical description: Metal bracket (L 7.5cm x W 1.5cm x D 2cm) with a solid end from which two arms extend. The arms have holes in the end. The bracket bears stamped serial number: '10380'.

Label: British aircraft component (pulley bracket for an S.E.5 fighter flap cable) made by women employees of the Davidson Aviation Company. Acquired in October 1918 as part of the original Imperial War Museum's 'Women's Work' collection.

Stamped: 10380

Corresponding references in 1917 catalogues

None found

Notes regarding identification

EPH 4738 has 'W118' painted on it

Made by Davidson Aviation Co Ltd.

Noteworthy traces of making This is made of two pieces – a central drilled core, 'hugged' by a pressed drilled plate and welded into place. It has the bite marks of a vice on it.

Interpretation EPH 4738 cannot be found in the 1917 catalogues but has a different code on it 'W118' from another collection.

Also see

8.1.12 EPH 4739



Figure 8.26 EPH 4739 (IWM London)



Figure 8.27 EPH 4739 (IWM London)

Modern Reference EPH 4739

Location IWM London

Date viewed 06/10/2021

Modern description Socket ('Aeroplane part')
Online catalogue location https://www.iwm.org.uk/collections/item/object/30084667
Online catalogue description Physical description: Metal socket (L 12cm x W 6cm x D 4.5cm) with various different size holes. Stamped with the number 65 6159. Label: British aircraft component (socket) made during the First World War by women employees of the firm Ransome, Sims and Geoffries at the Orwell Works, Ipswich. Acquired in October 1918 as part of the original Imperial War Museum's 'Women's Work' collection. Materials whole: metal Dimensions whole: L: 12cm W: 6cm D: 4.5cm
Corresponding references in 1917 catalogues None found Notes regarding identification EPH 4739 has 'W124 (1)' painted on it
Made by Ransome, Sims and Geoffries (Ipswich).
Noteworthy traces of making Two pressed plates with welded seam to join.
Interpretation EPH 4739 cannot be found in the 1917 catalogues but has a different code on it 'W124 (1)' from another collection.
Also see

8.1.13 EPH 4740



Figure 8.28 EPH 4740 (IWM London)



Figure 8.29 EPH 4740 (IWM London)

Modern Reference EPH 4740

Location IWM London

Date viewed 06/10/2021

Modern description Longeron clip

Online catalogue location https://www.iwm.org.uk/collections/item/object/30084669
<p>Online catalogue description Physical description: Long metal clip (L 12.5cm x W 4cm x D 3cm) angled shape with drilled with various holes.</p> <p>Label: British aircraft component (longeron clip) made during the First World War by women employees of the Phoenix Dynamo Manufacturing Co Ltd, Thornbury Works, Bradford, West Yorkshire. Acquired in October 1918 as part of the original Imperial War Museum's 'Women's Work' collection.</p> <p>Materials whole: metal</p> <p>Dimensions whole: L: 12.5cm W: 4cm D: 3cm</p> <p>Online catalogue number EPH 4740</p>
<p>Corresponding references in 1917 catalogues</p> <p>None found</p> <p>Notes regarding identification EPH 4740 has 'W132 (2)' painted on it</p>
Made by Phoenix Dynamo Manufacturing Co Ltd (Bradford).
Noteworthy traces of making Single piece – machine pressed – drilled holes.
Interpretation EPH 4740 cannot be found in the 1917 catalogues but has a different code on it 'W132 (2)' from another collection.
Also see

8.1.14 EPH 4741



Figure 8.30 EPH 4741 (IWM London)



Figure 8.31 EPH 4741 (IWM London)

Modern Reference EPH 4741

Location IWM London

Date viewed 06/10/2021

Modern description Landing gear guide flange

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30084670>

Online catalogue description

Physical description: Aluminium landing gear guide flange (L 9cm x W 5cm x D 1.5cm). A metal ring with two holes drilled through it and a curved and rounded piece of metal welded to one side.

Label: British aircraft component (landing gear guide flange) made during the First World War by women employees of the firm Ransome, Sims and Geoffries at the Orwell Works, Ipswich. Acquired (donated by manufacturer) in October 1918 as part of the original Imperial War Museum's 'Women's Work' collection.

Materials whole: metal

Dimensions whole: 1.5, 5.0, 9.0

Corresponding references in 1917 catalogues

None found

Notes regarding identification EPH 4741 has 'W136' painted on it

Made by Ransome, Sims and Geoffries (Ipswich).

Noteworthy traces of making Pressed (maybe hammered or formed) curved section welded to ring.

Interpretation EPH 4741 cannot be found in the 1917 catalogues but has a different code on it 'W136' from another collection.

Also see

8.1.15 EPH 4742



Figure 8.32 EPH 4742 (IWM London)



Figure 8.33 EPH 4742 (IWM London)

Modern Reference EPH 4742
Location IWM London
Date viewed 06/10/2021
Modern description socket
Online catalogue location https://www.iwm.org.uk/collections/item/object/30084671

Online catalogue description Long metal clip (L 12.5cm x W 4cm x D 3cm) angled shape with drilled with various holes.

Label: British aircraft component (longeron clip) made during the First World War by women employees of the Phoenix Dynamo Manufacturing Co Ltd, Thornbury Works, Bradford, West Yorkshire. Acquired in October 1918 as part of the original Imperial War Museum's 'Women's Work' collection.

Materials whole: metal

Dimensions whole: L: 12.5cm W: 4cm D: 3cm

Corresponding references in 1917 catalogues

None found

Notes regarding identification

EPH 4742 has 'W139 (4)' painted on it

Made by Phoenix Dynamo Manufacturing Co Ltd (Bradford).

Noteworthy traces of making Single pressed piece with drilled holes and one pop rivet

Interpretation EPH 4742 cannot be found in the 1917 catalogues but has a different code on it 'W139 (4)' from another collection.

Also see

8.1.16 EPH 4743

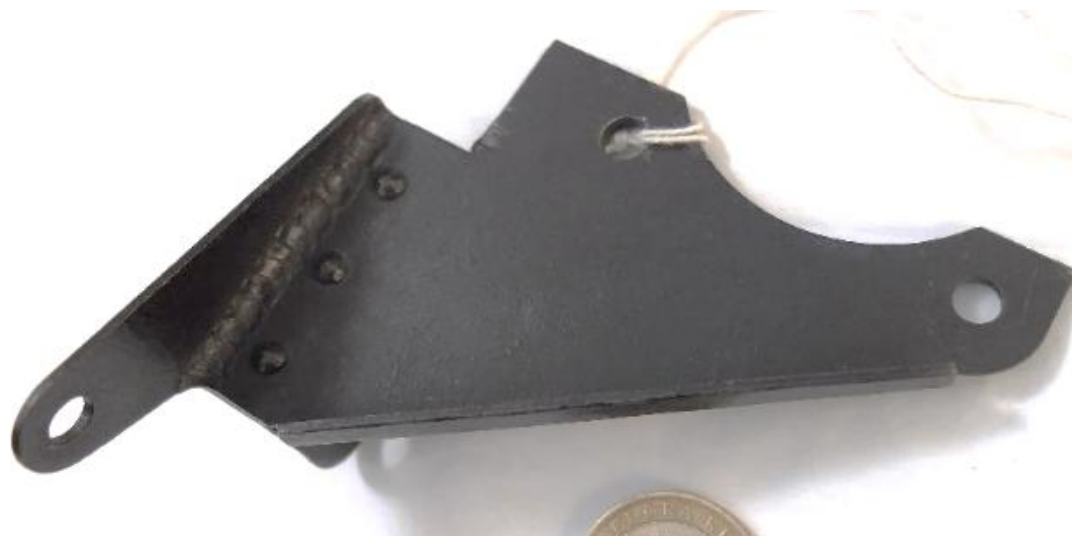


Figure 8.34 EPH 4743 (IWM London)



Figure 8.35 EPH 4743 (IWM London)

Modern Reference EPH 4743

Location IWM London

Date viewed 06/10/2021

Modern description rear bracket for carburettor controls

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30084672>

<p>Online catalogue description Physical description: Metal bracket (L 10cm x W 9.5cm x D 5cm) stamped with the number 11525.</p> <p>Label: British aircraft component (rear bracket for carburettor controls) made during the First World War by women employees of the firm Ransome, Sims and Geoffries at the Orwell Works, Ipswich. Acquired (donated by manufacturer) in October 1918 as part of the original Imperial War Museum's 'Women's Work' collection.</p> <p>Materials whole: metal</p> <p>Dimensions whole: 10.0, 5.0, 9.5</p>
<p>Corresponding references in 1917 catalogues</p> <p>None found</p> <p>Notes regarding identification EPH 4743 has 'W144' painted on it</p>
<p>Made by Ransome, Sims and Geoffries (Ipswich)</p>
<p>Noteworthy traces of making Rivets hand hammered. Rough welding on the joint.</p>
<p>Interpretation EPH 4743 cannot be found in the 1917 catalogues but has a different code on it 'W144' from another collection.</p>
<p>Also see</p>

8.1.17 EPH 4744



Figure 8.36 EPH 4744 (IWM London)

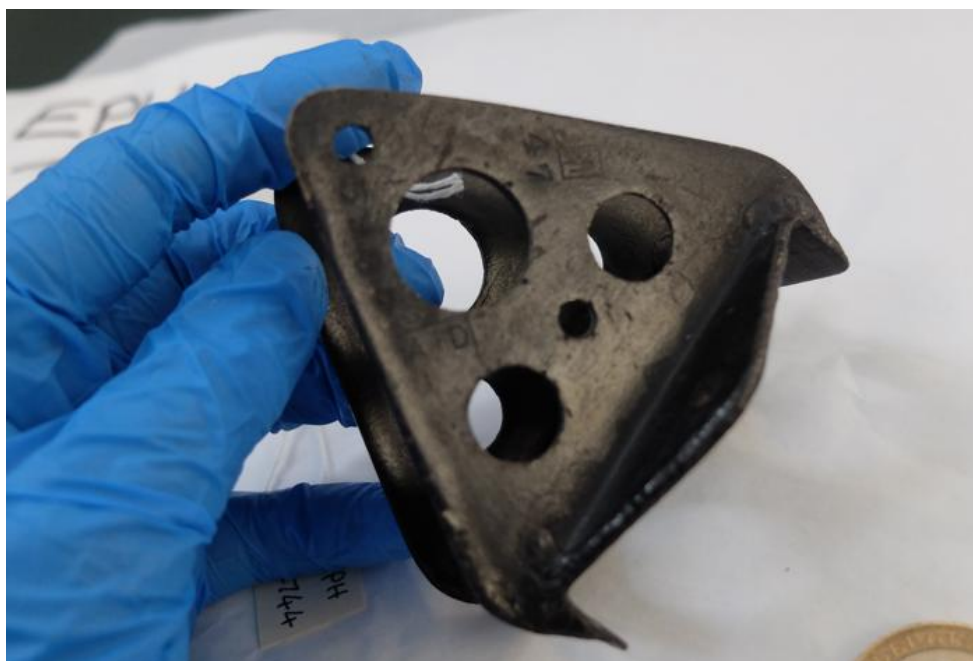


Figure 8.37 EPH 4744 (IWM London)

Modern Reference EPH 4744

Location IWM London

Date viewed 06/10/2021

Modern description Main petrol tank bracket
Online catalogue location https://www.iwm.org.uk/collections/item/object/30084673
<p>Online catalogue description Physical description: Metal bracket (L 8cm x W 8cm x D 8.5cm) drilled with various sized holes. Stamped with the number 47 5995.</p> <p>Label: British aircraft component (main petrol tank bracket) made during the First World War by women employees of the firm Ransome, Sims and Geoffries at the Orwell Works, Ipswich. Acquired (donated by manufacturer) in October 1918 as part of the original Imperial War Museum's 'Women's Work' collection.</p> <p>Materials whole: metal</p> <p>Dimensions whole: 8.0, 8.5</p>
<p>Corresponding references in 1917 catalogues</p> <p>None found</p> <p>Notes regarding identification EPH 4744 has 'W132' painted on it</p>
Made by Ransome, Sims and Geoffries at the Orwell Works, Ipswich
Noteworthy traces of making Made of three pieces with 2 welded seams.
Interpretation EPH 4744 cannot be found in the 1917 catalogues but has a different code on it 'W132' from another collection.
Also see

8.1.18 EPH 4745



Figure 8.38 EPH 4745 (IWM London)



Figure 8.39 EPH 4745 (IWM London)

Modern Reference EPH 4745

Location IWM London

Date viewed 06/10/2021

Modern description Socket

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30084674>

<p>Online catalogue description Physical description: Metal socket (L 11cm x W 7.5cm x D 4.5cm) drilled with various holes.</p> <p>Label: British aircraft component (socket) made during the First World War by women employees of the firm Ransome, Sims and Geoffries at the Orwell Works, Ipswich.</p> <p>Acquired (donated by manufacturer) in October 1918 as part of the original Imperial War Museum's 'Women's Work' collection.</p> <p>Materials whole: metal</p> <p>Dimensions whole: L: 11cm W: 7.5cm D: 4.5cm</p>
<p>Corresponding references in 1917 catalogues</p> <p>None found</p> <p>Notes regarding identification EPH 4745 has 'W126 (3)' painted on it</p>
<p>Made by Ransome, Sims and Geoffries (Ipswich)</p>
<p>Noteworthy traces of making Made in two sections – machine pressed (one overlaying the other and held together by 'invisible' (machined?) rivet. Possibly welded.</p>
<p>Interpretation EPH 4745 cannot be found in the 1917 catalogues but has a different code on it 'W126 (3)' from another collection.</p>
<p>Also see</p>

8.1.19 EPH 4746

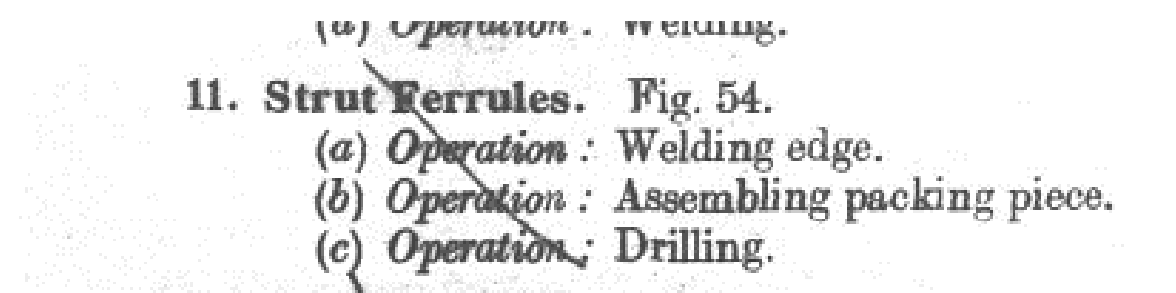


Figure 8.40 EPH 4746 (IWM London)



Figure 8.41 EPH 4746 (IWM London)

Modern Reference EPH 4746

Location IWM London
Date viewed 06/10/2021
Modern description Strut socket
Online catalogue location https://www.iwm.org.uk/collections/item/object/30084675
<p>Online catalogue description Physical description: Metal strut socket (L 8cm x W 8cm x D 3cm) with packing piece.</p> <p>Label: British aircraft component (strut socket with packing piece) made during the First World War by women employees of the firm Ransome, Sims and Geoffries at the Orwell Works, Ipswich. Acquired (donated by manufacturer) in October 1918 as part of the original Imperial War Museum's 'Women's Work' collection.</p> <p>Materials whole: metal</p> <p>Dimensions whole: L: 8cm W: 8cm D: 3cm</p>
<p>Corresponding references in 1917 catalogues</p>  <p>(IWM, MUN. VI/43, 1917, p. 90)</p> <p>Notes regarding identification EPH 4746 is not L11 but is a similar kind of object. It has W138 painted on it.</p>
Made by Ransome, Sims and Geoffries (Ipswich).
Noteworthy traces of making Pressed plate – welded on one end and also round core.
Interpretation EPH 4746 cannot be found in the 1917 catalogues but is similar to L11, albeit shorter. It has a different code on it 'W138' from another collection.
Also see

8.1.20 EPH 4747



Figure 8.42 EPH 4747 (IWM London)



Figure 8.43 EPH 4747 (IWM London)

Modern Reference EPH 4747

Location IWM London

Date viewed 06/10/2021

Modern description Fish plate (aeroplane part)

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30084676>

Online catalogue description Physical description: Long narrow metal plate (L 17cm x W 2.5cm) with drilled holes. Stamped with the number 5814 36.

Label: British aircraft component (fish plate) made during the First World War by women employees of the firm Ransome, Sims and Geoffries at the Orwell Works, Ipswich.

Acquired (donated by manufacturer) in October 1918 as part of the original Imperial War Museum's 'Women's Work' collection.

Materials whole: metal

Dimensions whole: Length 17.0 cm, Width 2.5 cm

Corresponding references in 1917 catalogues

52. Plate. Fig. 58.
(a) Operation : Drilling.
(b) Operation : Tinning.

(IWM, MUN. VI/43, 1917, p. 94)

Notes regarding identification

EPH 4747 has '5814' stamped on it, but L52 has no stamped numbers on it. EPH L52 is not EPH 4747 in the modern IWM collection. EPH 4747 has 'W145)' painted on it

Made by Ransome, Sims and Geoffries at the Orwell Works, Ipswich

Noteworthy traces of making Single drilled pressed plate.

Interpretation EPH 4747 cannot be found in the 1917 catalogues but is similar to L52, albeit shorter. It has a different code on it - 'W145' from another collection.

Also see

8.1.21 EPH 4749



Figure 8.44 EPH 4749 (IWM London)



Figure 8.45 EPH 4749 (IWM London)

Modern Reference EPH 4749

Location IWM London

Date viewed 06/10/2021

Modern description Strengthening plate

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30084678>

Online catalogue description Physical description: Metal plate (L 12cm x W 8.5cm) with stamped markings: '1452 7' and 'AID 160'.

Label: British aircraft component (strengthening plate for pilot's deck windows) made during the First World War by women employees of the Phoenix Dynamo Manufacturing Co Ltd, Thornbury Works, Bradford, West Yorkshire. Acquired (donated by the manufacturer) in October 1918 as part of the original Imperial War Museum's 'Women's Work' collection.

Stamped: 1452 7 AID 160

Materials whole: metal

Dimensions whole: Length 12.0 cm, Width 8.5 cm

Corresponding references in 1917 catalogues

None found

Notes regarding identification

Made by

Phoenix Dynamo Manufacturing Co Ltd, Thornbury Works, Bradford, West Yorkshire.

Noteworthy traces of making Single drilled plate.

