

OFFICIAL
WAR HISTORY
OF THE
PUBLIC WORKS DEPARTMENT

VOL. I

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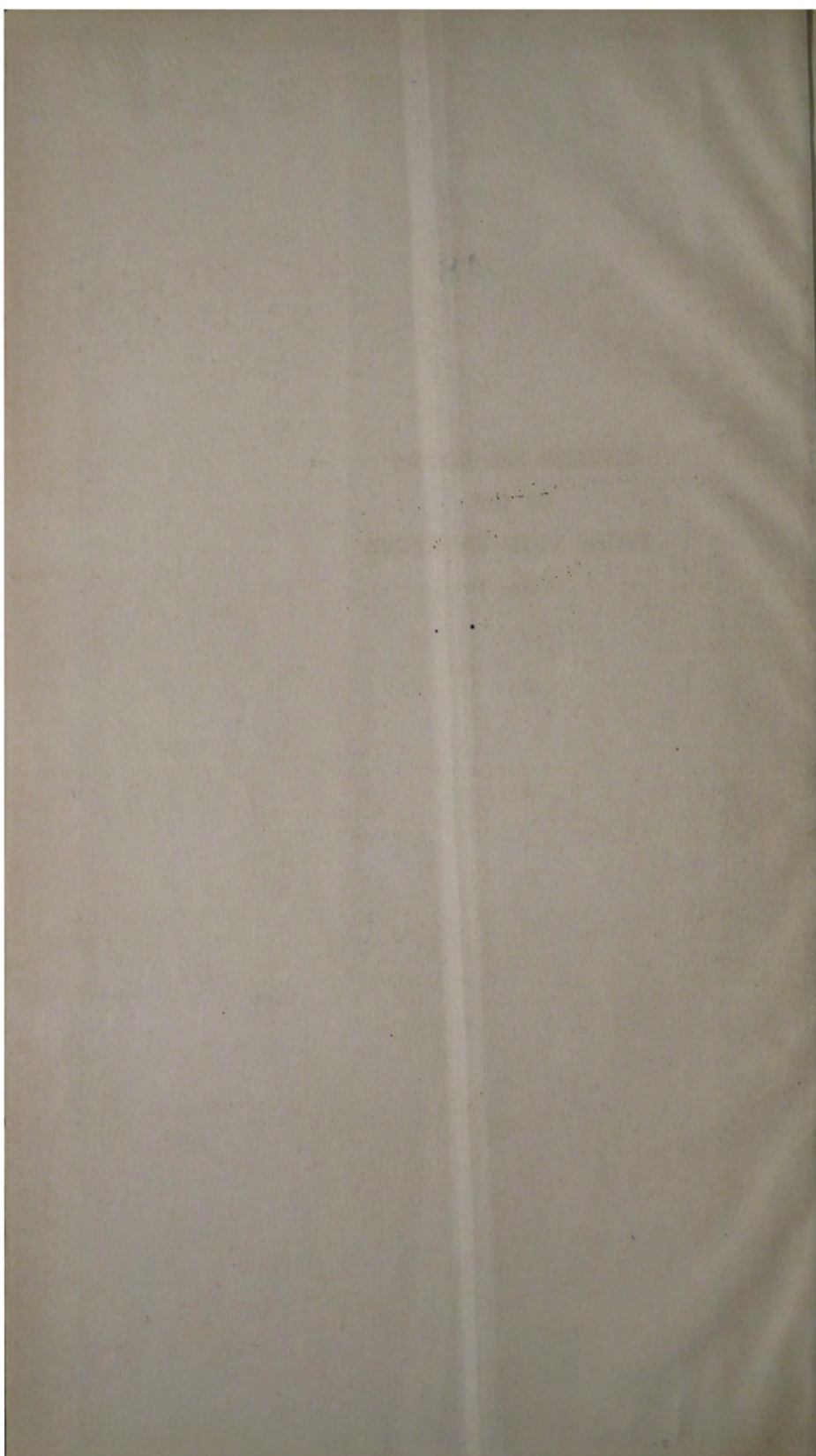
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OFFICIAL WAR HISTORY
OF THE
PUBLIC WORKS DEPARTMENT
VOL. 1.



January, 1948.

PREFACE.

This Departmental War History has been prepared primarily for use by the Editor-in-Chief of the New Zealand Official War Histories as a whole. I am sure it will meet that purpose admirably. But in addition to its value as an historical document, the narrative is of importance in that it sets out factually and objectively the full story of the war effort of the Public Works Department - a proud record of a remarkable achievement ...

Between 1939 and 1945 the Department carried out a defence construction programme involving an expenditure of over £47,000,000. Every conceivable kind of project was undertaken - from large camps, barracks, forts, aerodromes and naval bases, to an almost unbelievable variety of miscellaneous works and services for our own Forces, our American allies, and the defence of the Dominion generally. The difficulties encountered in accomplishing such a huge programme would have been formidable enough under normal peace-time conditions. Under the stress and strain of war, with all its attendant shortages of staff, manpower, and materials, these were at times almost insuperable. Yet, somehow, every demand made on the Department by those charged with the defence of the country was met speedily and efficiently, and the Heads of the Services have had nothing but the highest praise for the manner in which their requirements were fulfilled.