Interpretation

Also see

8.1.22 EPH 4750



Figure 8.46 EPH 4750 (IWM Duxford)



Figure 8.47 EPH 4750 (IWM Duxford)

Modern Reference EPH 4750

Location IWM Duxford

Date viewed 25/05/2023

Modern description Hardened carbon steel counterbore for cartridge cases
Online catalogue location https://www.iwm.org.uk/collections/item/object/30084680
<p>Online catalogue description Counterbores for cartridge cases</p> <p>Munitions manufacture components made by women workers of Herbert Hunt & Sons in Old Trafford, Manchester. These metal components were used to make rifle cartridge cases and artillery shell cases. Producing them involved using specialist machinery, which needed technical skills to operate.</p> <p>British machine-tool component made during the First World War by women employees of Herbert Hunt and Sons, Manchester to produce munitions. Counterbores were used for making cartridge cases (grooving; finishing turn and backing-off; milling square; hardening; grinding face and ends). Acquired as part of the original Imperial War Museum's 'Women's Work' collection.</p> <p>Dimensions: L: 128mm W: 43mm</p>
<p>Corresponding references in 1917 catalogues</p> <p>81—83. Counterbores for Cartridge Cases. Fig. 50.</p> <p><i>Operation 1 : Cut off. Time : 10 minutes.</i> <i>Remarks : Boy labour.</i></p> <p><i>Operation 2 : Rough turn. Time : 60 minutes.</i> <i>Remarks : Boy labour.</i></p> <p><i>Operation 3 : Groove. Time : 15 minutes.</i> <i>Remarks : Girl labour.</i></p> <p><i>Operation 4 : Finish turn and back off. Time : 10 minutes.</i> <i>Remarks : Woman labour.</i></p> <p><i>Operation 5 : Mill square. Time : 10 minutes.</i> <i>Remarks : Girl labour.</i></p> <p><i>Operation 6 : Harden. Time : 5 minutes.</i> <i>Remarks : Woman labour.</i></p> <p><i>Operation 7 : Grind diameter. Time : 20 minutes.</i> <i>Remarks : Man labour.</i></p> <p><i>Operation 8 : Grind face and ends. Time : 15 minutes.</i> <i>Remarks : Girl labour.</i></p> <p>(IWM, MUN. VI/43, 1917, p. 86)</p> <p>Notes regarding identification The 'S' of 'Sons' can be seen on the catalogue image of H81</p>
Made by Herbert Hunt & Sons in Old Trafford, Manchester
Noteworthy traces of making Large 3 stamped alongside engraving.

Interpretation H81 is EPH 4750 in the modern IWM collection.
See also Section 4.4.4

8.1.23 EPH 4751

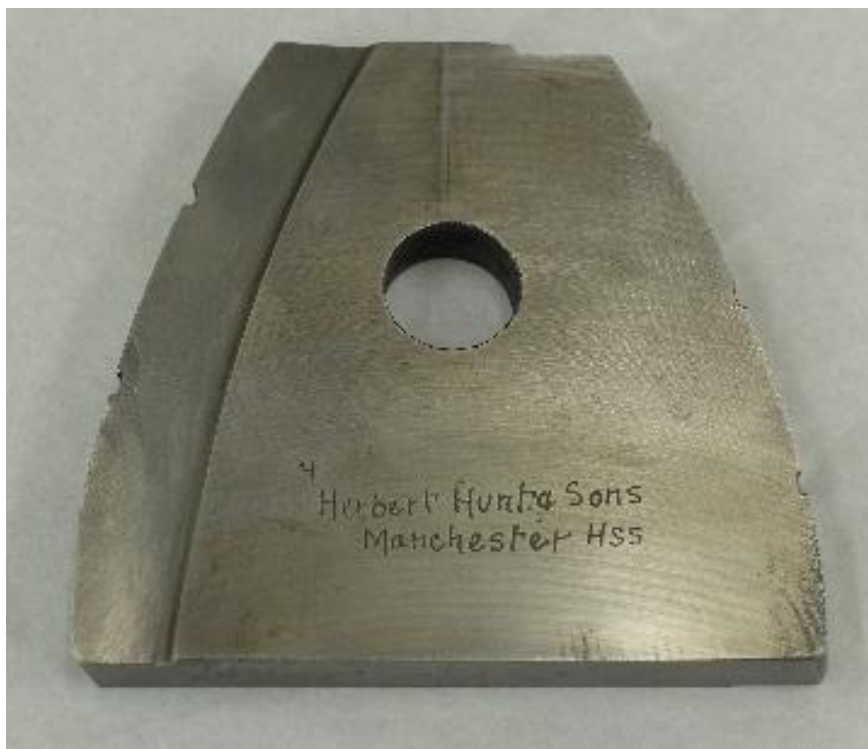



Figure 8.48 EPH 4751 (IWM Duxford)



Figure 8.49 EPH 4751 (IWM Duxford)

Modern Reference EPH 4751

Location IWM Duxford

Date viewed 25/05/2023
Modern description Spade cutter for finish-boring magazine of 60pdr Mk. II/L shrapnel shell
Online catalogue location https://www.iwm.org.uk/collections/item/object/30084679
<p>Online catalogue description</p> <p>Munitions manufacture components made by women workers of Herbert Hunt & Sons in Old Trafford, Manchester. These metal components were used to make rifle cartridge cases and artillery shell cases. Producing them involved using specialist machinery, which needed technical skill to operate.</p> <p>British machine-tool component made during the First World War by women employees of Herbert Hunt and Sons, Manchester for the production of munitions. 'Spade cutters' were used for finish boring the magazines of 60-pounder Mark II/L shrapnel shells.</p> <p>Acquired as part of the original Imperial War Museum's 'Women's Work' collection.</p> <p>Herbert Hunt and Sons was an engineering company based in Old Trafford, Manchester.</p> <p>Dimensions: L: 95mm W: 51mm</p>
<p>Corresponding references in 1917 catalogues</p> <p>6. Spade Cutter (Roughing) for Loose Nose of 6-inch H.E. Mark IV Shell. Fig. 47.</p> <p>(IWM, MUN. VI/43, 1917, p. 81)</p> <p>Notes regarding identification</p> <p>Notes regarding identification: distinct casting blemish on left hand side</p>
Made by Herbert Hunt and Sons, Manchester
Noteworthy traces of making Note  stamped alongside engraving. Curved, lined grinding marks, below hole – 'rainbow' shaped over the horizontal base.
Interpretation H6 is EPH 4751 in the modern IWM collection.
See also Section 4.4.4

8.1.24 EPH 4752



Figure 8.50 EPH 4752 (IWM London)

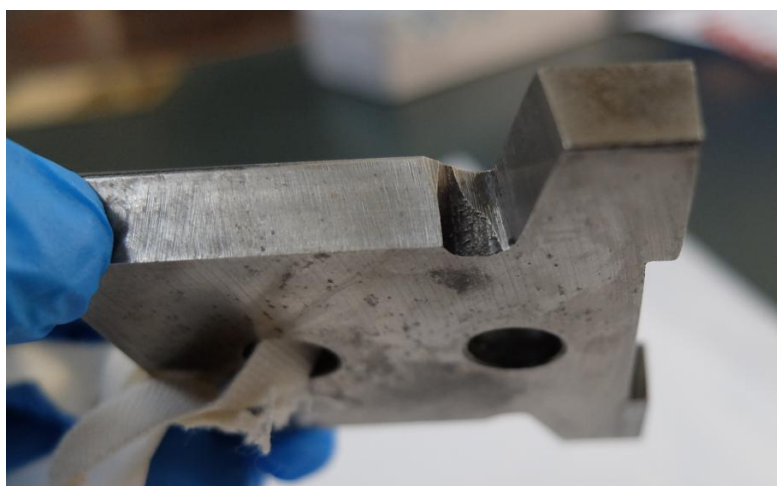


Figure 8.51 EPH 4752 (IWM London)

Modern Reference EPH 4752

Location IWM London

Date viewed 06/10/2021

Modern description Spade cutter (for sizing and coning shell noses)

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30084682>

This website was referenced on 25/11/2021 but is no longer there.

Online catalogue description Physical description: 1 metal spade cutter (L 7cm x W 5.5cm x D 1cm) with engraved markings: 'Herbert Hunt & Sons' / 'Manchester' / 'HSS'.

Label: Munitions manufacture components made by women workers of Herbert Hunt & Sons in Old Trafford, Manchester. These metal components were used to make rifle cartridge cases and artillery shell cases. Producing them involved using specialist machinery, which needed technical skill to operate.

Label: British machine-tool component made during the First World War by women employees of Herbert Hunt and Sons, Manchester for the production of munitions. Spade cutters were utilised for sizing and coning shell noses. Acquired as part of the original Imperial War Museum's 'Women's Work' collection.

Engraved: Herbert Hunt & Sons Manchester HSS

Materials whole: metal

Dimensions whole: 7x5.5x1 cm

Corresponding references in 1917 catalogues

22. Spade Cutter for Sizing and Coning Shell Noses. Fig. 48.

(IWM, MUN. VI/43, 1917, p. 83)

Notes regarding identification

no definitive evidence, but this object was in the same box as other pieces which have been identified in the 1918 Ministry of Munitions catalogue

Made by Herbert Hunt and Sons, Manchester

Noteworthy traces of making Machine tooled steel plate with engraving.

Interpretation H22 is most likely to be EPH 4752 in the modern IWM collection.

See also Section 4.4.4

8.1.25 EPH 4753



Modern Reference EPH 4753

Location IWM London

Date viewed 06/10/2021

Modern description spade cutter (for radiusing base of 4.5in shell)

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30084683>

Online catalogue description Physical description: 1 metal spade cutter (L 7.5cm x W 3.5cm x D 1cm) with engraved markings: 'Herbert Hunt & Sons' / 'Manchester' / 'HSS'.
Label: Munitions manufacture components made by women workers of Herbert Hunt & Sons in Old Trafford, Manchester. These metal components were used to make rifle

cartridge cases and artillery shell cases. Producing them involved using specialist machinery, which needed technical skill to operate.

Label: British machine-tool component made during the First World War by women employees of Herbert Hunt and Sons, Manchester for the production of munitions. This spade cutter was utilised for radiusing the base of 4.5in shells. Acquired as part of the original Imperial War Museum's 'Women's Work' collection.

Engraved: Herbert Hunt & Sons Manchester HSS

Materials whole: metal

Dimensions whole: 7x5.5x1 cm

Corresponding references in 1917 catalogues

17. Spade Cutter for Radiusing Base of 4.5-inch Shell. Fig. 48.

(IWM, MUN. VI/43, 1917, p. 82)

Notes regarding identification

traces of 'H17' can still be seen in the middle at the bottom of the item.

Made by Herbert Hunt & Sons.

Noteworthy traces of making

Interpretation H17 is EPH 4753 in the modern IWM collection.

See also Section 4.4.4

8.1.26 EPH 4754



Figure 8.52 EPH 4754 (IWM London)



Figure 8.53 EPH 4754 (IWM London)

Modern Reference EPH 4754

Location IWM London

Date viewed 06/10/2021

Modern description Front axle swivel pin

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30084684>

Online catalogue description Physical description: 1 steel axle pin (L 17.5cm x diameter 3cm).

Label: Motor vehicle components made by women workers of Crossley Motors Ltd of Gorton, Manchester. These components formed part of the internal workings of motor

vehicles. Crossley Motors supplied vehicles to the British armed forces, including nearly 10,000 for the Royal Flying Corps.

Label: Front axle swivel pin made during the First World War by women employees of Crossley Motors Ltd. The component is associated with the war production processes of 'turning; screwing and centring [sic]; scrolling; drilling and milling '. Acquired (donated by the manufacturer) in March 1918 as part of the original Imperial War Museum's 'Women's Work' collection.

Corresponding references in 1917 catalogues

86. Swivel Pin for Front Axle. Fig. 18.
(a) *Machine*: Jones & Lamson—Turn and screw. *Limit*: 0.001 inch. *Time*: 30 minutes.
(b) *Machine*: Engine Lathe—Scroll. *Time*: 4 minutes.
(c) *Machine*: 4-Spindle Sensitive Drill (Herbert)—Pin drill. *Time*: 10 minutes.
(d) *Machine*: Plain Miller (Ward)—Mill flat. *Time*: 5 minutes.
Remarks: Set up by skilled men, *a* done by boys, *b*, *c* and *d* done by women.

(IWM, MUN. VI/43, 1917, p. 37)

Notes regarding identification

Made by Crossley Motors Ltd

Noteworthy traces of making Single lathed rod

Interpretation EPH 4754 is likely to be O32

See also Section 4.4.7

8.1.27 EPH 4755

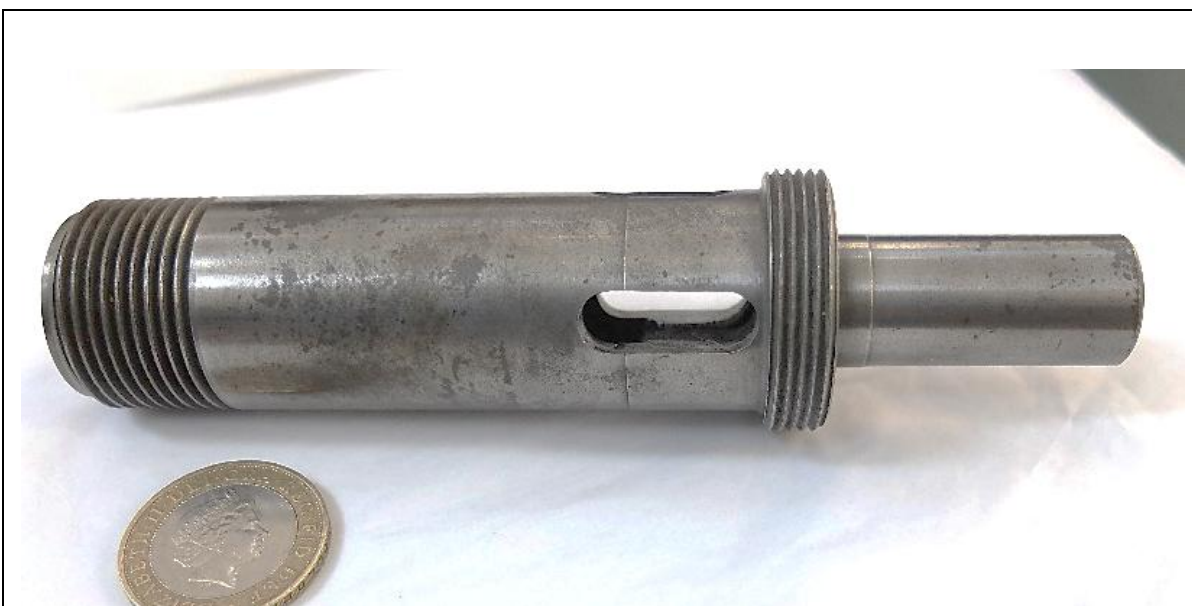


Figure 8.54 EPH 4755 (IWM London)



Figure 8.55 EPH 4755 (IWM London)

Modern Reference EPH 4755

Location IWM London

Date viewed 06/10/2021

Modern description Drill socket for pneumatic tools

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30084685>

Online catalogue description Physical description: Metal drill socket (L 15.5cm x diameter, maximum, 3cm). Metal tube with a narrower metal tube on one end. There are two external screw threads, a narrow one where the narrow tube meets the main tube and a wide one at the opposite end of the main tube.

Label: Drill socket for pneumatic tools made during the First World War by women working in the manufacturing industry on the British Home Front. The item was 'turned from CR steel by female labour except centre lathe operation'. Acquired as part of the original Imperial War Museum's 'Women's Work' collection.

Materials whole: metal

Dimensions whole: 15.5x3 cm

Corresponding references in 1917 catalogues

(GENERAL ENGINEERING—continued.)

12. Drill Socket for Pneumatic Tools. Fig. 81.

- (a) *Machine* : Capstan Lathe—Turning.
- (b) *Machine* : Centre Lathe—Turning.
- (c) *Machine* : Milling.
- (d) *Machine* : Grinding.

Remarks : Turned from C.R. steel by female labour **except centre lathe operation.**

(IWM, MUN. VI/43, 1917, p. 115)

Notes regarding identification

No distinct evidence to conclude that O12 and EPH 4755 are the same items, but were found with others positively identified.

Made by

Noteworthy traces of making

Interpretation O12 is likely to be EPH 4755 in the modern IWM collection.

See also Section 4.4.7

8.1.28 EPH 8717

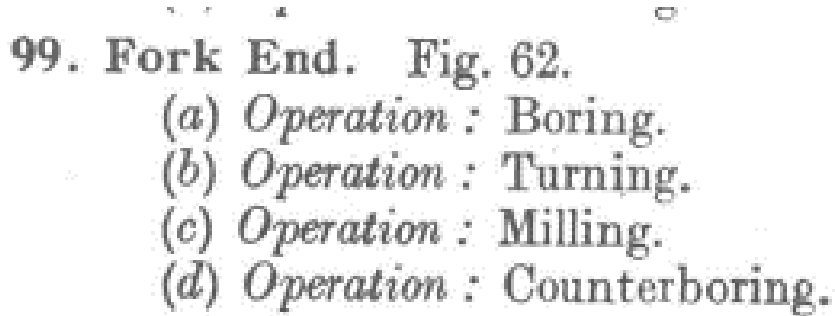


Figure 8.56 EPH 8717 (IWM Duxford)



Figure 8.57 EPH 8717 (IWM Duxford)

Modern Reference EPH 8717

Location IWM Duxford
Date viewed 17/11/2021
Modern description aircraft part ?
Online catalogue location https://www.iwm.org.uk/collections/item/object/30088488
Online catalogue description <p>The top section consists of a metal circular tube with four machine holes which is then fused with two further metal sections projecting outwards both with one machine hole each, the number 661 has been painted on the side.</p> <p>Dimensions: L: 10.1cm W: 5.3cm D: 4.4cm</p>
Corresponding references in 1917 catalogues  <p>(IWM, MUN. VI/43, 1917, p. 97)</p>
Notes regarding identification <p>original reference number L99 still clearly visible on the object</p>
Made by
Noteworthy traces of making Single section (lathed?) (aluminium?) hollow cylinder with open square section at the end. 2 x holes either side of cylinder, each surrounded by 3x puncture marks – for lining up in a machine? Or from where it was fitted as a component? This may be part of a drive shaft that connects to a universal joint - formed from one piece of metal.
Interpretation L99 is EPH 8717 in the modern IWM collection
See also Section 4.4.6

8.1.29 EPH 8718

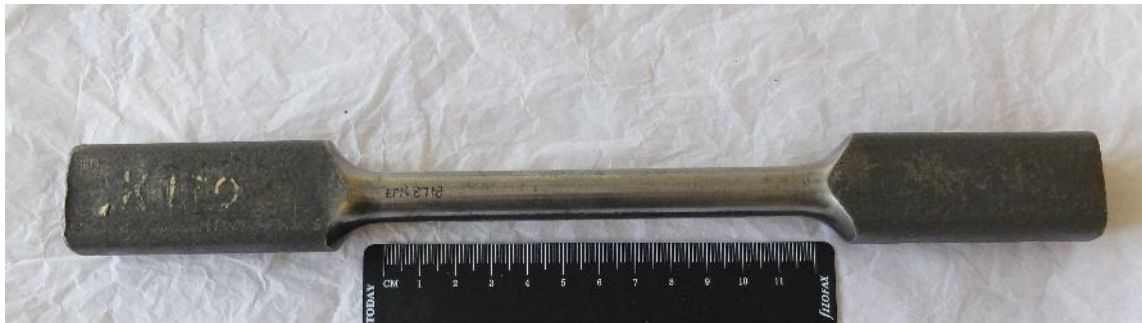


Figure 8.58 EPH 8718 (IWM Duxford)



Figure 8.59 EPH 8718 (IWM Duxford)

Modern Reference EPH 8718

Location IWM Duxford

Date viewed 17/11/2021

Modern description aeroplane part

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30088486>

Online catalogue description

Silver-coloured metal aeroplane component comprising metal rod with flattened ends and hole in each end for fixture

Dimensions: L: 28cm W: 3cm D: 1.7cm

History note: Part of the Women's Work Collection

Corresponding references in 1917 catalogues

performed by women.

- 114, 115. Pair of Shell Test Pieces for Tensile and Compression Testing Purposes. Fig. 53.
116, 117. Pair Shell Tensile and Compression Test Pieces. Fig. 53.
118, 119. French Shell Tensile Test Pieces. Fig. 53.
120, 121. French Rail Tensile Test Pieces. Fig. 53.
122, 123. Fish Plate Tensile Test Pieces. Fig. 53.
124, 125. Rail Tensile Test Pieces. Fig. 53.
126, 127. Rail Tensile Test Pieces. Fig. 53.
128, 129. British Public Tensile Test Pieces. Fig. 53.

(IWM, MUN. VI/43, 1917, p. 89)

Notes regarding identification traces of 'K120' can still be seen on the object

Made by

Noteworthy traces of making The trapezium cross section has saw marks and holes with rough surrounds. This item is not a finished piece.

Interpretation K120 is EPH 8718 in the modern IWM collection.

See also Section 4.4.5

8.1.30 EPH 8756



Figure 8.60 EPH 8756 (IWM Duxford)



Figure 8.61 EPH 8756 (IWM Duxford)

Modern Reference EPH 8756

Location IWM Duxford

Date viewed 25/05/2023
Modern description Spade cutter for base of 4.5-inch HE Mk.V & VII shells
Online catalogue location
<p>Online catalogue description Metal component, described as a spade cutter for a 4.5-inch HE Mark V and Mark VII shell, consists of a metal plate with a groove running along one side, there are two machined holes in the centre, adhesive tape had been attached to the item and has left a residue on the metal.</p> <p>On the associated museum label, it reads 'Time: 57 minutes'</p> <p>Part of a collection of mechanical components made in factories by women in Britain during the First World War.</p> <p>Dimensions: L: 99mm W: 77mm D: 12mm</p>
<p>Corresponding references in 1917 catalogues</p> <p>16. Spade Cutter for Base of 4.5-inch H.E. Marks V and VII Shells. Fig. 48.</p> <p>Operations and machines as given for Exhibit 1. Times as follows: Operation 2, -3 minutes. Operation 1, -4 minutes. Operations 3, 5, 6, 7, 9 and 10, -5 minutes each. Operations 4 and 8, -10 minutes each. Total time, 57 minutes.</p> <p><i>Note:</i> The times given above represent a fair example of actual practice in the factory where the tools are made. Inspection of the cutter takes place after operations 4, 5, 6 and 8. The whole of the above operations are performed by women, including hardening and rectifying.</p> <p>(IWM, MUN. VI/43, 1917, p. 82)</p> <p>Notes regarding identification Distinct 'rhombus' shaped cast mark between holes – identifies it as H16 from Whitechapel catalogue.</p>
Made by
<p>Noteworthy traces of making Distinct 'rhombus' shaped cast mark between holes – identifies it as H16 from Whitechapel catalogue.</p>
Interpretation H16 is EPH 8756 in the modern IWM collection.
See also Section 4.4.4

8.1.31 EPH 8763



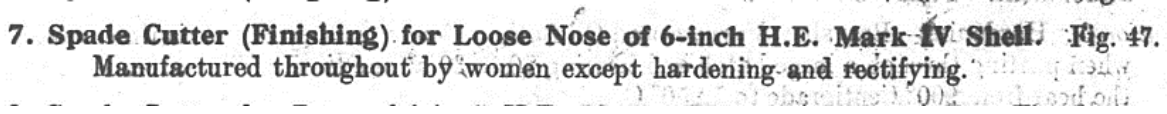
Figure 8.62 EPH 8763 (IWM Duxford)



Figure 8.63 EPH 8763 (IWM Duxford)

Modern Reference EPH 8763

Location IWM Duxford

Date viewed 25/05/2023
Modern description Component, spade cutter
Online catalogue location https://www.iwm.org.uk/collections/item/object/30088544
Online catalogue description <p>Metal component, described as a spade cutter for a loose nose 6-inch HE Mark IV shell, consists of a metal plate with a groove running along one side, there is a machined hole in the centre, adhesive tape had been attached to the item and has left a residue on the metal.</p> <p>Part of a collection of mechanical components made in factories by women in Britain during the First World War.</p> <p>Dimensions: L: 90mm W: 99mm D: 12mm</p>
Corresponding references in 1917 catalogues  <p>7. Spade Cutter (Finishing) for Loose Nose of 6-inch H.E. Mark IV Shell. Fig. 47. Manufactured throughout by women except hardening and rectifying.</p> <p>(IWM, MUN. VI/43, 1917, p. 81)</p>
Notes regarding identification Distinct 'lightning' shaped cast mark between holes – identifies it as H7 from Whitechapel catalogue.
Made by
Noteworthy traces of making Distinct 'lightning' shaped cast mark between holes – identifies it as H7 from Whitechapel catalogue.
Interpretation H7 is EPH 8763 in the modern IWM collection.
See also Section 4.4.4

8.1.32 EPH 8766



Figure 8.64 EPH 8766 (IWM Duxford)

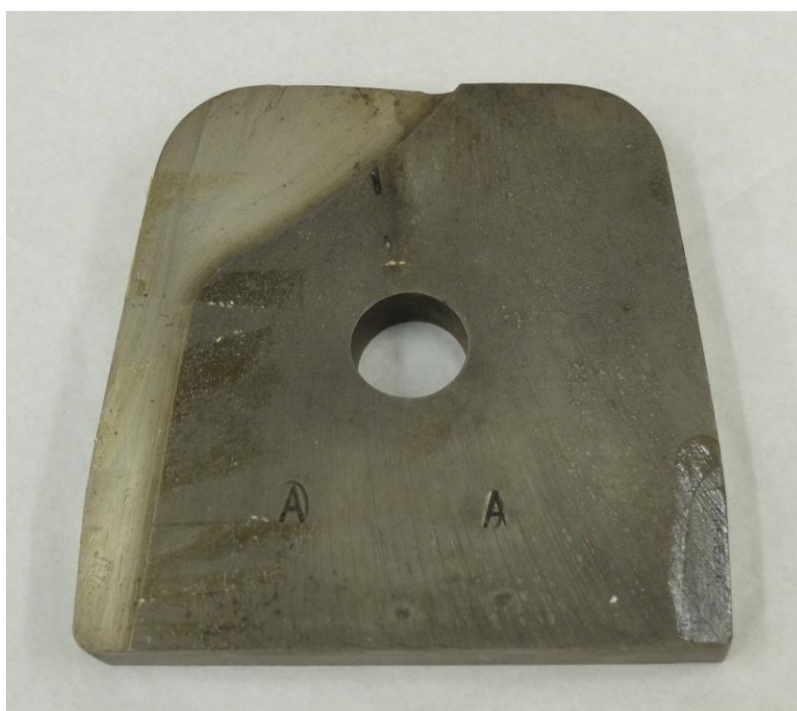
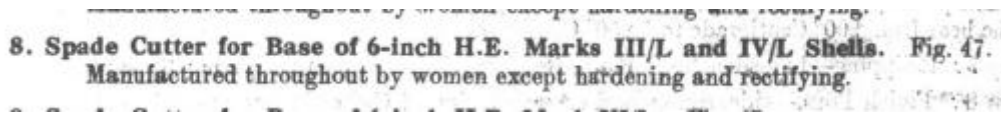


Figure 8.65 EPH 8766 (IWM Duxford)

Modern Reference EPH 8766

Location IWM Duxford

Date viewed 25/05/2023

Modern description Spade cutter for base of 6-inch HE Mk.III/L & IV/L shells
Online catalogue location https://www.iwm.org.uk/collections/item/object/30088538
<p>Online catalogue description Metal component, described as a spade cutter for the base of 6-inch HE Mark III/L and Mark IV/L shells, consists of a metal plate with a groove running along one side, there is a machined hole in the centre, 'A' and 'A' have been engraved on one side, adhesive tape had been attached to the item and has left a residue on the metal.</p> <p>Part of a collection of mechanical components made in factories by women in Britain during the First World War.</p> <p>Dimensions: L: 107mm W:106mm D: 13mm</p>
<p>Corresponding references in 1917 catalogues</p>  <p>(IWM, MUN. VI/43, 1917, p. 81)</p>
<p>Notes regarding identification</p> <p>stamped with the letters 'A' and 'A'</p>
Made by
Noteworthy traces of (A) Stamped on it – circle might be from the stamp.
Interpretation H8 is EPH 8766 in the modern IWM collection.
See also Section 4.4.4

8.1.33 EPH 8767



Figure 8.66 EPH 8767 (IWM Duxford)

Modern Reference EPH 8767

Location IWM Duxford

Date viewed 25/05/2023

Modern description component, spade cutter

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30088545>

Online catalogue description Metal component, described as a spade cutter for a loose nose 6-inch HE Mark IV shell, consists of a metal plate with a groove running along one side, there are two machined holes in the centre, adhesive tape had been attached to the item and has left a residue on the metal.

Part of a collection of mechanical components made in factories by women in Britain during the First World War.

Dimensions: L:99mm W:78mm D:12mm

Corresponding references in 1917 catalogues

Manufactured entirely by women, including hardening.

12. Spade Cutter for Finish Boring Magazine of 60-pounder Mark II/L Shrapnel. Fig. 48.
Manufactured entirely by women, including hardening.

(IWM, MUN. VI/43, 1917, p. 82)

Notes regarding identification this object was stored with other spade cutters which have been positively identified from photographs in the 1918 Ministry of Munitions catalogue.

Made by

Noteworthy traces of making

Interpretation H12 is EPH 8767 in the modern IWM collection.

See also Section 4.4.4

8.1.34 EPH 8768

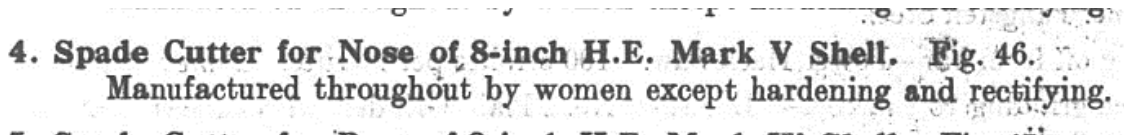


Figure 8.67 EPH 8768 (IWM Duxford)



Figure 8.68 EPH 8768 (IWM Duxford)

Modern Reference EPH 8768

Location IWM Duxford
Date viewed 25/05/2023
Modern description Spade cutter for nose of 8-inch HE Mk.V shell
Online catalogue location https://www.iwm.org.uk/collections/item/object/30088579
<p>Online catalogue description Large metal mechanical component comprising a thick metal plate with two machined holes through centre, there is sticky tape residue on one side of the item where an exhibition label was fixed.</p> <p>Spade cutter for nose of 8 inch H.E. Mark V Shell. Manufactured throughout by women except hardening and rectifying. Part of a collection of mechanical components made in factories by women in Britain during the First World War.</p> <p>Dimensions: L: 205 mm W: 133 mm D: 150 mm</p>
<p>Corresponding references in 1917 catalogues</p>  <p>4. Spade Cutter for Nose of 8-inch H.E. Mark V Shell. Fig. 46. Manufactured throughout by women except hardening and rectifying.</p> <p>(IWM, MUN. VI/43, 1917, p. 81)</p>
Notes regarding identification
Made by
Noteworthy traces of making distinct pitted cast marks along righthand side shown in both images.
Interpretation H14 is EPH 8768 in the modern IWM collection.
See also Section 4.4.4

8.1.35 EPH 8770



Figure 8.69 EPH 8770 (IWM Duxford)



Figure 8.70 EPH 8770 (IWM Duxford)

Modern Reference EPH 8770

Location IWM Duxford

Date viewed 25/05/2023

Modern description Spade cutter for base of three inch H.E. Shell

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30088576>

Online catalogue description

Small metal mechanical component comprising a metal plate with machined hole through centre, there is sticky tape residue on one side of the item where an exhibition label was fixed.

Spade cutter for base of three inch H.E. Shell. Part of a collection of mechanical components made in factories by women in Britain during the First World War

Dimensions: L: 56 mm W: 45 mm D: 9mm

Corresponding references in 1917 catalogues

20. Spade Cutter for Base of 3-inch H.E. Shell. Fig. 48.
Manufactured entirely by women, including hardening.

(IWM, MUN. VI/43, 1917, p. 83)

Notes regarding identification

similar shaped casting blemishes along righthand side to H20

Made by**Noteworthy traces of making**

Interpretation H20 is EPH 8770 in the modern IWM collection.

See also Section 4.4.4

8.1.36 EPH 8771



Figure 8.71 EPH 8771 (IWM Duxford)



Figure 8.72 EPH 8771 (IWM Duxford)

Modern Reference EPH 8771

Location IWM Duxford

Date viewed 25/05/2023
Modern description Spade cutter for base of 9.2-inch HE Mk.X/L shell
Online catalogue location https://www.iwm.org.uk/collections/item/object/30088578
<p>Online catalogue description Large metal mechanical component comprising a thick metal plate with machined hole through centre, also with following partly illegible inscriptions "...NEW CAPITAL" and "B R? There is cellotape residue on one side of the item where an exhibition label was fixed</p> <p>Spade cutter for base of 9.2 inch H.E. Mark X/L Shell. All ten operations by women except hardening and rectifying. Time: 1½ hours. Part of a collection of mechanical components made in factories by women in Britain during the First World War.</p> <p>Dimensions : L: 165 mm W: 175 mm D: 17 mm</p>
<p>Corresponding references in 1917 catalogues</p> <p style="text-align: center;">GROUP H.</p> <p style="text-align: center;">TOOL ROOM WORK (DRILLS, CUTTERS, &c.).</p> <p>1. Spade Cutter for Base of 9.2-inch H.E. Mark X/L Shell. Fig. 46.</p> <p><i>Material</i> : 18 per cent. Tungsten steel.</p> <p><i>Operation 1</i> : Cutting off from bar—Power Hack Saw. 100 strokes per minutes. <i>Time</i> : 10 minutes.</p> <p><i>Operation 2</i> : Drilling holes. <i>Time</i> : 10 minutes.</p> <p><i>Operation 3</i> : Surface grinding to thickness—Lumsden No. 2 Plain Grinder with surfacing attachment <i>Time</i> : 15 minutes.</p> <p><i>Operation 4</i> : Rough forming—Lumsden No. 2 Oscillating Grinder with roller former. <i>Time</i> : 30 minutes.</p> <p><i>Operation 5</i> : Rough lip and thin point (both sides) Lumsden No. 2 Plain Grinder with special attachment. <i>Time</i> : 10 minutes.</p> <p><i>Operation 6</i> : Hardening—Brayshaw Furnace and Salt Bath. <i>Time</i> : 10 minutes.</p> <p><i>Operation 7</i> : Relipping—Lumsden No. 2 Plain Grinder with special attachment.</p> <p><i>Operation 8</i> : Finish forming—Lumsden No. 2 Oscillating Grinder with roller former. <i>Time</i> : 30 minutes.</p> <p><i>Operation 9</i> : Cross pointing—Special Grinding Machine. <i>Time</i> : 10 minutes.</p> <p><i>Operation 10</i> : Rectifying—Lumsden No. 2 Oscillating Grinder. <i>Time</i> : 10 minutes.</p> <p><i>Note</i> : The times given above represent a fair example of actual practice in the factory where the tools are made. Inspection of the cutters takes place after operations 4, 5, 6 and 8. The whole of the above operations are performed by women, with the exception of hardening and rectifying.</p> <p>(IWM, MUN. VI/43, 1917, p. 83)</p>
Notes regarding identification
Made by
Noteworthy traces of making
Interpretation H1 is EPH 8871 in the modern IWM collection
See also Section 4.4.4

8.1.37 EPH 8778



Figure 8.73 EPH 8778 (IWM Duxford)



Figure 8.74 EPH 8778 (IWM Duxford)

Modern Reference EPH 8778

Location IWM Duxford

Date viewed 25/05/2023

Modern description component cylinder gauge

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30088562>

Online catalogue description Physical description: Metal component, described as a cylinder gauge for a shell 8.L 60-pounder, it consists of a circular metal hollow shape with a solid base, there are two brass lined circular holes on the sides opposite each other, the number '842' appears on the outside of the base, and the figures 'F', '6', 'K' and 'J' framed in a box appear on the interior.

History note: Part of a collection of mechanical components made in factories by women in Britain during the First World War.

Engraved: 842

Inscription: F

Inscription: 6

Inscription: K

Inscription: J

Corresponding references in 1917 catalogues

The order to which ready for Operation 3 under cognate.

223. Piston (110 h.p. Le Rhône). Part No. 6068. Fig. 6.

Material : Die casting in aluminium (special). Weight of casting : 2 lbs. 2½ ozs. Weight of finished piston (with bushes, no piston rings) : 840 grammes plus or minus 10 grammes equals 1.85 lbs.

Operation 1 : Turn outside and groove complete—Potter and Johnson Automatic Machine. Woman labour under supervision of male, skilled, setter-up. *Time* : 15 minutes. *Limits* : Diameter plus 0.05 mm. minus 0.0 mm. Length plus or minus 0.2 mm. Grooves, diameter plus or minus 0.1 mm. Width, plus or minus 0.02 mm.

Operation 2 : Bore and recess for gudgeon pin. Centre lathe. Semi-skilled man. *Time* : 15 minutes. *Limits* : Jig.

Operation 3 : Drill 5 oil holes—Herbert Sensitive Drilling Machine. Woman labour. *Time* : 5 minutes. *Limits* : Jig.

Operation 4 : Mill clearance in skirt—Small Milling Machine. Semi-skilled man. *Time* : 4 minutes. *Limits* : Jig.

Operations 5 and 6 : Fit bushes. Drill holes in bush, and grub screw holes. Bench, skilled man. *Time* : 1 hour.

Operation 7 : Bore and reamer gudgeon pin bushes—Centre Lathe. Skilled man. *Time* : 15 minutes. *Limits* : Plus 0.12 mm. minus 0.08 mm.

Remarks : Women also do work on pistons in fitting shop, such as reamer gudgeon pin holes, grinding in gudgeon pins, fitting grub screw, securing bush, &c. They work under the supervision of skilled men who give any help that may be required.

(IWM, MUN. VI/43, 1917, p. 25)

Notes regarding identification

N.B. This additional text is not found in (IWM, LBV 16242, 1918), although Fig 6 is (IWM, LBV 16242, 1918, fig. 6).

EPH 8778 has W101 painted on it.

Made by

Noteworthy traces of making 842 stamped on topside J, K and 6 stamped on underside.

Interpretation. EPH 8778 cannot be found in the 1917 catalogues but has a different code on it 'W110' from another collection.