It is fitting that the prominent part played by the Public Works Department in the defence of the Dominion should find a place in the Nation's archives, so that the problems faced and overcome, the results achieved, and the lessons learned in the dark years just behind us might not be lost to posterity.

* * * * *

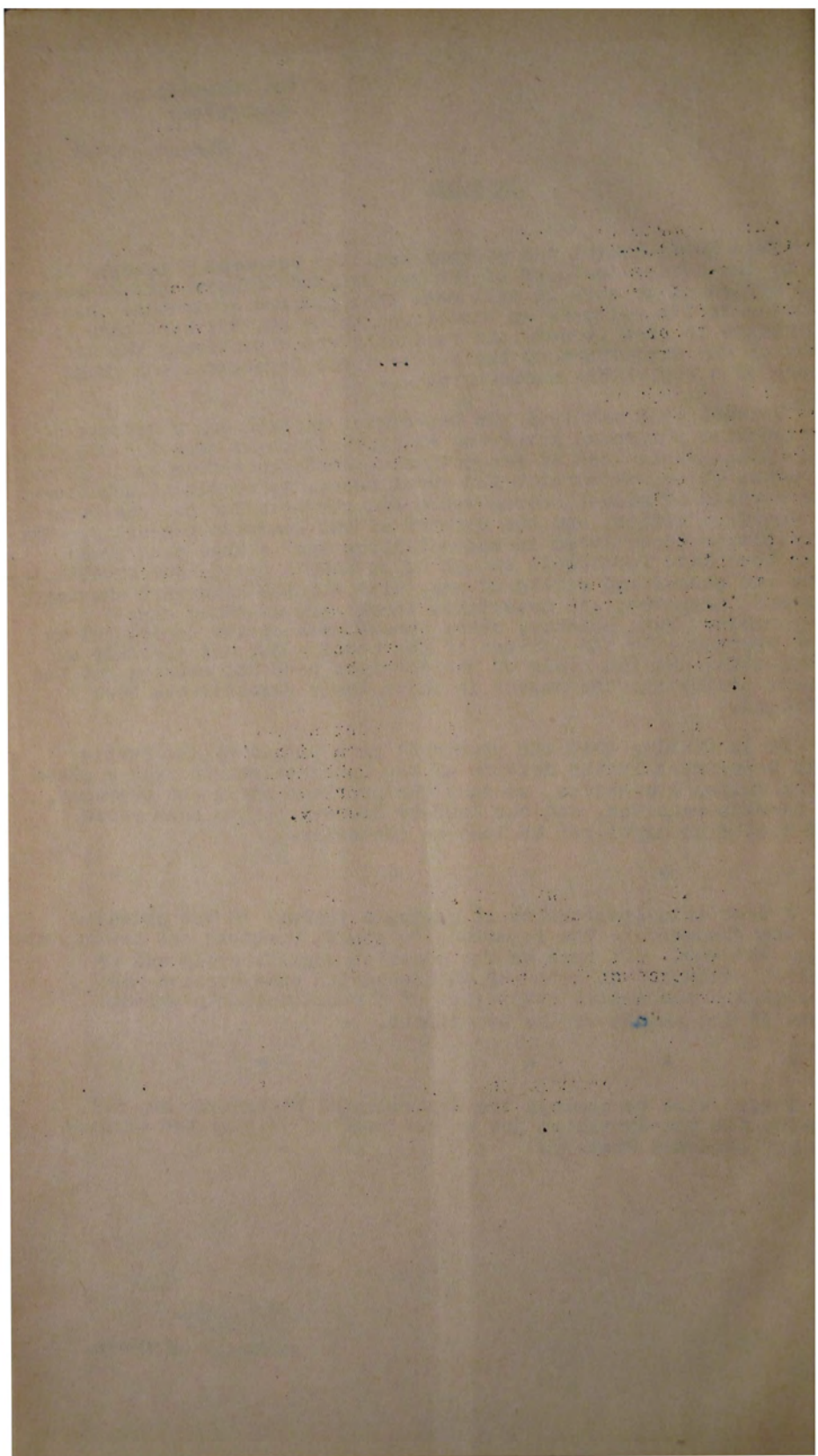
I take this opportunity of paying a tribute to the splendid services rendered by the Department's staff, workmen, and contractors during the war. All rose to the occasion magnificently and by tireless attention to duty and whole-hearted co-operation made possible the successful completion of a construction programme unique in the annals of the Department.

* * * * *

I also wish to commend the departmental historian, Mr. F.G. Grattan, for the excellent job he has made of writing and editing this Official War History.

B. Sample

Minister of Works.