See also Section 4.4.1

8.1.38 EPH 8876



Figure 8.75 EPH 8876 (IWM Duxford)



Figure 8.76 EPH 8876 (IWM Duxford)

Modern Reference EPH 8876

Location IWM Duxford

Date viewed 25/05/2023

Modern description Component cartridge container for Stokes Shell

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30088701>

<p>Online catalogue description Cartridge container for 3 Inch and 4 Inch Stokes Shell, comprising steel cylinder with machined hole bored through centre and a total of twelve smaller machined holes bored at regular intervals around the sides.</p> <p>Cartridge Container for 3 Inch and 4 Inch Stokes Shell. All operations performed by women supervised by men. A container taken direct from machine to machine could be finished completely in 10 minutes. Part of the Women's Work collection of aircraft and vehicle components manufactured by women during the First World War.</p> <p>Dimensions : L: 72 mm Dia: 32 mm</p>
<p>Corresponding references in 1917 catalogues</p> <p>Notes regarding identification</p>
<p>Made by</p>
<p>Noteworthy traces of making</p>
<p>Interpretation</p>
<p>See also</p>

8.1.39 EPH 8903



Figure 8.77 EPH 8903 (IWM Duxford)

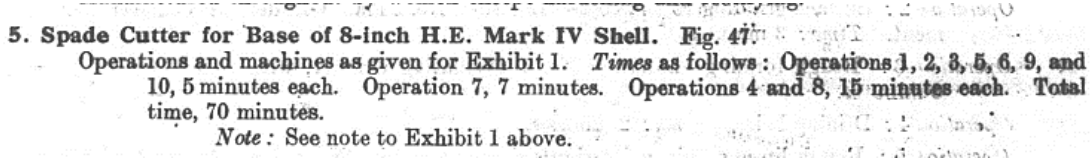


Figure 8.78 EPH 8903 (IWM Duxford)

Modern Reference EPH 8903

Location IWM Duxford

Date viewed 25/05/2023

Modern description Spade cutter for base of 8-inch HE Mk.IV shell
Online catalogue location https://www.iwm.org.uk/collections/item/object/30088655
<p>Online catalogue description Metal mechanical component comprising a thick metal square-shaped plate with two rounded corners, there are shaped grooves on both sides and adhesive tape residue on one side of the item where an exhibition label was fixed.</p> <p>Spade cutter for base of 8 inch H.E. Mark IV Shell. All ten operations by women except hardening and rectifying. Time: 70 minutes. Part of a collection of mechanical components made in factories by women in Britain during the First World War.</p> <p>Dimensions : 130 mm x 105 mm x 15 mm</p>
<p>Corresponding references in 1917 catalogues</p>  <p>5. Spade Cutter for Base of 8-inch H.E. Mark IV Shell. Fig. 47. Operations and machines as given for Exhibit 1. Times as follows : Operations 1, 2, 3, 5, 6, 9, and 10, 5 minutes each. Operation 7, 7 minutes. Operations 4 and 8, 15 minutes each. Total time, 70 minutes. Note : See note to Exhibit 1 above.</p> <p>(IWM, MUN. VI/43, 1917, p. 81)</p>
Notes regarding identification stamped with the letters 'A' and 'A'
Made by
Noteworthy traces of making stamped with the letters 'A' and 'A'
Interpretation H5 is EPH 8903 in the modern IWM collection.
See also Section 4.4.4

8.1.40 EPH 8911



Figure 8.79 EPH 8911 (IWM Duxford)



Figure 8.80 EPH 8911 (IWM Duxford)

Modern Reference EPH 8911

Location IWM Duxford

Date viewed 25/05/2023

Modern description Spade cutter for nose of 9.2-inch HE Mk. V/L shell

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30088659>

Online catalogue description Metal mechanical component comprising a thick metal triangular plate with shaped groove along one side, there are remnants of adhesive tape on the surface where an exhibition label was fixed.

Spade cutter for nose of 9.2 Inch H.E. Mark V/L Shell (half-cutter for adjustable boring head). Manufactured throughout by women except hardening and rectifying. Part of a

collection of mechanical components made in factories by women in Britain during the First World War.

Dimensions : L: 245 mm W: 60 mm D: 15 mm

Corresponding references in 1917 catalogues

3. Spade Cutter for Nose of 9.2-inch H.E. Mark V/L Shell (Half-Cutter for Adjustable Boring Head). Fig. 46.
Manufactured throughout by women except hardening and rectifying.

(IWM, MUN. VI/43, 1917, p. 81)

Notes regarding identification

Made by

Noteworthy traces of making a distinct casting blemish along the straight edge can be seen in both images

Interpretation H3 is EPH 8911 in the modern IWM collection

See also Section 4.4.4

8.1.41 EPH 8912



Figure 8.81 EPH 8912 (IWM Duxford)



Figure 8.82 EPH 8912 (IWM Duxford)

Modern Reference EPH 8912

Location IWM Duxford

Date viewed 25/05/2023

Modern description Spade cutter for base of 6-inch HE Mk.VI/L shell
Online catalogue location
<p>Online catalogue description Metal mechanical component comprising a thick rectangular metal plate with rounded corners, a lozenge shaped machined hole is bored through the centre, complete with inscription reading "Herbert Hunt & Sons, Manchester", there is cellotape residue on one side of the item where an exhibition label was fixed.</p> <p>Munitions manufacture components made by women workers of Herbert Hunt & Sons in Old Trafford, Manchester. These metal components were used to make rifle cartridge cases and artillery shell cases. Producing them involved using specialist machinery, which needed technical skill to operate.</p> <p>Spade cutter for base of 6 inch H.E. Mark VI/L. Manufactured throughout by women.</p> <p>Time: 2 hours. Part of a collection of mechanical components made in factories by women in Britain during the First World War.</p> <p>Dimensions : 105mm x 90mm x 12mm</p>
<p>Corresponding references in 1917 catalogues</p> <p>9. Spade Cutter for Base of 6-inch H.E. Mark VI/L. Fig. 47. Manufactured throughout by female labour, including hardening and grinding. The cutter is ground on all cutting edges and not finished to form by file. The following are the approximate times for the various manufacturing operations, (a) All milling operations, 70 minutes. (b) Hardening, 10 minutes. (c) All grinding operations, 40 minutes.</p> <p>(IWM, MUN. VI/43, 1917, p. 79)</p> <p>Notes regarding identification remains of 'H9' on bottom right hand corner</p>
Made by Herbert Hunt & Sons in Old Trafford, Manchester
Noteworthy traces of making
Interpretation EPH H9 is EPH 8912 in the modern IWM collection.
See also Section 4.4.4

8.1.42 EPH 8913

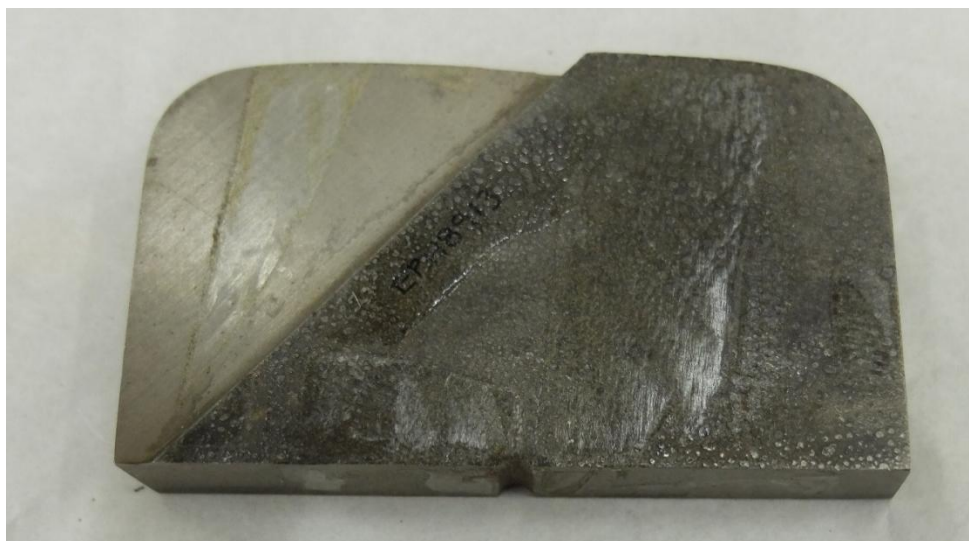


Figure 8.83 EPH 8913 (IWM Duxford)



Figure 8.84 EPH 8913 (IWM Duxford)

Modern Reference EPH 8913

Location IWM Duxford

Date viewed 25/05/2023

Modern description Spade cutter for base of 4.7-inch HE Mk. Ia/L shell

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30088639>

Online catalogue description Metal mechanical component comprising of a thick rectangular metal plate with rounded corners, there is cello tape residue on one side of the item where an exhibition label was fixed.

Spade cutter for base of 4.7 inch H.E. Mark Ia/L shell. Part of a collection of mechanical components made in factories by women in Britain during the First World War.

Dimensions : 80mm x 47mm x 13mm

Corresponding references in 1917 catalogues

14. Spade Cutter for Base of 4.7-inch H.E. Mark Ia/L Shell. Fig. 48.
Manufactured entirely by women, including hardening.

(IWM, MUN. VI/43, 1917, p. 82)

Notes regarding identification trace of "H14" can be seen in bottom left hand corner

Made by

Noteworthy traces of making

Interpretation H14 is EPH 8913 in the modern IWM collection.

See also Section 4.4.4

8.1.43 EPH 10201



Modern Reference EPH 10201

Location IWM Duxford

Date viewed 17/11/2021

Modern description Four pieces of chronometer chain and unformed links - a bit like a small bicycle chain.

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30105310>

Online catalogue description Four pieces of a silver-coloured metal chronometer chain made by women workers, the chain pieces are mounted with wire on a thin card mount.

Corresponding references in 1917 catalogues

GROUP P—*continued*.
(OPTICAL MUNITIONS—*continued*.)
12. Chronometer Chain made entirely by Women—Processes Shown. Fig. 90.

(IWM, MUN. VI/43, 1917, p. 127)

Notes regarding identification the underside of the cardboard upon which the chains are mounted has 'W806' painted on it.

Made by Thomas Mercer & Sons

Noteworthy traces of making Possible hammer/press marks between riveted links.

Interpretation EPH 10201 is similar to P12, but a different example because is marked as 'W306'

See also Section 4.4.8

8.1.44 EPH 10894

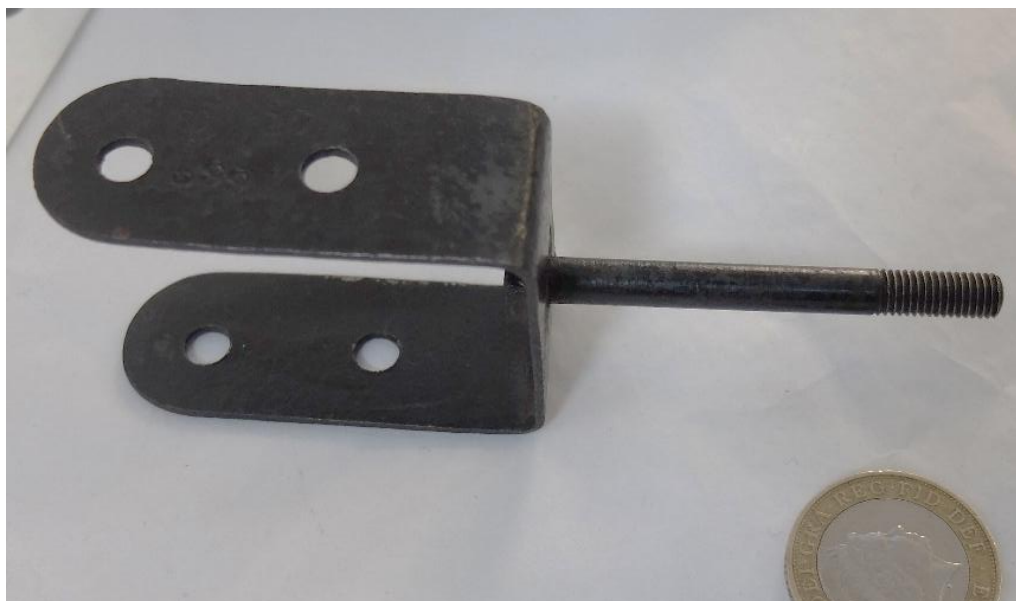


Figure 8.85 EPH 10894 (IWM London)



Figure 8.86 EPH 10894 (IWM London)

Modern Reference EPH 10894

Location IWM London

Date viewed 06/10/2021

Modern description bracket metal

Online catalogue location <https://www.iwm.org.uk/collections/item/object/30112499>

Online catalogue description

Physical description: Black painted metal aircraft component, the component is U-shaped with a pair of machined holes along the two opposing sides, there is a further machined hole at the bottom of the 'U' which has a long threaded bolt soldered through it, the component is stamped along one outside edge with the following markings 'SD 17 5991'.

History note: Metal aircraft component, which forms part of the Women's Work collection.

Inscription: SD 17 5991

Corresponding references in 1917 catalogues**Notes regarding identification****Made by**

Noteworthy traces of making Pressed bracket. The bolt in the hole is welded into position.

Interpretation**See also**

8.2 Appendix Two: IWM Image Copyright Permissions



CLEARING COPYRIGHT FOR MATERIAL IN THE RESEARCH ROOM

Any images taken on a digital camera during your visit are for reference use only. Please contact imagesales@iwm.org.uk should you wish to order high quality scans or photographs of collection material for publication in a book, article or website, or broadcast via television or film.

The Copyright, Designs and Patents Act 1988, as amended and revised (CDPA) states that copyright lasts for 70 years after the death of an author, although if they died before 1969 their private papers will remain in copyright until 31 December 2039. Revisions to the copyright law in 2014 now allow certain types of "Fair Dealing" copying activities. These include copying of all copyright materials for non-commercial research or private study. Also the use of quotations without specific permission as long as the quote is: published, short, used genuinely for the purposes of quotation, necessary and relevant to illustrate a point, used fairly and reasonably, does not form the main basis of a commercial activity, and there is sufficient acknowledgement of the author and title. For longer quotes such as sizeable paragraphs, multiple letters, or chapters of memoirs, permission will still need to be sought. More about this and the other exceptions to copyright can be found here: <https://www.gov.uk/guidance/exceptions-to-copyright>.

It is your responsibility to ensure that any copying of in-copyright works is carried out legitimately in accordance with the legislation.

Most of the material in the Research Room falls under the following categories:

• Private papers • Oral history recordings • Photographs • Books • IWM's own Archive and the War Artists' Archive

Private papers and Oral history recordings

These include letters, journals, diaries and sound recordings. For the majority of these collections, copyright is held by the original authors, interviewees or their legal heirs and is covered by the CDPA. It is a condition of access to the collections that the permission of each copyright holder must be obtained before significant extracts from them can be published in a book, article or website, or broadcast via television, film or radio. For further information please contact imagesales@iwm.org.uk.

Photographs & Books

The majority of these collection are **NOT** IWM copyright and are covered by the CDPA. Clearing copyright permissions is the responsibility of the user, not the Museum.

IWM's own Archive, the War Artists' Archive,

This includes material from the Museum Archive as well as artists' illustrated journals and correspondence. Although the copyright for a significant proportion of this material belongs to IWM, in many cases, especially when material does not originate with IWM, the copyright belongs to the original authors or their legal heirs and is covered by the CDPA. If you wish to publish significant extracts from our archives in a book, article or website, or broadcast via television, film or radio, please contact imagesales@iwm.org.uk for the War Artists' Archive or foi@iwm.org.uk for the Museum Archive (for permissions and further information.)

Figure 8.87 Clearing copyright for material in the IWM Research Room

DIGITAL COPYING – PAYMENT MADE

VALID ALL DAY

Place this card where it is clearly visible while you are making copies at your desk

NO FLASH ! NO SHUTTER SOUNDS !

HAVE YOU SIGNED A USER REGISTRATION FORM ? WE ASK ALL FIRST-TIME USERS TO DO THIS – IT SETS OUT THE RESEARCH ROOM RULES

DIGITAL COPYING IS ONLY PERMITTED IN THE RESEARCH ROOM

SEE ALSO:

- Reverse of this Card – GUIDANCE ON USING COPYING SUPPORTS
- Separate Sheet handed to you with this card – CLEARING COPYRIGHT FOR MATERIAL IN THE RESEARCH ROOM
- Posters displayed in the Research Room – NOTING COPYRIGHT ISSUES

PLEASE RETURN CARD TO DESK AT THE END OF THE DAY

Figure 8.88 Payment made for digital copying IWM

9 References

9.1 IWM London Women's War Work Archive

9.1.1 Catalogues

IWM, MUN. VI/39 (1917)

IWM, MUN. VI/40 (1917).

IWM, MUN. VI/41 (1918).

IWM, MUN. VI/42 (1918).

IWM, MUN. VI/43 (1917).

IWM, MUN. VI/44 (1917).

IWM, LBY 2240 (1918).

IWM, LBY 16242 (1918). Ministry of Munitions, Labour Supply Department.

RA, MLPAM C8926 A21429 (1919).

9.1.2 Correspondence

IWM, MUN 1/3 Correspondence Re Burlington House (1917).

IWM, ENI/1/COM/24/2 Draft letter to firms on list (1917).

IWM, ENI/3/GEN/10 Letter to ffoulkes from Bicknell re Woman Representative Munition Making (1917).

IWM, ENI/3/MUN/2/4 Letter from Lady Norman to Ben Morgan (1917).

IWM, ENI/3/MUN/2/4 Letter from Lady Norman to Galbraith (1917).

IWM, ENI/3/MUN/2/4 Letter from Galbraith (1917).

IWM, ENI/3/MUN/2/4 Letter from McLaren to Galbraith accepting Cunard shells (1917).

IWM, ENI/3/MUN/2/4 Letter from McLaren to Lady Norman (1917).

IWM, ENI/3/MUN/2/4 Letter from Miss Monkhouse to Lady Norman (1917).

IWM, ENI/3/COR/1 Memoranda to Col. Stansfeld from Director General 15th June (1917).

IWM, ENI/3/GEN/4 Letter from Agnes Conway to Ben H. Morgan 7th July (1917).

IWM, ENI/3/GEN/4 Letter from Ben H. Morgan to Agnes Conway 12th July (1917).

IWM, ENI/3/COR/1 Letter from J.R. Stansfeld to Lady Norman 29th August (1917).

IWM, ENI/3/COR/1 Letter from Lady Norman to J.R. Stansfeld 12th September (1917).

IWM, ENI/3/COR/1 Letter from J.R. Stansfeld to Lady Norman 24th November (1917).

IWM, MUN. 1/2 Letter from Lady Norman to Col Stansfeld 26th November (1917).

IWM, ENI/1/COM/24/2 Letter to Col. Stansfeld from Agnes Conway 8th December (1917).

IWM, ENI/1/COM/24/2 Letter to Lady Norman to Col. Stansfeld 3rd December (1917).

IWM, ENI/3/MUN/2/4 Letter of thanks Lady Norman (1918).

IWM, ENI/3/COR/2/1, Memo to ffoulkes from Conway 6th Jan (1918).

IWM, ENI/3/COR/2/1 Letter from Agnes Conway to Charles ffoulkes 19th July (1918).

IWM, 01/15/3&3A Letter to Lady Mond 15th Dec (1920).

IWM, 01/15/3&3A, Letter to Miss Monkhouse 16th Dec (1920).

IWM, 01/15/3&3A, Letter to Lady Norman 13th Dec (1939).

IWM, EN2/1/WOM/002 Letter from L. R. Bradley (1940).

IWM, 01/15/3&3A, Letter to Lady Norman 26th Sept (1940).

IWM, 01/15/3&3A, Letter from Bradley 1st Feb (1941).

IWM, 01/15/3&3A, Letter to Lady Norman 16th Jul (1941).

IWM, 01/15/3&3A Letter to Lady Norman 26th Feb (1942).

IWM, 01/15/3&3A Letter to Lady Norman 23rd Nov (1960).

IWM, 01/15/3&3A, Letter to Frankland 2nd Sept (1962).

IWM, 01/15/3&3A, Letter to Lady Norman 12th Mar (1963).

IWM, GB62 Letter re Lady Norman's death 13th March (1964).

9.1.3 Documents

IWM, B.S. 28/5 London: Ministry of Munitions, Labour Supply Department (1916).

IWM, ENI/1/COM/24/2 Permanent Memorial To Women's Work On Engineering Munitions (1917).

IWM, ENI/3/COR/24/2 Report from Women's Section May 1st to September 20th (1917).

IWM, ENI/3/COR/24/2 Report from Women's Section May 1917 to February 1918.

IWM, MUN. 1/7 List Of Munition Gifts Received/Not Received/Refused/Unanswered (1918)

9.1.4 Publications

IWM, MUN. VI/13 (1916) *Dilution of Labour Bulletin*, 1(1).

IWM, MUN. VI/17 (1916) *Dilution of Labour Bulletin*, 1(1).

IWM, MUN. VI/17 (1917) *Dilution of Labour Bulletin*, 1(4).

IWM, MUN. VI/16 (1917) *Dilution of Labour Bulletin*, 1(4).

IWM, MUN. VI/17 (1917) *Dilution of Labour Bulletin*, 1(5).

IWM, MUN. VI/17 (1917) *Dilution of Labour Bulletin*, 1(6)..

IWM, MUN. VI/17 (1917) *Dilution of Labour Bulletin*, 1(6).

IWM, MUN. VI/17 (1917) *Dilution of Labour Bulletin*, 1(9).

IWM, MUN. VI/17 (1917) *Dilution of Labour Bulletin*, 1(3)..

IWM, MUN. VI/18 (1917) *Dilution of Labour Bulletin*, 1(6)..

IWM MUN. VI/20 (1917) *Dilution of Labour Bulletin*, 1(6).

IWM, MUN. VI/17 (1917) *Dilution of Labour Bulletin*, 1(5).

9.1.5 WWSC Minutes

IWM, EN1/3/COR/1 WWSC Minutes 10th May (1917).

IWM, EN1/3/COR/1 WWSC Minutes 17th May (1917).

IWM, EN1/3/GEN/10 WWSC Minutes 25th April (1918).

IWM, EN1/3/GEN/10 WWSC Minutes 15th Aug (1918).

IWM, EN1/3/GEN/10 WWSC Minutes 12th Sept (1918).

IWM, EN1/3/GEN/10 WWSC Minutes 9th Oct (1918).

IWM, EN1/3/GEN/10 WWSC Minutes 14th Dec (1918).

IWM, EN1/3/GEN/10 WWSC Minutes 23rd Sept (1919).

9.2 Women, War and Society, 1914-1918 Archive: Gale Primary Sources online

9.2.1 Correspondence: deaths of munition workers

Correspondence Re Deaths Of Munition Workers And The Depositing Of Photographs. Roll Of Honour Of Munition Workers. Munitions. 24/10/1919. MS Women, War and Society, 1914-1918 MUN. 34.2/5. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141770/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Correspondence Re Deaths Of Munition Workers And The Depositing Of Photographs. Roll Of Honour Of Munition Workers. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 34.2/6. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141771/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Correspondence Re Deaths Of Munition Workers And The Depositing Of Photographs. Roll Of Honour Of Munition Workers. Munitions. 29/07/1918. MS Women, War and Society, 1914-

1918 MUN. 34.2/7. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141773/GDSC?u=iwm&sid=bookmark-GDSC&pg=2. Accessed 20 July 2023.

Correspondence Re Deaths Of Munition Workers And The Depositing Of Photographs. Roll Of Honour Of Munition Workers. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 34.2/9. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141778/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Correspondence Re Deaths Of Munition Workers And The Depositing Of Photographs. Roll Of Honour Of Munition Workers. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 34.2/10. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141779/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Correspondence Re Deaths Of Munition Workers And The Depositing Of Photographs. Roll Of Honour Of Munition Workers. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 34.2/11. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141781/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Correspondence Re Deaths Of Munition Workers And The Depositing Of Photographs. Roll Of Honour Of Munition Workers. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 34.2/12. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141782/GDSC?u=iwm&sid=bookmark-GDSC&pg=2. Accessed 20 July 2023.

Correspondence Re List Of Girl Workers Who Have Died. Roll Of Honour Of Munition Workers. Munitions. 11 Sept. 1918. MS Women, War and Society, 1914-1918 MUN. 34.2/13. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141784/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Extract From Press Cutting. Roll Of Honour Of Munition Workers. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 34.2/20. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141796/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

List Of Workers To Whom Fatal Accidents Occurred Up To November. Roll Of Honour Of Munition Workers. Munitions. 18 Nov. 1918. MS Women, War and Society, 1914-1918 MUN. 34.2/14. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141785/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Munition Workers Who Lost Their Lives Through Explosions. Roll Of Honour Of Munition Workers. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 34.2/18. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141792/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Names And Addresses Of Workers Who Met With Fatal Accidents. Roll Of Honour Of Munition Workers. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 34.2/15. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141786/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Names Of Munition Workers Who Have Died From TNT Poisoning. Roll Of Honour Of Munition Workers. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 34.2/21. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141797/GDSC?u=iwm&sid=bookmarkGDSC&pg=1. Accessed 20 July 2023.

Names And Addresses Of Writers Who Have Died Of Poisoning During War Work. Roll Of Honour Of Munition Workers. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 34.2/16. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141789/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

9.2.2 Exhibition administration

Check List Of Firms. General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions. n.d. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London MUN. 1/6. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075743/GDSC?u=iwm&sid=bookmark-GDSC&xid=2ea74a5b&pg=1. Accessed 18 May 2022.

Circular Letter Re Collection Of Material For A Permanent Exhibition. General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions. 23 Oct. 1917. MS Women, War and Society, 1914-1918 MUN. 1/2. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075737/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 28 Feb. 2023.

Correspondence Re Exhibition At Burlington House. General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions. n.d. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London MUN. 1/3. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075738/GDSC?u=iwm&sid=bookmark-GDSC&xid=848d9a4d&pg=1. Accessed 18 May 2022.

Correspondence Re Photograph Album. Armstrong Whitworth And Co. Welfare Work. Munitions. 18 Feb. 1919. MS Women, War and Society, 1914-1918 MUN. 24/14. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141351/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Correspondence Re Photographs Of Women Employed In The Yard. Shipbuilding: Harland And Wolff Ltd. Munitions. 1 July 1918. MS Women, War and Society, 1914-1918 MUN. 35.1/2. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141801/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Correspondence Re Purchase Of A Picture. Armstrong Whitworth And Co. Welfare Work. Munitions. 18 Dec. 1919. MS Women, War and Society, 1914-1918 MUN. 24/13. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141350/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Draft List Of Firms To Be Invited To Present Specimens Of Women's Work. General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 1/4. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075740/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 28 Feb. 2023.

Draft Of Scheme. *General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions*. n.d. MS Women, War and Society, 1914-1918 MUN. 1/14. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075755/GDSC?u=iwm&sid=bookmark-GDSC&pg=2. Accessed 20 July 2023.

List Of Exhibits That Are Not Accompanied By Additional Information. General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 1/8. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075746/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

List Of Exhibits With Technical Descriptions In Files. General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 1/9. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075747/GDSC?u=iwm&sid=bookmarkGDSC&pg=1. Accessed 20 July 2023.

List Of Munition Exhibits Presented To The Women's Section Of The Imperial War Museum By Various Firms. General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 1/20. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075804/GDSC?u=iwm&sid=bookmark-GDSC&pg=8. Accessed 20 July 2023.

List Of Munition Exhibits Presented To The Women's Section Of The Imperial War Museum By Various Firms. General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions. n.d. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London MUN. 1/21. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075822/GDSC?u=iwm&sid=bookmark-GDSC&xid=a47c98e5&pg=1. Accessed 11 Feb. 2022

List Of Munition Exhibits Presented To The Women's Section Of The Imperial War Museum By Various Firms. General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions. n.d. MS Women, War and Society, 1914-1918: The

Women at Work Collection, Imperial War Museum, London MUN. 1/22. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075840/GDSC?u=iwm&sid=bookmark-GDSC&xid=0c9efcc0&pg=1. Accessed 11 Feb. 2022.

List Of Munition Gifts Received/Not Received/Refused/Unanswered. General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 1/7. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075744/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

List Of Photographs Of Women Making Munitions. General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 1/18. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075761/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 28 Feb. 2023.

Press Handout Re Permanent Exhibition (With List Of The Technical Newspapers). General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 1/11. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075750/GDSC?u=iwm&sid=bookmark-GDSC&pg=2. Accessed 20 July 2023.

Proposed Collection Of Exhibits In Groups. General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions. n.d. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London MUN. 1/10. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075748/GDSC?u=iwm&sid=bookmark-GDSC&xid=bc8e067c&pg=1. Accessed 18 May 2022.

9.2.3 Munition factories: reports and administration

Account Of Work By Kathleen Lindsay. *Woolwich Arsenal, Inspection Depot. Account Of The Work Of Lady Superintendant - Lady Kathleen Lindsay*. Munitions. 11 Apr. 1920. MS Women, War and Society, 1914-1918 MUN. 8/3. Imperial War Museum. Archives Unbound,

link.gale.com/apps/doc/SC5108075874/GDSC?u=iwm&sid=bookmark-GDSC&pg=1.

Accessed 20 July 2023.

Account Of Sutton Glass Works St. Helens. Ministry Of Munitions, Central Stores, Sutton Glass Works. Munitions. 14 July 1918. MS Women, War and Society, 1914-1918 MUN. 6/2. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075867/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023

Account Of The Royal Naval Ordnance Dept, Woolwich Arsenal. Woolwich Arsenal Ordnance Depot. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 9/3. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075877/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Account Of The Work. General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions. 05/09/1917. MS Women, War and Society, 1914-1918 MUN. 1/12. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075752/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Account Of Work (Welfare) At Manchester. National Shell Factories. Report Of Supervisors. Munitions. 1918 - 1919. MS Women, War and Society, 1914-1918 MUN. 23/14. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141302/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Addenda To Report Of Work In The Engineers Drawing Office. Kingsnorth Airship Station. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 15.2/7. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108076111/GDSC?u=iwm&sid=bookmarkGDSC&pg=1. Accessed 20 July 2023.

Additional Draft. General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 1/5. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075742/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Application Form. Armstrong Whitworth And Co. Welfare Work. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 24/7. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141342/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Circular Letter Re Collection Of Material For A Permanent Exhibition. General Information Concerning Munitions Exhibition Of The Womens Section, Catalogues Etc. Munitions. 23 Oct. 1917. MS Women, War and Society, 1914-1918 MUN. 1/2. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075737/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Correspondence Re Deposit Of Material In Connection With Georgetown. Scottish Filling Factory, Georgetown. Munitions. 30 Jan. 1919. MS Women, War and Society, 1914-1918 MUN. 13/4. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075978/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Correspondence Re Deposit Of Material. Scottish Filling Factory, Georgetown. Munitions. 26 May 1919. MS Women, War and Society, 1914-1918 MUN. 13/7. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075983/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Correspondence Re Employment Of Women. Federation Of University Women. Education. 2 Nov. 1917. MS Women, War and Society, 1914-1918 ED. 3/18. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108086220/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Correspondence Re H.M. Factory Gretna. H.M. Factory At Gretna. Munitions. 28 Aug. 1917. MS Women, War and Society, 1914-1918 MUN. 13/2. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075970/GDSC?u=iwm&sid=bookmarkGDSC&pg=3. Accessed 20 July 2023.

Correspondence Re Photographs Of Women At Singer. Singer Manufacturing Co. Ltd. Singer Clydebank, Scotland, Welfare. Munitions. 24 June 1918. MS Women, War and Society, 1914-

1918 MUN. 28/2. Imperial War Museum. Archives Unbound,
link.gale.com/apps/doc/SC5108141529/GDSC?u=iwm&sid=bookmark-GDSC&pg=1.
Accessed 20 July 2023.

Correspondence Re Proposed Account Of Work At The Factory. National Amatol Factory,
Liverpool. Munitions. 4 Dec. 1918. MS Women, War and Society, 1914-1918 MUN. 26/2.
Imperial War Museum. Archives Unbound,
link.gale.com/apps/doc/SC5108141461/GDSC?u=iwm&sid=bookmark-GDSC&pg=1.
Accessed 20 July 2023.

Correspondence Re RNAS Depot, White City, Photographs. Royal Naval Air Service Depot,
White City. Munitions. 19 Feb. 1918. MS Women, War and Society, 1914-1918 MUN. 16/4.
Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108076123/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July
2023.

Correspondence Re Palmers Co. Jarrow. Shipbuilding: Palmers Co. Jarrow. Munitions. 21
June 1918. MS Women, War and Society, 1914-1918 MUN. 35.3/2. Imperial War Museum.
Archives Unbound, link.gale.com/apps/doc/SC5108141812/GDSC?u=iwm&sid=bookmark-GDSC&pg=2. Accessed 20 July 2023

Correspondence Re Proposed Account Of The Ordnance Dept. Woolwich Arsenal Ordnance
Depot. Munitions. 15 July 1918. MS Women, War and Society, 1914-1918 MUN. 9/2.
Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108075876/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20
July 2023.

Correspondence Re Rough Draft Of Resumé Of Welfare Work. Armstrong Whitworth And Co.
Welfare Work. Munitions. 9 June 1919. MS Women, War and Society, 1914-1918 MUN.
24/12. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141348/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20
July 2023.

Correspondence Re Supervisor Miss Hammick. National Shell Factories. Report Of
Supervisors. Munitions. 11 Apr. 1919. MS Women, War and Society, 1914-1918 MUN. 23/4.

Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141281/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Correspondence Re Welfare Work At Swansea. National Shell Factories. Report Of Supervisors. Munitions. 21 Feb. 1919. MS Women, War and Society, 1914-1918 MUN. 23/16. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141315/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Index To W.C.C. Minutes. War Cabinet Committee On Women In Industry. Employment. n.d. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London EMP. 70/58. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108155459/GDSC?u=iwm&sid=bookmark-GDSC&xid=ce73f98e&pg=1. Accessed 12 May 2022

Memorandum Of Association Of The Women Muniton Workers Ltd. Drysdale And Co. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 17.2/7. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108076156/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Personal Experience Account Of Work As A Weekend Muniton Worker. Drysdale And Co. Munitions. 16 Jan. 1921. MS Women, War and Society, 1914-1918 MUN. 17.2/9. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108076158/GDSC?u=iwm&sid=bookmark-GDSC&pg=2. Accessed 20 July 2

Scheme For Section On Women's Employment By Miss F.H. Durham, Chief Woman Inspector, Employment Dept. Ministry Of Labour. Employment. n.d. MS Women, War and Society, 1914-1918 EMP. 1 I. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108114155/GDSC?u=iwm&sid=bookmarkGDSC&pg=1. Accessed 20 July 2023.

Replies Giving Various Reasons For Non-Employment Of Women. Replies To Circular List Of Photographs. Shipbuilding: John Brown And Co. Ltd. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 35.2/3. Imperial War Museum. Archives Unbound,

link.gale.com/apps/doc/SC5108141807/GDSC?u=iwm&sid=bookmarkGDSC&pg=1. Accessed 20 July 2023.

List Of Shell Factories And Names Of Welfare Supervisors. Supervisors National Shell Factories. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 22/6. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141261/GDSC?u=iwm&sid=bookmarkGDSC&pg=1. Accessed 20 July 2023.

Re Employment Of Women In Scientific Institutes, Colleges. Employment. 1919. MS Women, War and Society, 1914-1918 EMP. 64/10. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108086915/GDSC?u=iwm&sid=bookmarkGDSC&pg=1. Accessed 20 July 2023.

Replies To A Circular Concerning The Substitution Of Women In Industrial, Commercial, Or Other Pursuits During The First World War, 1919. Employment. n.d. MS Women, War and Society, 1914-1918 EMP. 21. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108073155/GDSC?u=iwm&sid=bookmarkGDSC&pg=2. Accessed 20 July 2023.

Report Of An Interview With Ms. Rowbotham Galloway Engineering College. Galloway Engineering Co Ltd, Tongland. Munitions. 31 Dec. 1918. MS Women, War and Society, 1914-1918 MUN. 17.3/11. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108076251/GDSC?u=iwm&sid=bookmarkGDSC&pg=1. Accessed 20 July 2023

Report Of Visits To Creche. Various Reports Received From The Welfare Section Of The Ministry Of Munitions. Munitions. 30 May 1917. MS Women, War and Society, 1914-1918 MUN. 18.9/15. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141057/GDSC?u=iwm&sid=bookmarkGDSC&pg=1. Accessed 20 July 2023.

Report Of Work Done By Women In The Chemical Laboratory Of Kingsnorth Airship Station. Kingsnorth Airship Station. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 15.2/5. Imperial War Museum. Archives Unbound,

link.gale.com/apps/doc/SC5108076101/GDSC?u=iwm&sid=bookmarkGDSC&pg=1. Accessed 20 July 2023.

Report Of Work In The Engineers Drawing Office At Kingsnorth Airship Station. Kingsnorth Airship Station. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 15.2/3. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108076091/GDSC?u=iwm&sid=bookmark-GDSC&pg=2. Accessed 20 July 2023.

Report: *Welfare Work Among Female Munition Workers. Singer Manufacturing Co. Ltd.* Singer Clydebank, Scotland, Welfare. Munitions. 3 Sept. 1918. MS Women, War and Society, 1914-1918 MUN. 28/5. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141532/GDSC?u=iwm&sid=bookmark-GDSC&pg=4. Accessed 20 July 2023.

Women's Work In The Woolwich Arsenal. Demobilisation Of Women. Woolwich Arsenal. Welfare. Munitions. n.d. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London MUN. 29/24. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141736/GDSC?u=iwm&sid=bookmark-GDSC&xid=1fad8a7f&pg=4. Accessed 18 May 2022.

Women's Work In The Woolwich Arsenal. Miss Lillian Barker. The Woman. Woolwich Arsenal. Welfare. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 29/23. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141734/GDSC?u=iwm&sid=bookmark-GDSC&pg=2. Accessed 20 July 2023.

Women's Work In The Woolwich Arsenal. Recreations. Woolwich Arsenal. Welfare. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 29/20. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141726/GDSC?u=iwm&sid=bookmark-GDSC&pg=3. Accessed 20 July 2023.

Women's Work In The Woolwich Arsenal, Various Types Of Work. Woolwich Arsenal. Welfare. Munitions. n.d. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London MUN. 29/16. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141674/GDSC?u=su_uk&sid=bookmarkGDSC&xid=45b29c3e&pg=2. Accessed 19 Aug. 2021.

9.2.4 Pamphlets and leaflets

Booklet - The Woman's Part, L.R. Yates. Pamphlets. Magazines, And Leaflets. Munitions. 1918. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London MUN. VII/15. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108077286/GDSC?u=iwm&sid=bookmarkGDSC&xid=74045fc2&pg=45. Accessed 18 May 2022.

Booklet: Engineering For Educated Women. Galloway Engineering Co Ltd, Tongland. Munitions. n.d. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London MUN. 17.3/2. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108076160/GDSC?u=iwm&sid=bookmarkGDSC&xid=bd54b53a&pg=1. Accessed 11 Feb. 2022.

Bulletin: Dilution Of Labour. Pamphlets. Munitions. Aug. 1917. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London MUN. VI/22. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108074780/GDSC?u=iwm&sid=bookmarkGDSC&xid=0c4d3672&pg=6. Accessed 11 Feb. 2022

Collection Of Pamphlets On The Substitution Of Women In Industry For Enlisted Men Prepared By Home Office And Board Of Trade Nos. 1 To 27 1917, Second Edition. Employment. n.d. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London EMP. 27/5. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108074231/GDSC?u=iwm&sid=bookmarkGDSC&xid=c5d408dd&pg=1. Accessed 11 Feb. 2022.