THE HON. R. SEMPLE.
*Minister of Public Works, Dec. 1935 to Jan. 1941,
and again from Dec. 1942.
(Designated Minister of Works from April 1943)*



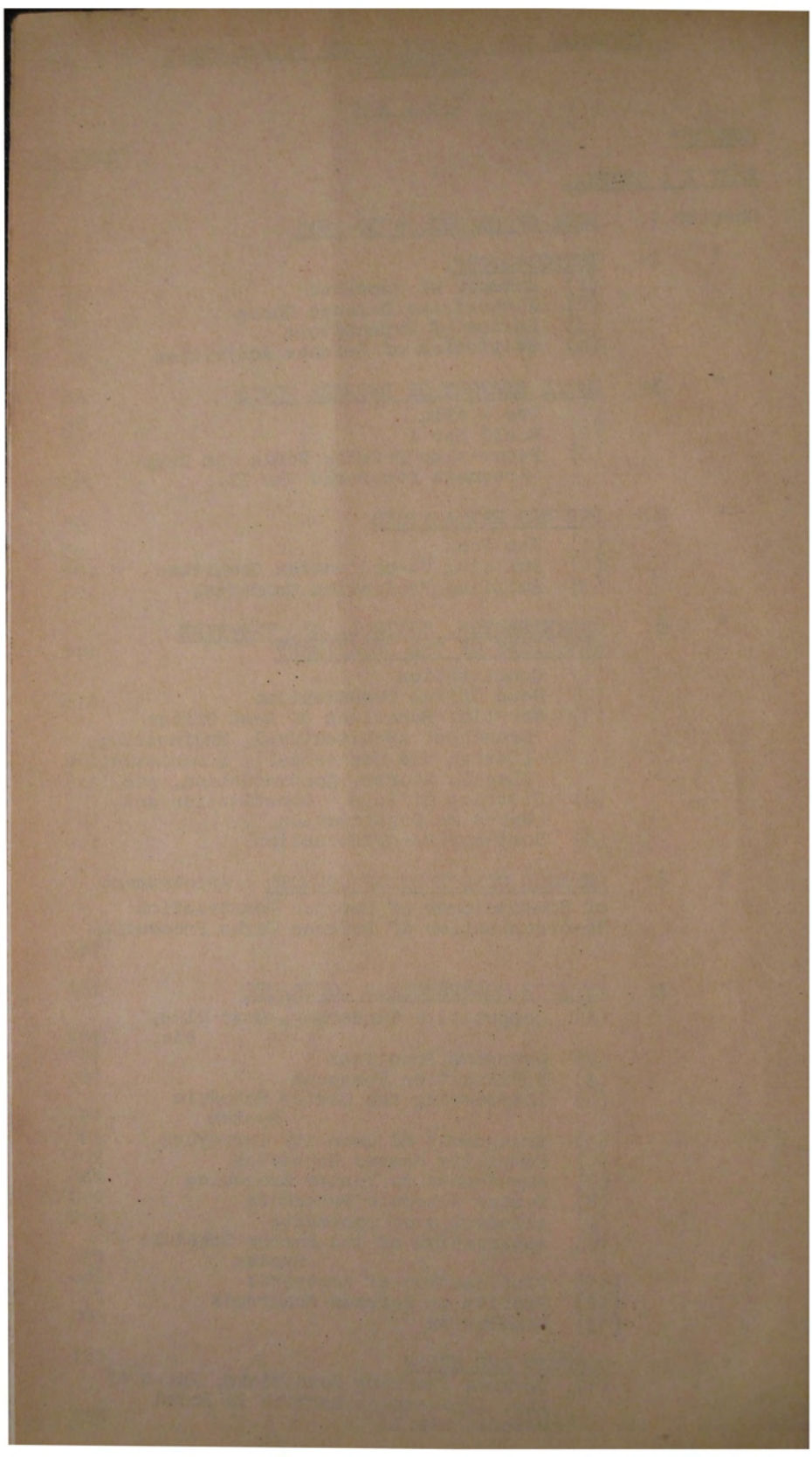
THE HON. H. T. ARMSTRONG



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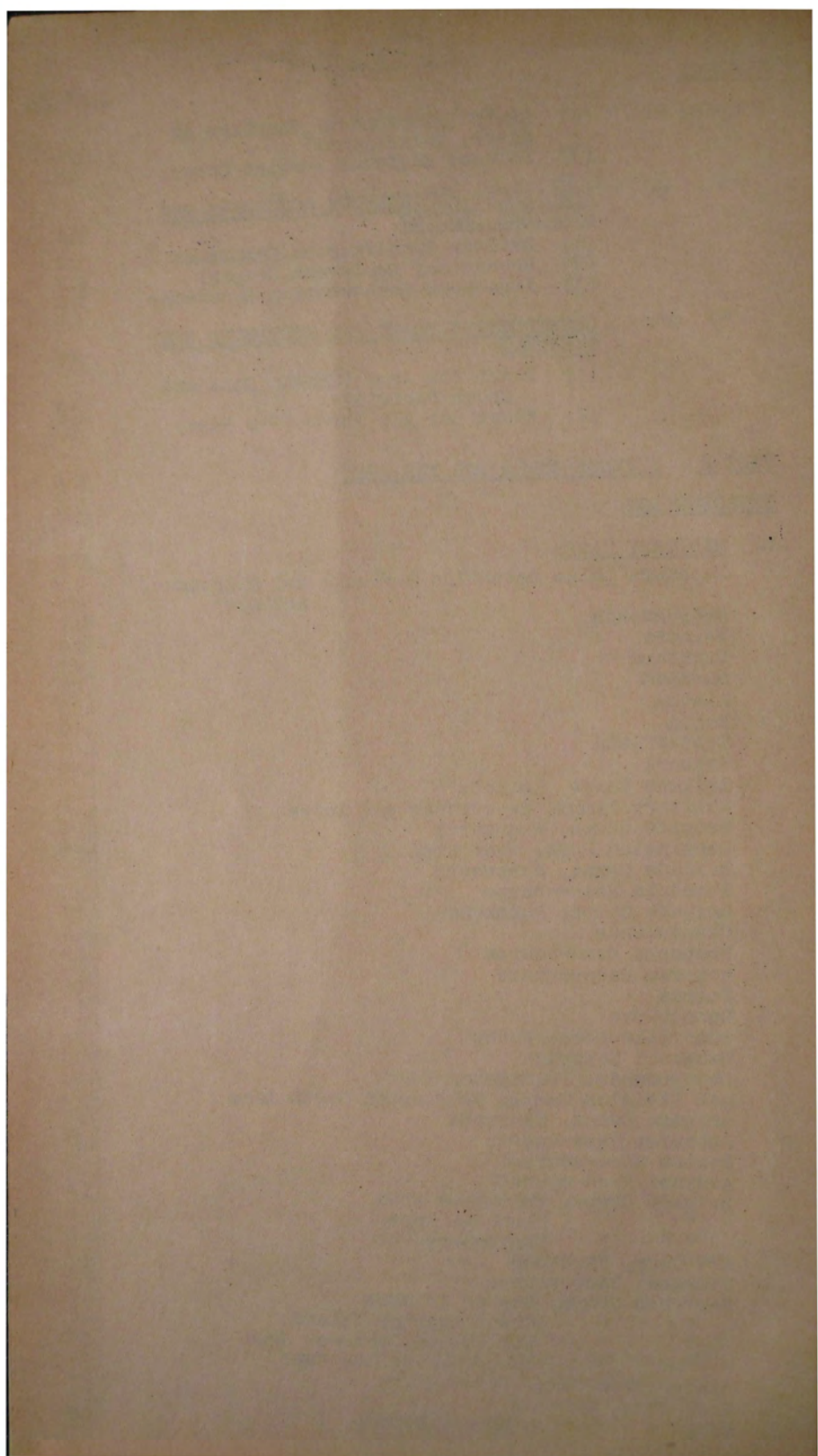