Copy Of Carry On: British Women's Work In War Time. Women's Work Numbers Of Various Journals. Journals. n.d. MS Women, War and Society, 1914-1918 Journals 1/4. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108103651/GDSC?u=su_uk&sid=bookmarkGDSC&pg=7. Accessed 11 Apr. 2024.

Copy Of The Sphere Vol. LXXIII No. 954. Women's Work Numbers Of Various Journals. Journals. n.d. MS Women, War and Society, 1914-1918 Journals 1/2. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108103607/GDSC?u=su_uk&sid=bookmarkGDSC&pg=10. Accessed 11 Apr. 2024.

Leaflet: A Message To Our Munition Workers. Y.W.C.A. Benevolent Organisations. n.d. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London B.O.3 16/35. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108102605/GDSC?u=iwm&sid=bookmark-GDSC&xid=7e7831b3&pg=1. Accessed 11 Feb. 2022

Leaflet: Educated Women As War Workers - A Practice Scheme. Drysdale And Co. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 17.2/5. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108076148/GDSC?u=iwm&sid=bookmark-GDSC&pg=2. Accessed 20 July 2023.

Leaflet: Exhibits In Relation To Industrial Welfare. Various Reports Received From The Welfare Section Of The Ministry Of Munitions. Munitions. n.d. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London MUN. 18.9/3. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108140999/GDSC?u=iwm&sid=bookmarkGDSC&xid=3d6019b5&pg=8. Accessed 18 May 2022.

Pamphlet: How To Dress For Munition Making. Pamphlets. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. V/1. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108161575/GDSC?u=iwm&sid=bookmark-GDSC&pg=3. Accessed 20 July 2023.

Pamphlet: The Munitions Miracle, W.S. Churchill, M.P. Pamphlets. Magazines, And Leaflets. Munitions. n.d. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London MUN. VII/1. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108076384/GDSC?u=iwm&sid=bookmark-GDSC&xid=9c433b4c&pg=1. Accessed 18 May 2022.

Pamphlet Wartime Employment Of Women In Metal Trades. Research Report No. 8. National Industrial Conference Board. Wartime Employment. Employment. July 1918. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London EMP. 76/1. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108095945/GDSC?u=su_uk&sid=bookmark-GDSC&xid=60dc7810&pg=1. Accessed 19 Aug. 2021.

Ministry Of Munitions, Dilution Section. Process Sheet No. 11. Pamphlets. Munitions. n.d. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War

Museum, London MUN. VI/11. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108074611/GDSC?u=iwm&sid=bookmarkGDSC&xid=bba265a2&pg=1. Accessed 11 Feb. 2022.

Report Of The Engineering Trades (New Industries Committee). Pamphlets. Magazines, And Leaflets. Munitions. 1918. MS Women, War and Society, 1914-1918 MUN. VII/19. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108077485/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Report Of The Principle Lady Inspector Of Factories. Chief Inspector Of Factories And Workshops. Employment. 1913. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London EMP. 45.1. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108163187/GDSC?u=iwm&sid=bookmark-GDSC&xid=b151c3f7&pg=15. Accessed 18 May 2022.

Report. War Cabinet Committee On Women In Industry. Employment. 1919. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London EMP. 70a.EMP. 70a. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108095167/GDSC?u=iwm&sid=bookmarkGDSC&xid=9a70aa45&pg=1. Accessed 12 May 2022.

Women's War Work - Booklet Issued By The War Office September 1916. Employment. n.d. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London EMP. 24. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108073225/GDSC?u=iwm&sid=bookmarkGDSC&xid=061e8ee3&pg=6. Accessed 11 Feb. 2022.

9.2.5 Photographs

Photograph: Group Of Supervisors, Swansea. National Shell Factories. Report Of Supervisors. Munitions. Dec. 1918. MS Women, War and Society, 1914-1918 MUN. 23/19. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141321/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Photograph: Swansea NSF Ladies AFC (First Letter). National Shell Factories. Report Of Supervisors. Munitions. 1918. MS Women, War and Society, 1914-1918 MUN. 23/21. Imperial War Museum. Archives Unbound,

link.gale.com/apps/doc/SC5108141325/GDSC?u=iwm&sid=bookmark-GDSC&pg=1.

Accessed 20 July 2023.

Photograph Weekend Lady Workers. Armstrong Whitworth And Co. Welfare Work.

Munitions. Sept. 1915. MS Women, War and Society, 1914-1918 MUN. 24/2. Imperial War Museum. Archives Unbound,

link.gale.com/apps/doc/SC5108141332/GDSC?u=iwm&sid=bookmarkGDSC&pg=1. Accessed 20 July 2023.

9.2.6 Press

Demobilised Women. Press Cuttings: General. Supplementary Material. 1919. MS Women, War and Society, 1914-1918 SUPP. 48/177. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108182621/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20

July 2023.

Discharge Of Women From Factories. Press Cuttings: Women In Munitions Work.

Supplementary Material. 1918 - 1919. MS Women, War and Society, 1914-1918 SUPP. 31/27. Imperial War Museum. Archives Unbound,

link.gale.com/apps/doc/SC5108180521/GDSC?u=iwm&sid=bookmark-GDSC&pg=1.

Accessed 20 July 2023.

Magazine: *Bombshell, N.P.F. Templeboro Vol. 1. No. 1*. Pamphlets. Magazines, And Leaflets. Munitions. Mar. 1917. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London MUN. VII/5. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108076727/GDSC?u=iwm&sid=bookmark-GDSC&xid=3aba05b1&pg=1. Accessed 18 May 2022.

Magazine: *Bombshell, N.P.F. Templeboro Vol. 1. No. 4*. Pamphlets. Magazines, And Leaflets. Munitions. June 1917. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London MUN. VII/6. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108076744/GDSC?u=iwm&sid=bookmark-GDSC&xid=347d0864&pg=9. Accessed 18 May 2022.

Magazine: *Carr On Armstrong Munition Workers Magazine*. Pamphlets. Magazines, And Leaflets. Munitions. 1916. MS Women, War and Society, 1914-1918 MUN. VII/13. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108076744/GDSC?u=iwm&sid=bookmark-GDSC&xid=347d0864&pg=9.

[gale.com/apps/doc/SC5108077178/GDSC?u=iwm&sid=bookmark-GDSC&pg=10](https://www.gale.com/apps/doc/SC5108077178/GDSC?u=iwm&sid=bookmark-GDSC&pg=10). Accessed 20 July 2023.

Magazine: Shell Chippings. A Six Eight Munition Magazine, Vol. 1. Pamphlets. Magazines, And Leaflets. Munitions. Sept. 1916. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London MUN. VII/14. Imperial War Museum. Archives Unbound, [link.gale.com/apps/doc/SC5108077270/GDSC?u=su_uk&sid=bookmark-GDSC&xid=765c6eb3&pg=8](https://www.gale.com/apps/doc/SC5108077270/GDSC?u=su_uk&sid=bookmark-GDSC&xid=765c6eb3&pg=8). Accessed 29 Sept. 2021.

Magazine: The Woman Engineer, Vol. 1 No. 5. Pamphlets. Magazines, And Leaflets. Munitions. Dec. 1920. MS Women, War and Society, 1914-1918 MUN. VII/17. Imperial War Museum. Archives Unbound, [link.gale.com/apps/doc/SC5108077434/GDSC?u=iwm&sid=bookmark-GDSC&pg=2](https://www.gale.com/apps/doc/SC5108077434/GDSC?u=iwm&sid=bookmark-GDSC&pg=2). Accessed 20 July 2023.

Newspaper Cuttings: An Exhibition Of Women's Work In Time Of War. Galloway Engineering Co Ltd, ccrecheand. Munitions. 1917. MS Women, War and Society, 1914-1918 MUN. 17.3/10. Imperial War Museum. Archives Unbound, [link.gale.com/apps/doc/SC5108076246/GDSC?u=iwm&sid=bookmark-GDSC&pg=1](https://www.gale.com/apps/doc/SC5108076246/GDSC?u=iwm&sid=bookmark-GDSC&pg=1). Accessed 20 July 2023.

Newspaper Cuttings: Experts From The Glasgow School Of Welding Carrying Out Repair Work On A Ship's Rudder. Shipbuilding. Press Cuttings. Munitions. 1916 - 1919. MS Women, War and Society, 1914-1918 MUN. 36/16. Imperial War Museum. Archives Unbound, [link.gale.com/apps/doc/SC5108141839/GDSC?u=iwm&sid=bookmark-GDSC&pg=1](https://www.gale.com/apps/doc/SC5108141839/GDSC?u=iwm&sid=bookmark-GDSC&pg=1). Accessed 20 July 2023.

Newspaper Cuttings: Women As Engineers. Galloway Engineering Co Ltd, Tongland. Munitions. 1917. MS Women, War and Society, 1914-1918 MUN. 17.3/7. Imperial War Museum. Archives Unbound, [link.gale.com/apps/doc/SC5108076242/GDSC?u=iwm&sid=bookmark-GDSC&pg=1](https://www.gale.com/apps/doc/SC5108076242/GDSC?u=iwm&sid=bookmark-GDSC&pg=1). Accessed 20 July 2023.

Newspaper Cuttings: Women's Help Against U Boats. Shipbuilding. Press Cuttings. Munitions. 1916 - 1919. MS Women, War and Society, 1914-1918 MUN. 36/2. Imperial War Museum. Archives Unbound, [link.gale.com/apps/doc/SC5108141818/GDSC?u=iwm&sid=bookmark-GDSC&pg=1](https://www.gale.com/apps/doc/SC5108141818/GDSC?u=iwm&sid=bookmark-GDSC&pg=1). Accessed 20 July 2023.

Newspaper Reports: *Women Airship Builders In A Royal Navy Airship Station*. Royal Naval Air Service Depot, White City. Munitions. 1918 - 1919. MS Women, War and Society, 1914-1918 MUN. 16/7. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108076126/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

Reprint Of An Article The Midland Daily Telegraph Re Work For Munition Workers. Various Reports Received From The Welfare Section Of The Ministry Of Munitions. Munitions. n.d. MS Women, War and Society, 1914-1918 MUN. 18.9/18. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108141067/GDSC?u=iwm&sid=bookmark-GDSC&pg=3. Accessed 20 July 2023.

The Status Of Women After The War. Press Cuttings: General. Supplementary Material. 1915. MS Women, War and Society, 1914-1918 SUPP. 43/197. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108185803/GDSC?u=iwm&sid=bookmarkGDSC&pg=1. Accessed 20 July 2023.

Tribunal Hears Claims Of 200 Female Ex-Employees. Press Cuttings: Women In Munitions Work. Supplementary Material. 1918 - 1919. MS Women, War and Society, 1914-1918 SUPP. 31/184. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108180701/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023

Women In Industry. Times, 6 Feb. 1917, p. 11. The Times Digital Archive, link.gale.com/apps/doc/CS185927750/TTDA?u=su_uk&sid=bookmark-TTDA. Accessed 20 July 2023.

Women's War Services Exhibition. Press Cuttings: General. Supplementary Material. January 1918 - June 1918. MS Women, War and Society, 1914-1918 SUPP. 46/190. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108182207/GDSC?u=iwm&sid=bookmark-GDSC&pg=1. Accessed 20 July 2023.

9.2.7 Sheffield University training administration

Correspondence Accompanying The Two Replies Below. Sheffield University. Education. 28 Aug. 1919. MS Women, War and Society, 1914-1918: The Women at Work Collection,

Imperial War Museum, London ED. 2.16/7. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108086146/GDSC?u=iwm&sid=bookmarkGDSC&xid=b756182c&pg=1. Accessed 11 Feb. 2022.

Correspondence Re Iron And Steel Works Analysts. Sheffield University. Education. n.d. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London ED. 2.16/9. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108086148/GDSC?u=iwm&sid=bookmarkGDSC&xid=16611575&pg=1. Accessed 11 Feb. 2022.

Correspondence Re List Of Work Undertaken By Past Students. Sheffield University. Education. 10 Dec. 1918. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London ED. 2.16/5. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108086142/GDSC?u=iwm&sid=bookmarkGDSC&xid=d7c323d7&pg=2. Accessed 11 Feb. 2022.

Correspondence Re The Various Types Of Work Undertaken By Women From Sheffield University. Sheffield University. Education. 28 Oct. 1918. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London ED. 2.16/2. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108086138/GDSC?u=iwm&sid=bookmarkGDSC&xid=8770039d&pg=1. Accessed 11 Feb. 2022.

Correspondence Re Work Of Training Women Workers To Replace Men In Coke Oven Laboratories. Sheffield University. Education. 20 Aug. 1919. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London ED. 2.16/8. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108086147/GDSC?u=iwm&sid=bookmarkGDSC&xid=7181720b&pg=1. Accessed 11 Feb. 2022.

List Of Some Posts Filled By Students Of Sheffield. Sheffield University. Education. n.d. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London ED. 2.16/3. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108086140/GDSC?u=iwm&sid=bookmarkGDSC&xid=fedddb71&pg=1. Accessed 11 Feb. 2022.

Newspaper Cuttings Re Women Workers. Sheffield University. Education. 1917. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London ED. 2.16/10. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108086149/GDSC?u=iwm&sid=bookmarkGDSC&xid=27389a9f&pg=1. Accessed 11 Feb. 2022.

Pamphlet: Report And Statement Of Accounts, Edgar Allen Inst Year Ending. Sheffield. Local Records. 31 Dec. 1917. MS Women, War and Society, 1914-1918: The Women at Work Collection, Imperial War Museum, London L.R. 355/2. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108138904/GDSC?u=iwm&sid=bookmarkGDSC&xid=528affe0&pg=12. Accessed 18 May 2022.

9.2.8 War Cabinet Correspondence

Correspondence To Miss Conway Re Women's War Club. Sheffield. Local Records. 19 Mar. 1919. MS Women, War and Society, 1914-1918 L.R. 355/102. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108139375/GDSC?u=iwm&sid=bookmarkGDSC&pg=1. Accessed 20 July 2023.

War Cabinet Committee On Women In Industry. Employment. 1 Nov. 1918. MS Women, War and Society, 1914-1918 EMP. 70/H4-/H61. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108159623/GDSC?u=iwm&sid=bookmarkGDSC&pg=1. Accessed 20 July 2023.

War Cabinet Committee On Women In Industry. Employment. 8 Jan. 1919. MS Women, War and Society, 1914-1918 EMP. 70/F1-/F46. Imperial War Museum. Archives Unbound, link.gale.com/apps/doc/SC5108165938/GDSC?u=iwm&sid=bookmarkGDSC&pg=1. Accessed 20 July 2023

9.3 Films

IWM (2019) *Film: A day in the life of a munition worker [main title]*. Available at <https://www.iwm.org.uk/collections/item/object/1060023048> (Accessed: 08/07/2020).

Sandwell Society of Film Makers (1971). *Lucy Woodall*. Available at <https://www.youtube.com/watch?v=o-Mb4JRfxvw> (Accessed: 4 November 2023).

Birmingham Trade Union Resource Centre(1976). *Nothing to Lose - The Women Chainmakers Strike of 1910 Cradley Heath* Available at https://www.youtube.com/watch?v=Zvm8Adm_MSU. (Accessed: 4 November 2023).

BBC (2014) *World War One At Home*. Available at <https://www.bbc.co.uk/programmes/p01q82xz> (Accessed: 9 April 2023).

9.4 Web pages

Eliza Tinsley (2021) *The history of Eliza Tinsley*. Available at <https://elizatinsley.co.uk/our-history> (Accessed 18/05/2022).

Google Arts & Culture (2023) *High explosive: the Cunard Shell Works in the First World War*. Available at <https://artsandculture.google.com/story/high-explosive-the-cunard-shell-works-in-the-first-world-war/YQUR-aUj7IA5Jw> (Accessed 13/04/2023).

Homefront Heroines Project (2019) *Anne Airy*. Available at <https://homefrontheroines.org.uk/anna-airy> (Accessed: 28/07/2022).

IWM (2019) *Collections item object 30084682*. Available at <https://www.iwm.org.uk/collections/item/object/30084682> (Accessed: 08/07/2020).

IWM (2019) *Did the First World War transform women's lives?* Available at <https://www.iwm.org.uk/history/did-the-first-world-war-transform-womens-lives> (Accessed: 10/11/2011).

IWM (2019) *Equipment: component, spade cutter, womens work*. Available at: <https://www.iwm.org.uk/collections/item/object/30088545> (Accessed: 08/07/2020).

IWM (2019) *Equipment: component, cylinder gauge, womens work*. Available at: <https://www.iwm.org.uk/collections/item/object/30088562> (Accessed: 08/07/2020).

IWM (2019) *Equipment: spade cutter for base of 3-inch HE shell, womens work*. Available at: <https://www.iwm.org.uk/collections/item/object/30088576> (Accessed: 08/07/2020).

IWM (2019) *How IWM London found a home*. Available at <https://www.iwm.org.uk/history/how-iwm-london-found-a-home> (Accessed: 15/06/2022)

IWM (2019) *Photographs: collections of the Imperial War Museum*. Available at:
<https://www.iwm.org.uk/collections/item/object/205297121> (Accessed: 08/07/2020).

IWM (2019) *Photographs: munitions production on the home front, 1914-1918*. Available at
<https://www.iwm.org.uk/collections/item/object/205087805> (Accessed: 08/07/2020).

IWM (2019) *Photographs: the shipbuilding industry in Britain, 1914-1918*. Available at:
<https://www.iwm.org.uk/collections/item/object/205260898> (Accessed: 08/07/2020)

IWM (2019) *Private Papers: Private papers of Miss G M West*. Available at
<https://www.iwm.org.uk/collections/item/object/1030007006> (Accessed: 08/04/2021).

IWM (2019) *Sound: West, Gabrielle Mary (Oral history)*. Available at
<https://www.iwm.org.uk/collections/item/object/80008574> (Accessed: 08/04/2021).

IWM (2019) *Souvenirs and Ephemera: 6in shell*. Available at
<https://www.iwm.org.uk/collections/item/object/30021793> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: 8 in HE shell*. Available at
<https://www.iwm.org.uk/collections/item/object/30021481> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: aeroplane part, Women's Work*. Available at
<https://www.iwm.org.uk/collections/item/object/30088486> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: aircraft part?, Women's Work*. Available at
<https://www.iwm.org.uk/collections/item/object/30088488> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: bracket, metal*. Available at
<https://www.iwm.org.uk/collections/item/object/30112499> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: clip for frame ('aeroplane part')*. Available at
<https://www.iwm.org.uk/collections/item/object/30083639> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: collection: chronometer chain*. Available at
<https://www.iwm.org.uk/collections/item/object/30105310> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: counterbores for cartridge cases*. Available at <https://www.iwm.org.uk/collections/item/object/30084680> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: deflection dial (engraved) for 6pdr HA mountings, Women's Work*. Available at <https://www.iwm.org.uk/collections/item/object/30083626> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: drill socket for pneumatic tools*. Available at <https://www.iwm.org.uk/collections/item/object/30084685> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: end socket for fairing support tube*. Available at <https://www.iwm.org.uk/collections/item/object/30084664> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: fin clip for tail unit*. Available at <https://www.iwm.org.uk/collections/item/object/30083633> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: fish plate ('aeroplane part')*. Available at <https://www.iwm.org.uk/collections/item/object/30084676> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: flap cable pulley bracket (SE5)*. Available at <https://www.iwm.org.uk/collections/item/object/30084666> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: front axle swivel pin*. Available at <https://www.iwm.org.uk/collections/item/object/30084684> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: landing gear guide flange*. Available at <https://www.iwm.org.uk/collections/item/object/30084670> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: Longeron clip*. Available at <https://www.iwm.org.uk/collections/item/object/30084669> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: main petrol tank bracket*. Available at <https://www.iwm.org.uk/collections/item/object/30084673> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: model, diorama, Central Stores of the Ministry of Munitions, Newbury Depot*. Available at <https://www.iwm.org.uk/collections/item/object/30018073> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: model, diorama, Central Stores of the Ministry of Munitions, Newbury Depot*. Available at <https://www.iwm.org.uk/collections/item/object/30018073> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: munition workers making brass rifle cartridges (plaster relief)*. Available at <https://www.iwm.org.uk/collections/item/object/30018133> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: munition workers making brass rifle cartridges (plaster relief)*. Available at <https://www.iwm.org.uk/collections/item/object/30018133> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: obturator pad*. Available at <https://www.iwm.org.uk/collections/item/object/30083627> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: pulley, second elevator*. Available at <https://www.iwm.org.uk/collections/item/object/30084663> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: rear bracket for carburettor controls*. Available at <https://www.iwm.org.uk/collections/item/object/30084672> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: skid lever (SE5)*. Available at <https://www.iwm.org.uk/collections/item/object/30084665> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: socket ('aeroplane part')*. Available at <https://www.iwm.org.uk/collections/item/object/30084667> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: socket*. Available at <https://www.iwm.org.uk/collections/item/object/30084674> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: spade cutter (for radiusing base of 4.5in shell)*. Available at <https://www.iwm.org.uk/collections/item/object/30084683> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: spade cutter for finish-boring magazine of 60pdr Mk.II/L shrapnel shell, Womens work*. Available at <https://www.iwm.org.uk/collections/item/object/30084679> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: strengthening plate*. Available at <https://www.iwm.org.uk/collections/item/object/30084678> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: strut socket*. Available at <https://www.iwm.org.uk/collections/item/object/30084675> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: telescope holder for 6pdr HA sight, Women's Work*. Available at <https://www.iwm.org.uk/collections/item/object/30083625> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: The First Voluntary Munition Works Canteen, Woolwich Arsenal, 1915*. Available at <https://www.iwm.org.uk/collections/item/object/30018448> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: the first voluntary munition works canteen, Woolwich Arsenal, 1915*. Available at <https://www.iwm.org.uk/collections/item/object/30018448> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: vent bolt nut, 6-inch howitzer breech mechanism, Women's Work*. Available at <https://www.iwm.org.uk/collections/item/object/30083642> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: wiring plate*. Available at <https://www.iwm.org.uk/collections/item/object/30084668> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: women at Hayes filling factory – working in an assembling shed*. Available at <https://www.iwm.org.uk/collections/item/object/30019646> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: women filling container bags with TNT at Woolwich Arsenal*. Available at <https://www.iwm.org.uk/collections/item/object/30018447> (Accessed: 08/07/2020).

IWM (2019) *Souvenirs and Ephemera: women lacing up an airship envelope at Whaite City*. Available at <https://www.iwm.org.uk/collections/item/object/30018283> (Accessed: 08/07/2020).

IWM (2019) *Uniforms and Insignia: badge, lapel, British Women's 'On War Service' badge*. Available at <https://www.iwm.org.uk/collections/item/object/30077027> (Accessed: 12/05/2021).

IWM (2019) *Uniforms and Insignia: On War Service 1916 badge*. Available at <https://www.iwm.org.uk/history/on-war-service-badge> (Accessed: 08/07/2020).

IWM (2024) *Nine Women Reveal The Dangers Of Working In A Munitions Factory*. Available at <https://www.iwm.org.uk/history/9-women-reveal-the-dangers-of-working-in-a-first-world-war-munitions-factory> (Accessed: 07/07/2024).

IWM (2024) *Who set up the Imperial War Museums?*. Available at <https://www.iwm.org.uk/history/who-set-up-the-imperial-war-museums> (Accessed: 07/07/2024).

Redbridge Museum & Heritage Centre (2021) *The Chainmaker 1907*. Available at <https://www.sylviapankhurst.com/artist?pgid=krdj7y31-d6345d2d-d82f-467a-b413-4232e194f5f9> (Accessed: 16/09/2023).

Redbridge Museum & Heritage Centre (2021) *The Nailmaker 1907*. Available at <https://www.sylviapankhurst.com/artist?pgid=krdj7y31-6f3eeb0c-b33b-446a-9972-e694222c0611> (Accessed: 16/09/2023).

Royal Academy (2023) *1918 - Imperial War Exhibition, 7 January 1918 to 24 February 1918*. Available at: <https://www.royalacademy.org.uk/art-artists/exhibition-catalogue/1918-imperial-war-exhibition> (Accessed 14/04/2023).

Royal Academy (2023) *Gallery IX, Burlington House after the explosion of a German bomb in 1917., ca. September 24 1917*. Available at: <https://www.royalacademy.org.uk/art-artists/work-of-art/gallery-ix-burlington-house-after-the-explosion-of-a-german-bomb-in-1917> (Accessed 14/04/2023).

Royal Collection Trust (2022) *Red Cross exhibition, 22 June 1918*. Available at <https://www.rct.uk/collection/2303822-b> (Accessed: 29/07/2023).

Society of Designer Craftsmen (2016) *Our history*. Available at <https://societyofdesignercraftsmen.org.uk/our-history> (Accessed: 10/05/2022).

Streeter P. (2018) *Radical Object: Military sweetheart brooches of the First World War*. Available at <https://www.historyworkshop.org.uk/war-military/radical-objects-military-sweetheart-brooches-of-the-first-world-war/> (Accessed:01/02/2022).

UK Parliament (2022) *Munitions of War Act 1915*. Available at: <https://www.parliament.uk/about/living-heritage/transformingsociety/parliament-and-the-first-world-war/legislation-and-acts-of-war/kdjgh/> (Accessed 13/04/2023).

University of Warwick (2022) *Brass and metal Workers' Crusade*. Available at https://warwick.ac.uk/services/library/mrc/archives_online/digital/tradeboard/crusade (Accessed: 23/10/2023).

10 Bibliography

10.1 Books

Adie, K., 2013. *Fighting on the home front: the legacy of women in world war one*. Hachette UK.

Andrews, I.O. and Hobbs, M.A., 1921. *Economic effects of the World War upon women and children in Great Britain (Vol. 4)*. Oxford University Press.

Andrews, M. and Lomas, J., 2018. *A history of women in 100 objects*. The History Press.

Andrews, M. and Lomas, J., 2018. *Hidden heroines: the forgotten suffragettes*. The Crowood Press.

- Ashton, J., 2017. *Vol 1 Feminism and museums: intervention, disruption and change*. Museums Etc.
- Barnsley, T., 2010. *Breaking their chains: Mary Macarthur and the chainmakers' strike of 1910*. Bookmarks Publ..
- Bechdel, A., 2008. *The essential dykes to watch out for*. Houghton Mifflin Harcourt.
- Beddoe, D., 1983. *Discovering women's history: a practical manual*. Pandora Press.
- Beddoe, D., 1989. *Back to home and duty: women between the wars, 1918 - 1939*. Pandora Press.
- Beddoe, D., 2000. *Out of the shadows: a history of women in twentieth-century Wales*. University of Wales Press.
- Berg, M., 2005. *The age of manufactures, 1700-1820: industry, innovation and work in Britain*. Routledge.
- Braybon, G., 2012. *Women workers in the First World War*. Routledge.
- Braybon, G. ed., 2022. *Evidence, history and the great war: historians and the impact of 1914-18*. Berghahn Books.
- Braybon, G. and Summerfield, P., 2013. *Out of the cage: women's experiences in two world wars*. Routledge.
- Brown, M., 1991. *The Imperial War Museum book of the First World War: a great conflict recalled in previously unpublished letters, diaries, documents and memoirs*. Sidgwick & Jackson Ltd.
- Buck, C., 2015. *Conceiving strangeness in British First World War writing*. Springer.
- Cadbury, E., Matheson, M.C. and Shann, G., 1907. *Women's work and wages: A phase of life in an industrial city*. University of Chicago Press.
- Caine, H., 1916. *Our girls: their work for the war*. Hutchinson & Company.

- Chew, K. and Wilson, A., 1993. *Victorian science and engineering portrayed in the Illustrated London News*. Alan Sutton.
- Childe, V.G. and Green, S., 1941. *Man makes himself*. Moonraker Press.
- Cole, G.D.H., 1923. *Trade unionism and munitions (No. 9)*. Oxford, Clarendon.
- Coltofean-Arizancu, L., 2021. *Gender stereotypes in archaeology: A short reflection in image and text*. Sidestone Press.
- Condell, D. and Liddiard, J., 2022. *Working for victory?: images of women in the First World War, 1914–18*. Routledge.
- Conway, A.E., 1917. *A Ride through the Balkans: on classic ground with a camera*. London: R. Scott.
- Conway, A.E. and Conway, W.M., 2019. *The book of art for young people*. Good Press.
- Cumming, E. and Kaplan, W., 1991. *The Arts and Crafts Movement* (pp. 18-22). London: Thames and Hudson.
- Day, J. ed., 2013. *Making senses of the past: toward a sensory archaeology*. SIU Press.
- De Waal, E., 2011. *The Hare with Amber Eyes*. Random House.
- Downs, L.L., 1995. *Manufacturing inequality: gender division in the French and British metalworking industries, 1914-1939*. Cornell University Press.
- Eliade, M., 2020. *The forge and the crucible: the origins and structure of alchemy*. University of Chicago Press.
- Evans, J., 1966. *The Conways: a history of three generations*. Museum Press.
- Ffoulkes, C.J., 1988. *The armourer and his craft from the XIth To The XVth Century*. Courier Corporation.
- Franke, E. and Jelinek-Menke, R., 2022. *Handling religious things. The material and the social in museums*. Philipps-Universität Marburg.

- Fredette, R.H., 2006. *The sky on fire: the first Battle of Britain, 1917-1918*. University of Alabama Press.
- Galsworthy, J., 1912. *The inn of tranquillity: studies and essays*. W. Heinemann.
- Grayzel, S.R. and Proctor, T.M., 2017. *Gender and the Great War*. Oxford University Press.
- Gilchrist, R., 2012. *Gender and archaeology: contesting the past*. Routledge.
- Hamilton, P., 1978. *Three years or the duration: the memoirs of a munition worker, 1914-1918*. Peter Owen.
- Hart, I., 2010. *Arts and Crafts Objects*. Manchester University Press.
- Haskins, H.V., 2005. *Now you see them, now you don't: the critical reception of women's work at the Arts & Crafts Exhibition Society, 1888-1916*. Concordia University.
- Herbert, E.W., 1993. *Iron, gender, and power: rituals of transformation in African societies*. Indiana University Press.
- Hewitt, M., 2013. *The Victorian world*. London.
- Higonnet, M.R., Jenson, J. and Michel, S. eds., 1987. *Behind the lines: gender and the two world wars*. Yale University Press.
- Hodges, J., 1976. *Artifacts: an introduction to early materials and technology*. Bristol Classical Press.
- Holloway, G., 2007. *Women and work in Britain since 1840*. Routledge.
- Hughes-Wilson, J., 2014. *A history of the First World War in 100 Objects: in association with the Imperial War Museum*. Cassell.
- Huneault, K., 2002. *Difficult subjects: working women and visual culture, Britain 1880-1914*. Routledge.
- Hunt, C.J., 2019. *Righting the wrong: Mary Macarthur 1880-1921: the working woman's Champion*. West Midlands History Limited.
- Hutchins, B.L., 1915. *Women in modern industry*. G. Bell and Sons, Limited.

- Hutton, W., 1836. *The history of Birmingham*. Wrightson and Webb.
- Hyams, J., 2013. *Bomb girls-britain's secret army: the munitions women of World War II*. Kings Road Publishing.
- Ingold, T., 2001. *Beyond art and technology: the anthropology of skill*. Anthropological perspectives on technology, pp.17-31.
- Jones, A., 2007. *Memory and material culture*. Cambridge University Press.
- Johnson, M., 2019. *Archaeological theory: an introduction*. John Wiley & Sons.
- Johnston, R., 2020. *Bronze Age worlds: a social prehistory of Britain and Ireland*. Routledge.
- Kaplan, W. and Boris, E., 1987. " *The art that is life*": the Arts & Crafts Movement in America, 1875-1920 (pp. 170-171). Boston: Little, Brown.
- Kavanagh, G., 2014. *Museums and the First World War: a social history*. Leicester University Press.
- Kidd, A.T., 1949. *History of the tin-plate workers and sheet metal workers and braziers societies*. National Union of Sheet Metal Workers and Braziers.
- Knauth, P., 1974. *The metalsmiths (the emergence of man)*. Lifetime Books.
- Krasny, E. and Perry, L. eds., 2022. *Curating as feminist organizing*. Taylor & Francis.
- Lerner, G., 1969. *New approaches to the study of women in American history*. Bobbs-Merrill.
- Levin, A.K., 2010. *Gender, sexuality and museums: A Routledge reader*. Routledge.
- Levy, T.E. and Garrett, K., 2007. *Journey to the Copper Age: archaeology in the Holy Land*. San Diego Museum of Man.
- Lofthouse, A., 2001. *Then & Now: The Sheffield Blitz, Operation Crucible*. ALD Design & Print.
- Lomas, J., 2014. *The home front in Britain: images, myths and forgotten experiences since 1914*. Springer.

- Ludwig, V., 2017. *Museum dioramas: Their relevance in the 21st century*. Deutsches Museum.
- MacGregor, N., 2011. *A History of the World in 100 Objects*. Penguin UK.
- Marwick, A., 1977. *Women at war, 1914-1918*. HarperCollins Distribution Services.
- Mercer, A., 2016. *The changing face of exhibiting women's wartime work at the Imperial War Museum*. In *Performing the Self* (pp. 154-168). Routledge.
- Milne, J.D., 1857. *Industrial and social position of women in the middle and lower ranks*. Chapman and Hall, 193, Piccadilly.
- Mitchell, D.J., 1966. *Women on the warpath: the story of the women of the First World War*. Cape.
- Morgan, C.E., 2013. *Women workers and gender identities, 1835-1913: the cotton and metal industries in England*. Routledge.
- Moss, R., 2006. *Chain and anchor making in the Black Country*. Sutton.
- Mudie-Smith, R., 1906. *Handbook of the "Daily News": sweated industries' exhibition*. Burt.
- Neff, W.F., 2013. *Victorian working women: an historical and literary study of women in British industries and professions 1832-1850*. Routledge.
- Ouditt, S., 2020. *Fighting forces, writing women: identity and ideology in the First World War*. Routledge.
- Pankhurst, E., 1987. *The home front: a mirror to life in England during the First World War*. Ebury Press.
- Pankhurst, R.K.P., 1979. *Sylvia Pankhurst: artist and crusader: an intimate portrait*. Paddington Press.
- Paxton, N., 2018. *Exhibition*. In *Stage Rights!* (pp. 17-49). Manchester University Press.
- Perez, C.C., 2019. *Invisible women: data bias in a world designed for men*. Abrams.

- Pinchbeck, I., 1969. *Women workers and the Industrial Revolution, 1750-1850*. 1st ed. London: Cass.
- Roberts, E., 1990. *Women's work 1840–1940* (pp. 209-280). Macmillan Education UK.
- Robinson, J., 2020. *Ladies can't climb ladders: the pioneering adventures of the first professional women*. Random House.
- Samuel, R., 2012. *Theatres of memory: past and present in contemporary culture*. Verso Books.
- Saunders, N.J., 2011. *Killing time: archaeology and the First World War*. The History Press.
- Saunders, N.J. and Cornish, P. eds., 2021. *Conflict landscapes: materiality and meaning in contested places*. Routledge.
- Saunders, N., 2020. *Trench art: materialities and memories of war*. Routledge.
- Schiffer, M.B. ed., 2001. *Anthropological perspectives on technology* (No. 5). UNM Press.
- Sherard, R.H., 1898. *The white slaves of England: being true pictures of certain social conditions in the kingdom of England in the year 1897*. J. Bowden.
- Smith, B.W., 1965. *Sixty centuries of copper*. Copper Development Association.
- Speck, C., 2014. *Beyond the battlefield: women artists of the two World Wars*. Reaktion books.
- Sørensen, Marie Louise Stig. *Gender archaeology*. John Wiley & Sons, 2013.
- Stefano, M.L., Davis, P., Corsane, G., Denes, A., Cummins, A., Dixey, A., Mazel, A., Hottin, C., Kreps, C., Bowers, D.J. and Trimboli, D. eds., 2012. *Safeguarding intangible cultural heritage*. Boydell and Brewer.
- Rebay-Salisbury, K. and Stig Sørensen, M.L., 2012. *Embodied knowledge: Historical perspectives on belief and technology*. Oxbow Books.
- Saunders, N.J. ed., 2004. *Matters of conflict: Material culture, memory and the First World War*. Psychology Press.

- Simonton, D. ed., 2006. *The Routledge history of women in Europe since 1700* (Vol. 349). Abingdon: Routledge.
- Strachan, H. ed., 2023. *The British home front and the First World War*. Cambridge University Press.
- Stefano, M.L. and Davis, P. eds., 2016. *The Routledge companion to intangible cultural heritage*. Taylor & Francis.
- Stefano, M.L., 2021. *Practical considerations for safeguarding intangible cultural heritage*. Routledge.
- Thom, D., 1998. *Nice girls and rude girls: women workers in World War I*. I.B. Tauris.
- Tilly, L.A. and Scott, J.W., 2016. *Women, work and family*. Routledge.
- Tweeddale, G., 1986. *Giants of Sheffield Steel: the men who made Sheffield the steel capital of the world*. Sheffield City Libraries.
- Valenze, D., 1995. *The first industrial woman*. OUP Catalogue.
- Walby, S., 2013. *Patriarchy at work: patriarchal and capitalist relations in employment, 1800-1984*. John Wiley & Sons.
- Wallis, J., 2015. *Commemoration, memory and the process of display: negotiating the Imperial War Museum's First World War exhibitions, 1964-2014*. University of Exeter (United Kingdom).
- Warner, O.O.M.W., 1964. *A history of the Tin Plate Workers Alias Wire Workers Company of the City of London*. Tin Plate Workers.
- Warr, P., 2015. *Sheffield in the Great War*. Pen and Sword.
- Watson, J.S., 2004. *Fighting different wars: experience, memory, and the First World War in Britain* (Vol. 16). Cambridge University Press.
- Wellington, J., 2013. *War and the imperial imaginary: museums, exhibitions and visual displays of the First World War in Britain, Canada, and Australia 1914–42*. Yale University.

Wightman, C., 2014. *More than munitions: women, work and the engineering industries, 1900-1950*. Routledge.

Williamson, J.G., 2002. *Coping with city growth during the British industrial revolution*. Cambridge University Press.

Wilson, E., 2003. *Adorned in dreams: fashion and modernity*. Rutgers University Press.

Witcomb, J.M., 2006. *Remembering war: The Great War between memory and history in the twentieth century*. Yale University Press.

Woollacott, A., 1994. *On her their lives depend: munitions workers in the Great War*. Univ of California Press.

Yodovich, N., 2019. *The Feminist Side of The Force: Women Negotiating Feminism and Star Wars/Doctor Who Fandoms*. The University of Manchester (United Kingdom).