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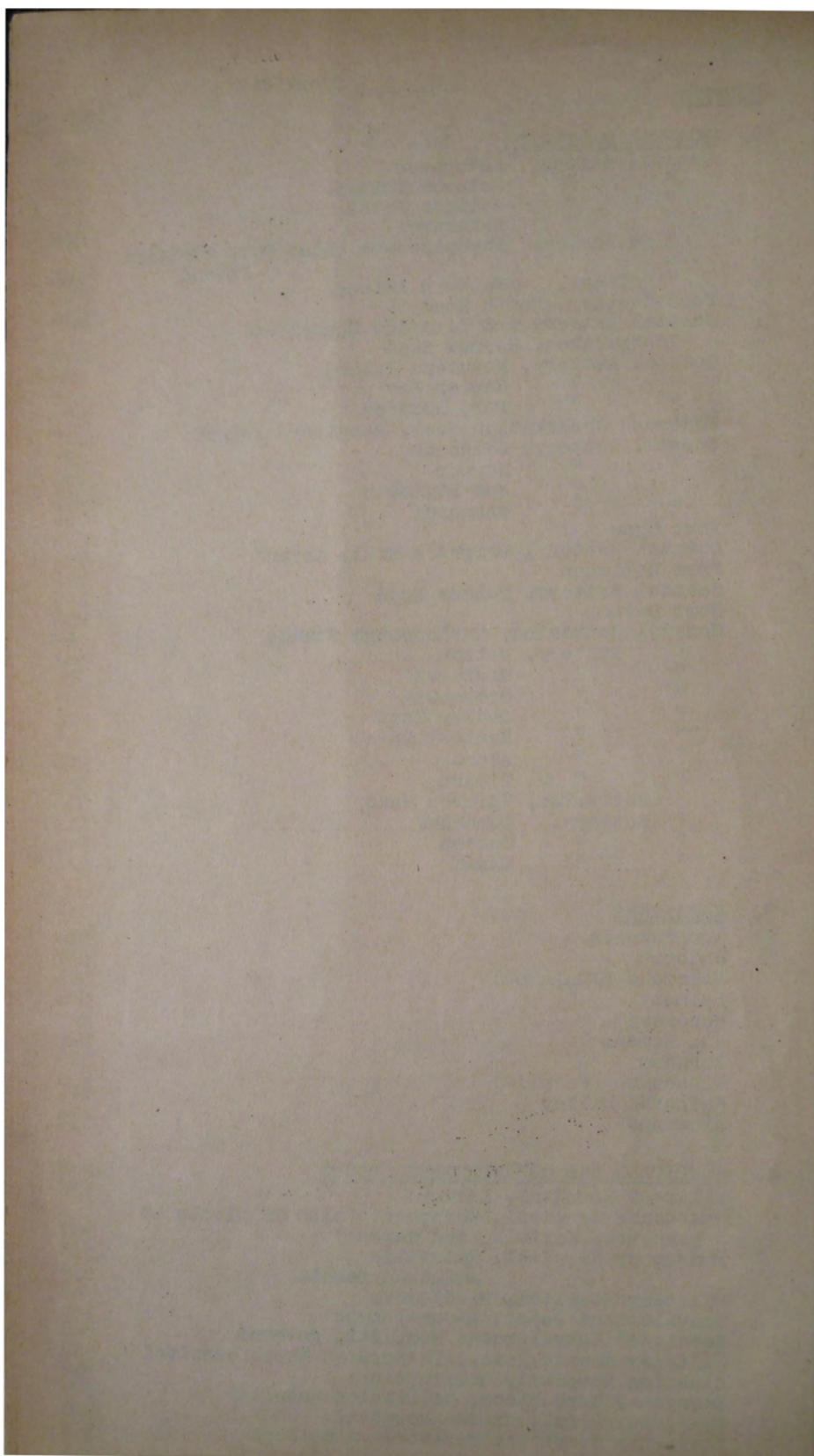
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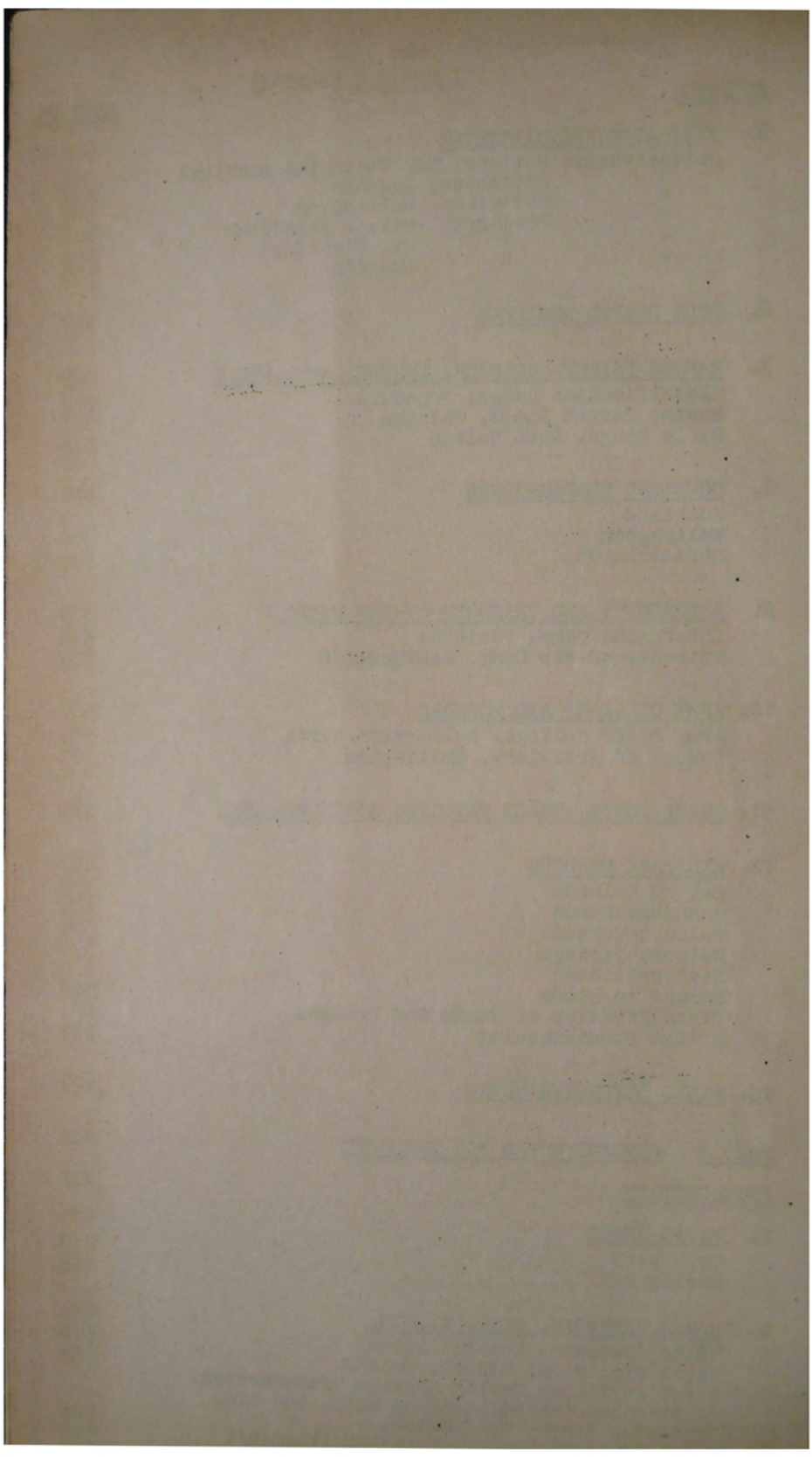
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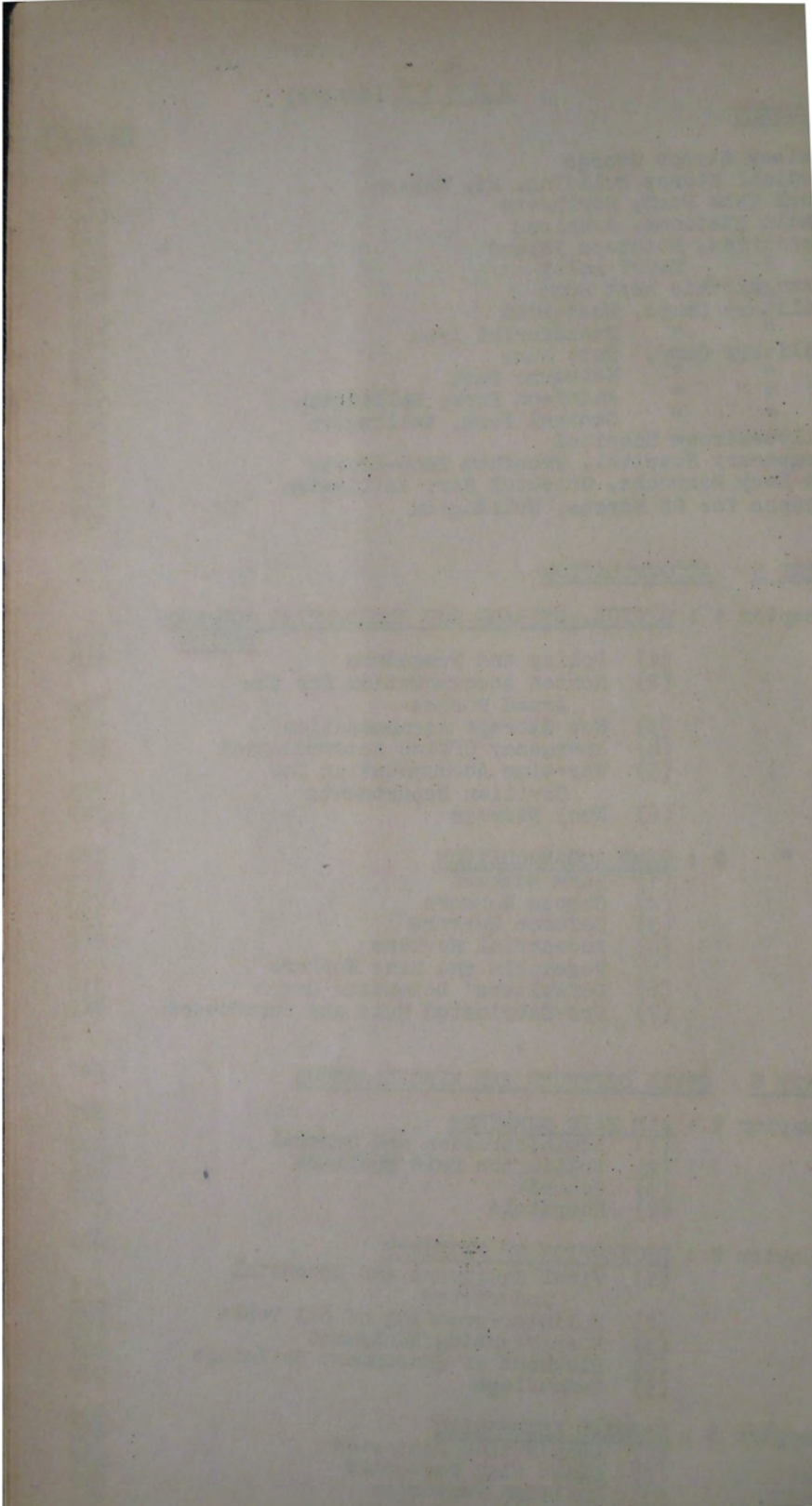