Young, A., 2010 [1770]. *A six months tour through the north of England*. Gale Ecco, Print Editions

Young, P., 2009. *Globalization and the Great Exhibition: the Victorian new world order*. Springer.

10.2 Chapter in an edited book

Andrews, M., 2014. Contemporary images and ideas of the Home Front. In *The Home Front in Britain: Images, Myths and Forgotten Experiences since 1914* (pp. 232-244). London: Palgrave Macmillan UK.

Braybon, G., 1995. 'Women and the War', in S. Constantine (ed) *The First World War in British History*, Hodder Arnold. pp. 141-67.

Boussahba-Bravard, M. and Rogers, R., 2017. 'Introduction: positioning women in the world's fairs, 1876–1937', in M. Boussahba-Bravard and R. Rogers (eds) *Women in International and Universal Exhibitions, 1876–1937*. Routledge. pp. 1-24.

Bruland, K., 2004. *Industrialisation and technological change*. The Cambridge economic history of modern Britain, 1, pp.117-147.

Carden-Coyne, A., 2022. *Curating the Sensory War, 1914–2014: Emotions, sensations and the violence of modern war*, in P. Cornish and N.J. Saunders (eds) *Curating the Great War*. Routledge. pp. 229-246

Condell, D., 2002. *The history and role of the Imperial War Museum*, in B. Korte and R. Schneider (eds) *War and the cultural construction of identities in Britain*, Amsterdam: Rodopi. pp. 25- 38.

de Bruin-Molé, Megen (2018) *Space bitches, witches, and kick-ass princesses: Star Wars and popular feminism*, in S. Guynes and D. Hassler-Forest (eds) *Star Wars and the History of Transmedia Storytelling*. Amsterdam. Amsterdam University Press, pp. 225-240.

Grayzel, S. and Proctor, T., 2017. The Scholarship of the First World War. In *Gender and the Great war*, edited by Susan R. Grayzel and Tammy M. Proctor, pp.248-258.

Saunders, N.J., 2020. *Matter and memory in the landscapes of conflict: the Western Front 1914–1999*, in B. Bender and M. Winer (eds) *Contested Landscapes: Movement, Exile and Place* (pp. 37-53). Routledge.

Sorensen, M.L.S., 1996. *Women As, and Metalworkers*. Museum of London.

Taylor, J., 2012. Exhibiting the ‘Foreign’ in a National Museum: Imperial War Museum London and Languages at War, in H. Footitt and M. Kelly (eds) *Languages and the Military: Alliances, Occupation and Peace Building* (pp. 227-235). London: Palgrave Macmillan UK.

Tonna, C.E., 2023. Wrongs of Woman, in L. Dalley (ed) *Women’s Economic Writing in the Nineteenth Century* (pp. 11-19). Routledge.

Wallis, J. and Taylor, J., 2017. The art of war display 1: The Imperial War Museum’s First World War galleries, 2014, in J. Wallis and J. Taylor (eds), *Commemorative Spaces of the First World War* (pp. 101-114). Routledge.

Witcomb, A., 2020. “Sticky” objects, faces and voices in the museum: Love and Sorrow’s use of affective interpretation strategies to challenge masculinist commemorations of World War I, in J. Damousi, D. Tout-Smith and B. Ziino (eds.) *Museums, History and the Intimate Experience of the Great War* (pp. 171-189). Routledge.

10.3 Journal articles

Äikäs, T., Lipkin, S. and Ahola, M., 2020. Introduction: Entangled rituals and beliefs from contemporary times to prehistory. *Entangled beliefs and rituals: religion in Finland and Sápmi from Stone Age to contemporary times* (pp. 2-15). Suomen arkeologinen seura.

Andrews, M., 2016. Tropes and Trench Cakes: The Home Front in the Media and Community History. *Twentieth Century British History*, 27(4), pp.506-512.

Andrews, M., 2018. Entitlement and the shaping of First World War commemorative histories. *Cultural Trends*, 27(2), pp.63-67.

Andrews, M., 2019. Worcestershire's Women. *History*, 104(363), pp.851-870.

Bailey, C., 1990. Black Country Working Women. *Oral History*, 18(2), pp.75-78.

Bell, F., 1919. Women at the works - and elsewhere. *Fortnightly*, 106(636), pp.909-920.

Bell, T. and Spikins, P., 2018. The object of my affection: attachment security and material culture. *Time and Mind*, 11(1), pp.23-39.

Berg, M., 1993. Women's property and the industrial revolution. *The Journal of Interdisciplinary History*, 24(2), pp.233-250.

Binford, L.R. and as Anthropology, A., 1962. American Antiquity. Salt Lake City, *Society for American Archaeology*, 28(2), pp.217-25.

Blackburn, S., 1988. Working-class attitudes to social reform: Black Country chainmakers and anti-sweating legislation, 1880–1930. *International Review of Social History*, 33(1), pp.42-69.

Blackburn, S., 1991. Ideology and social policy: the origins of the Trade Boards Act. *The Historical Journal*, 34(1), pp.43-64.

Blackburn, S., 1995. How useful are feminist theories of the welfare state?. *Women's History Review*, 4(3), pp.369-394.

Blackburn, S.C., 1997. 'No necessary connection with homework': Gender and sweated labour, 1840–1909. *Social History*, 22(3), pp.269-285.

Blackburn, S., 2001. Gender, work and labour history: a response to Carol Morgan. *Women's History Review*, 10(1), pp.121-136.

Blackburn, S.C., 1999. A very moderate socialist indeed? RH Tawney and minimum wages. *Twentieth Century British History*, 10(2), pp.107-136.

Blackburn, S.C., 2009. Curse or cure? Why was the enactment of Britain's 1909 Trade Boards Act so controversial?. *British Journal of Industrial Relations*, 47(2), pp.214-239.

Bowen, C., 2008. Recording women's work in factories during the Great War: the Women's Work Sub-Committee's "substitution" photographic project. *LISA Review/LISA e-journal. Literature, History of Ideas, Images, Societies of the English-speaking World–Literature, History of Ideas, Images and Societies of the English-speaking World*, 6 (4), pp.27-39.

Brandt, S., 1994. The memory makers: Museums and exhibitions of the First World War. *History and Memory*, 6(1), pp.95-122.

Caine, H., 1917. The Appalling Waste of the War. *Current History (1916-1940)*, 6(3), pp.452-455.

Callen, A., 1984. Sexual division of labor in the arts and crafts movement. *Woman's Art Journal*, 5(2), pp.1-6.

Callihan, E. and Feldman, K., 2018. Presence and power: Beyond feminism in museums. *Journal of Museum Education*, 43(3), pp.179-192.

Clark, G., 2005. The British Industrial Revolution, 1760-1860. *World Economic History*, pp.1-65.

Cohoe, C.M., 2022. Knowing in Aristotle part 2: Technē, phronēsis, sophia, and divine cognitive activities. *Philosophy Compass*, 17(1), p.e12799.

Cornish, P., Were, G. and King, J., 2012. Extremes of Collecting at the Imperial War Museum, 1917–2009. *Extreme Collecting*, pp.157-167.

Culleton, C.A., 1988, January. Gender-charged munitions: The language of World War I munitions reports. In *Women's Studies International Forum (Vol. 11, No. 2)*, pp. 109-116.

Cundy, A., 2017. Objects of war: the response of the Imperial War Museum, London, to the First and the Second World Wars. *Post-Medieval Archaeology*, 51(2), pp.261-273.

Cveček, S., 2023. No place like home for metalworkers: Household-based metal production at Early Bronze Age Çukuriçi Höyük and beyond. *History and Anthropology*, 34(5), pp.932-955.

Dempsey, K., Gilchrist, R., Ashbee, J., Sagrott, S. and Stones, S., 2020. Beyond the martial façade: gender, heritage and medieval castles. *International Journal of Heritage Studies*, 26(4), pp.352-369.

Elliott, B., 2019, December. Craft Theory in Prehistory: Case Studies from the Mesolithic of Britain and Ireland. In *Proceedings of the Prehistoric Society* (Vol. 85, pp. 161-176). Cambridge University Press.

Evans, C., 1998. A skilled workforce during the transition to industrial society: forgemen in the British iron trade, 1500-1850. *Labour History Review*, 63(2), pp.143-159.

Fell, A.S., 2018. Female War Icons: Visual Representations of Women's Contribution to the First World War in France and Britain in 1914–1918 and 2014–2018. *L'Homme*, 29(2), pp.35-50.

Gale, W.K.V., 1953. Hand Wrought Chains. *Transactions of the Newcomen Society*, 29(1), pp.195-204.

Gardiner, J.K., 2011. Queering Genre: Alison Bechdel's *Fun Home: A Family Tragicomic* and The Essential Dykes to Watch Out For. *Contemporary Women's Writing*, 5(3), pp.188-207.

Grayzel, S.R., 1991. Introduction to 'A change in Attitude: the Women's Work collection of the Imperial War Museum'. *Women War & Society collection*.

Gregg, A.P., Mahadevan, N. and Sedikides, C., 2017. The SPOT effect: People spontaneously prefer their own theories. *Quarterly Journal of Experimental Psychology*, 70(6), pp.996-1010.

Gullace, N.F., 1997. White feathers and wounded men: female patriotism and the memory of the Great War. *Journal of British Studies*, 36(2), pp.178-206.

- Harrison, R., 2011. Surface assemblages. Towards an archaeology in and of the present. *Archaeological dialogues*, 18(2), pp.141-161.
- Hayashida, T., 2021. Article 5. Museum as Propaganda: War Exhibitions in Britain during the First World War. *UrbanScope: e-journal of the Urban-Culture Research Center*, (12), pp.57-64.
- Hedenstierna-Jonson, C., Kjellström, A., Zachrisson, T., Krzewińska, M., Sobrado, V., Price, N., Günther, T., Jakobsson, M., Götherström, A. and Storå, J., 2017. A female Viking warrior confirmed by genomics. *American journal of physical anthropology*, 164(4), pp.853-860.
- Honeyman, K., 2007. Doing business with gender: Service industries and British business history. *Business History Review*, 81(3), pp.471-493.
- Houlbrook, C., 2018. Lessons from love-locks: the archaeology of the contemporary assemblage. *Journal of material culture*, 23(2), pp.214-238.
- Kavanagh, G., 1988. Museum as memorial: The origins of the Imperial War Museum. *Journal of Contemporary History*, 23(1), pp.77-97.
- Kean, H., 2005. Public History and Popular Memory: issues in the commemoration of the British militant suffrage campaign. *Women's History Review*, 14(3-4), pp.581-602.
- Kitson, A., Sheehan, M. and Harcourt, M., 2024. Making meaning about the First World War in museums. *History Education and Historical Inquiry*, p.315.
- Kovačević, I. and Kanner, S.B., 1970. Blue book into novel: The forgotten industrial fiction of Charlotte Elizabeth Tonna. *Nineteenth-Century Fiction*, 25(2), pp.152-173.
- Lawrence, K.F., 2011. Sparqling conversation: Automating the Bechdel-Wallace test. *Narrative and Hypertext 2011 Proceedings*, pp.13-16.
- Le Rossignol, J.E., 1917. Some Phases of the Minimum Wage Question. *The American Economic Review*, 7(1), pp.251-274.
- Maltby, J. and Rutterford, J., 2006. 'She possessed her own fortune': Women investors from the late nineteenth century to the early twentieth century. *Business History*, 48(02), pp.220-253.

- Maltz, D., 2020. Robert Sherard: The cosmopolitan journalist and the slum exposé, 1897–1905. *19th Century Studies*, 32, pp.104-125.
- Malvern, S., 2000, April. War, Memory and Museums: Art and Artefact in the Imperial War Museum. In *History Workshop Journal* (Vol. 49, No. 1).
- McKiernan, M., 2011. Estelle Sylvia Pankhurst The Chainmaker 1907. *Occupational medicine*, 61(4), pp.224-225.
- Martineau, H., 1852. Tubal-Cain.”. *Household Words*, 5(15), pp.192-97.
- McCartney, I., 2019. The archaeology of first world war U-boat losses in the english channel and its impact on the historical record. *The Mariner's Mirror*, 105(2), pp.183-201.
- Monkhouse, O.E., 1918. The Employment of Women in Munition Factories. *Proceedings of the Institution of Mechanical Engineers*, 94(1), pp.213-238.
- Morgan, B.H., 1918. The Efficient Utilization of Labour in Engineering Factories.(With Special Reference to Women's Work.). *Proceedings of the Institution of Mechanical Engineers*, 94(1), pp.239-324.
- Morgan, C.E., 1997. Gender constructions and gender relations in cotton and chain-making in England: A contested and varied terrain. *Women's History Review*, 6(3), pp.367-389.
- Moss, S., 2008. “Wartime Hysterics”: alcohol, women and the politics of wartime social purity in England. *British popular culture and the first World War*, pp.147-172.
- Nicholas, S. and Oxley, D., 1993. The living standards of women during the industrial revolution, 1795-1820. *Economic History Review*, pp.723-749.
- O’Farrell, H., 2024. Introduction to the Focus Issue: Women and Museums. *Collections*, 20(3), pp.411-414.
- Paterson, S., 2018. “An Unusual Phenomenon”: The Women's Work Sub-Committee at the Imperial War Museum and how it Recorded what Women Did during the Great War. *Collections*, 14(4), pp.533-546.
- Perez, C.C. and Frimston, A., 2019. Caroline Criado Perez. *The World Today*, 75(3), pp.18-21.

Pyecroft, S. (1994) 'British Working Women and the First World War', *The Historian*, 56(4), pp. 699–710.

Rickard, J., 1979. The anti-sweating movement in Britain and Victoria: The politics of empire and social reform. *Australian Historical Studies*, 18(73), pp.582-597.

Roberts, J., 2017. A Biography of the Trousered Munitions Women's Uniform of World War 1. *Apparence*.

Richardson, J., 2023. 'A fur coat and a blunted vocabulary are misfits': Representations of Munitionettes' Fashion and Class during the First World War. *Costume*, 57(1), pp.82-107.

Rughiniş, C., Rughiniş, R. and Humă, B., 2016, May. Impromptu crowd science and the mystery of the Bechdel-Wallace test movement. In *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems* (pp. 487-500).

Saunders, N.J., 2002. Excavating memories: archaeology and the Great War, 1914–2001. *Antiquity*, 76(291), pp.101-108.

Smith, C., 1914. The working of the trade boards act in Great Britain and Ireland. *Journal of Political Economy*, 22(7), pp.605-629.

Southwood, H., 2007. Dust, history, and politics: assigning meanings to objects at Marischal Museum, 1980-2000. *Journal of Museum Ethnography*, (19), pp.121-134.

Stansky, P., 1976. Art, industry, and the aspirations of William Martin Conway. *Victorian Studies*, 19(4), pp.465-484.

Stevenson, D., 2020. Britain's Biggest Wartime Stoppage: The Origins of the Engineering Strike of May 1917. *History*, 105(365), pp.268-290.

Thom, D., 1978. Women at the Woolwich Arsenal 1915-1919. *Oral History*, 6(2), pp.58-73.

Thom, D., 1914. Making Spectaculars: Museums and how we remember Gender in Wartime. *Evidence, History and the Great War: historians and the impact of*, 18, pp.48-66.

Thomas, Z., 2020. Between Art and commerce: women, business ownership, and the arts and crafts movement. *Past & Present*, 247(1), pp.151-196.

- Thornton, A., 2011. The Allure of Archaeology: Agnes Conway and Jane Harrison at Newnham College, 1903–1907. *Bulletin of the History of Archaeology* 21(1):37.
- Tilly, L.A., 1994. Women, women's history, and the Industrial Revolution. *Social Research*, pp.115-137.
- Torrence, R. and Clarke, A., 2016. Excavating ethnographic collections: negotiations and cross-cultural exchange in Papua New Guinea. *World Archaeology*, 48(2), pp.181-195.
- Voss, B.L., 2012. Curation as research. A case study in orphaned and underreported archaeological collections. *Archaeological Dialogues*, 19(2), pp.145-169.
- Walsh, F., 2017. 'We work with shells all day and night': Irish female munitions workers during the First World War. *Saothar*, 42, pp.19-30.
- Wilkinson, M., 1991. Patriotism and duty: the Women's Work collection at the Imperial War Museum'. *Imperial War Museum Review*, 6, pp.31-8.
- Witmore, C., 2014. Archaeology and the new materialisms. *Journal of contemporary archaeology*, 1(2), pp.203-246.
- Wolfe, U.I.Z.M., 2019. Grasping at Threads: A Discussion on Archaeology and Craft. *Crafting in the World: Materiality in the Making*, pp.51-73.

10.4 Doctoral dissertations

- Baillie, M., 2002. The Women of Red Clydeside: Women Munitions Workers in the West of Scotland during the First World War (Doctoral dissertation, McMaster University, Canada).
- Bracey, L.R., 2016. Women Workers in Sheffield's Metal Trades, c. 1742-1867 (Doctoral dissertation, University of Sheffield).
- Harding, C., 2022. *Horace Nicholls: Artist, Journalist, Propagandist, Opportunist* (Doctoral dissertation, University of Brighton).
- Hargreaves, R.J., 2017. *The developments of minimum wage legislation in the United Kingdom*. (Doctoral dissertation, Sheffield Hallam University).

Hoban, S., 2014. *The Birmingham Municipal School of Art and opportunities for women's paid work in the Art and Crafts Movement* (Doctoral dissertation, University of Birmingham).

Hogg, S., 1967. *The employment of women in Great Britain 1891-1921* (Doctoral dissertation, University of Oxford).

Kirkland, B.C.A., 2015. *"Now thrive the Armourers": The Development of the Armourers' Crafts and the Forging of Fourteenth-century London* (Doctoral dissertation, University of York).

Kozak, M., 1976. Women munition workers during the first world war with special reference to engineering. (Doctoral dissertation, University of Hull).

Law, V.C., 1993. *The women's cause: feminist campaigns 1918-1928* (Doctoral dissertation, Institute of Education, University of London).

Richardson, J., 2019. Female munition workers' workwear in Britain, 1914-1918: a visual and material culture analysis (Doctoral dissertation, University of Brighton).

Sheridan, M.R., 2016. *The Bombshell: More than munitions 1917-1919*. (Doctoral dissertation, Sheffield Hallam University).

Vainikka, V., 2018. The Portrayal of Female Characters in the Star Wars Film Saga (Master's thesis, Itä-Suomen yliopisto).

10.5 Reports

Bertram, G., 2017. *The HCA/Radcliffe red list of endangered crafts. Project Report*. The Heritage Crafts Association.

Chartres, J., 1916. *The Munitions of War Acts: 1915 & 1916 (5 & 6 Geo. 5. Cc. 54 and 99). An Analysis with Notes, Followed by Appendices Containing the Text of the Acts, Orders, Rules, and Other Relevant Documents*. Stevens and sons.

Evans, S., 2012. *Coppersmithing: researching ancient origins, traditional techniques and modern contexts*. The Churchill Fellowship.

Drake, B., 1918. *Women in the Engineering Trades: A Problem, a Solution, and Some Criticisms; Being a Report Based on an Enquiry by a Joint Committee of the Fabian Research*

Department and the Fabian Women's Group. By Barbara Drake. (No. 3). Fabian Research Department.

Kenyon, D., 2015. *First World War National Factories: An Archaeological, Architectural and Historical Review*. Historic England.

Pullen, R., Newsome, S., Williams, A. and Cocroft, W., 2013. *Curtis's and Harvey Ltd Explosives Factory, Cliffe and Cliffe Woods, Medway: Archaeological Survey and Analysis of the Factory Remains*. English Heritage.