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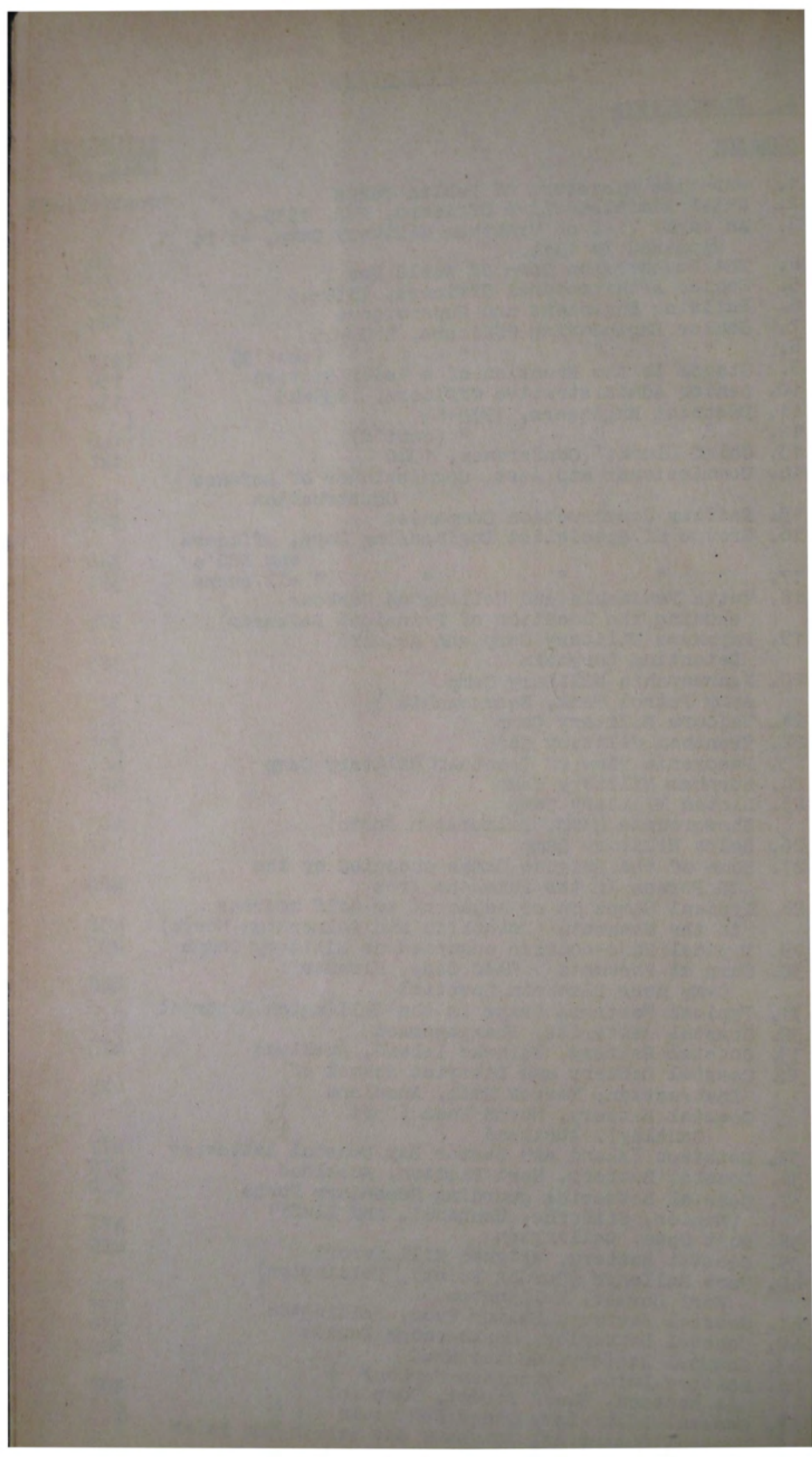
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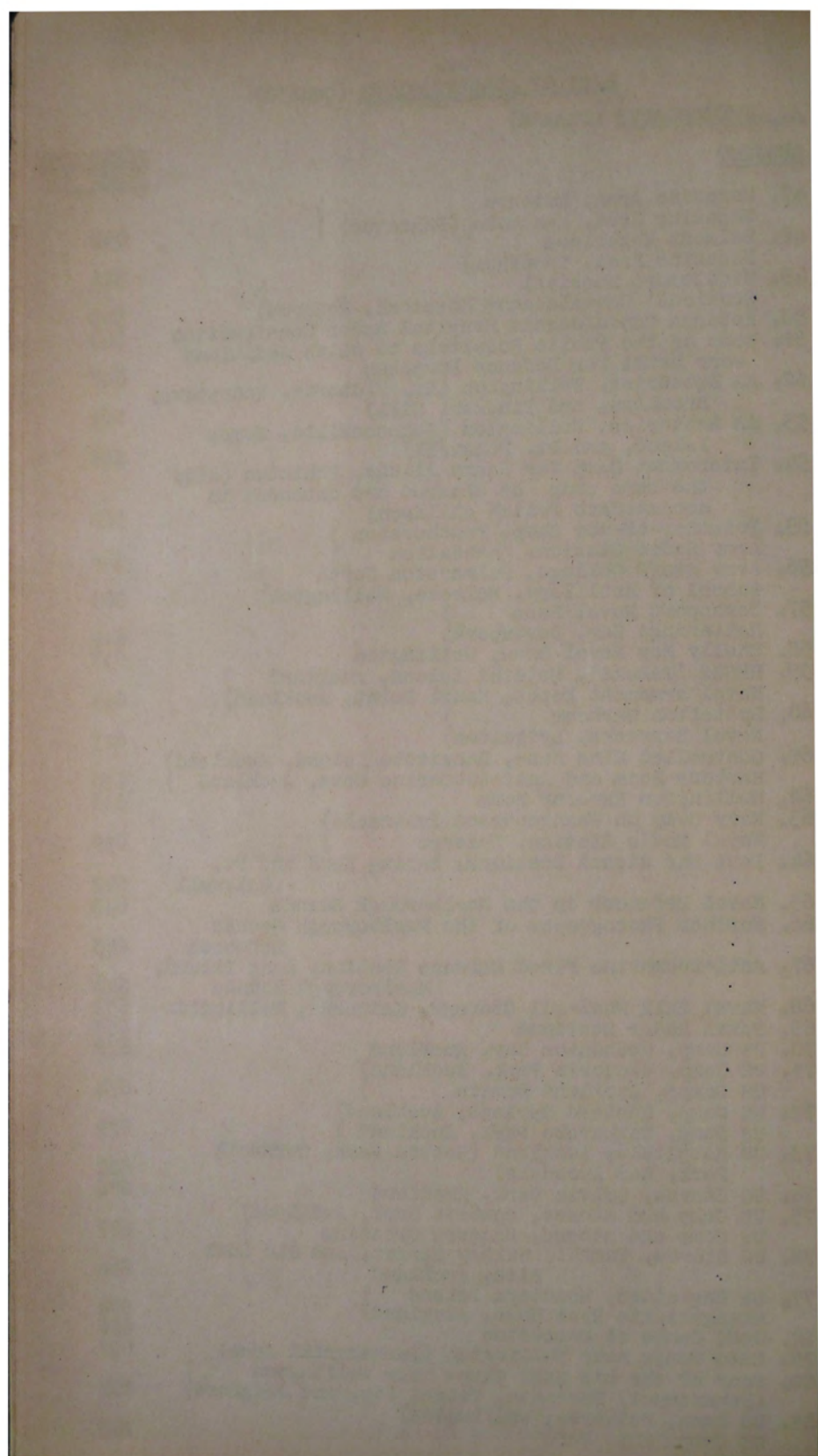
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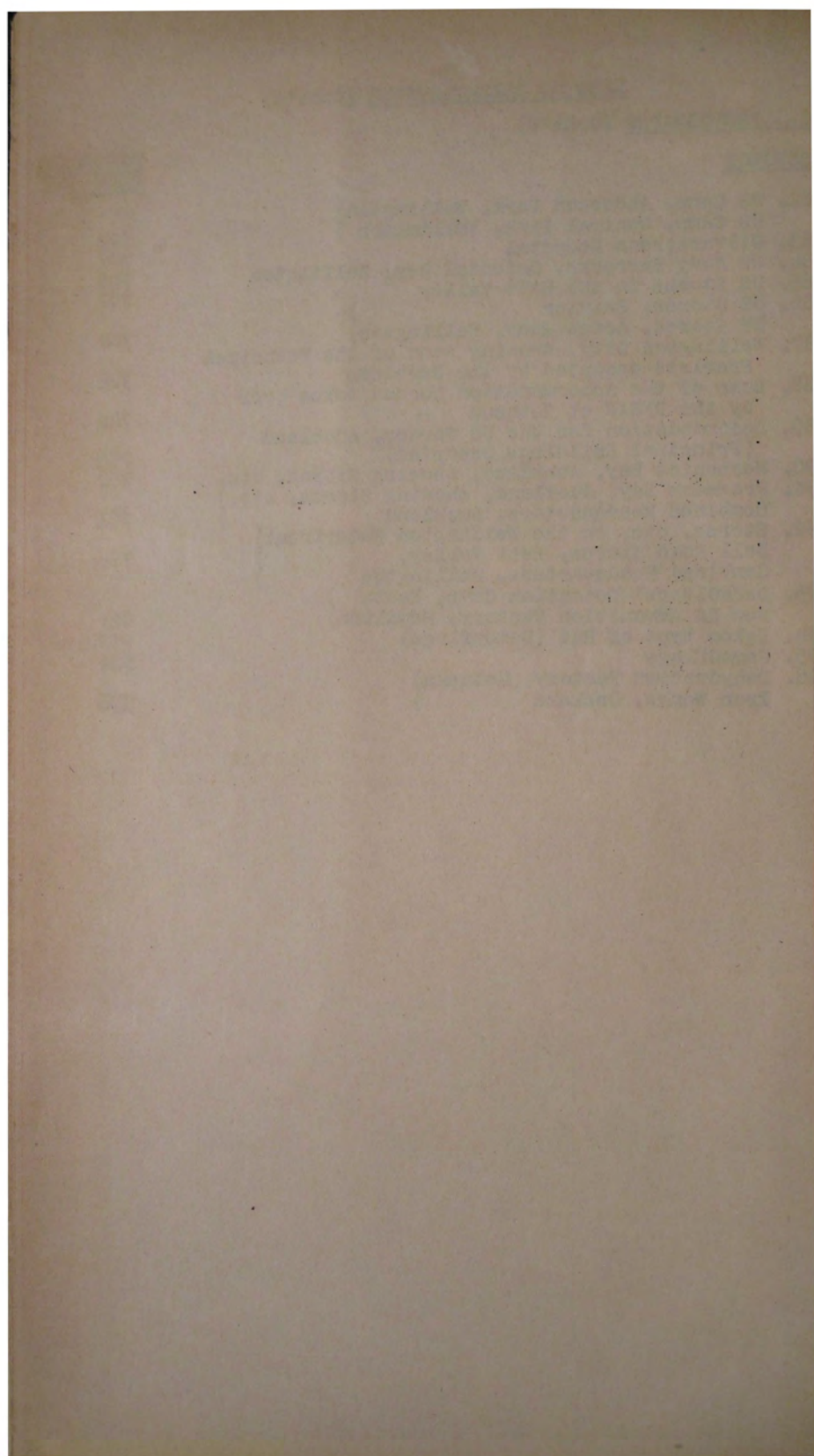
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(N.B. Public works districts are as at the outbreak of war)

KEY TO MAP REFERENCES IN WORKS NARRATIVES

Army works on the district maps are coloured red, Navy blue, United States Forces green, and civil and general brown. All such works on each district map are numbered consecutively. The map reference given in item 4 of the preamble to the descriptions of works incorporated in parts 2, 3, 4, and portions of 6 consists of the map number (as above, 1 to 13); the initial A for Army, N for Navy, US for United States Forces, and C for Civil and General; and the consecutive number as shown on the maps.

Thus 1/A4 refers to Army work No. 4 (Coastal Battery, Whangaroa) on Map No. 1 (North Auckland).

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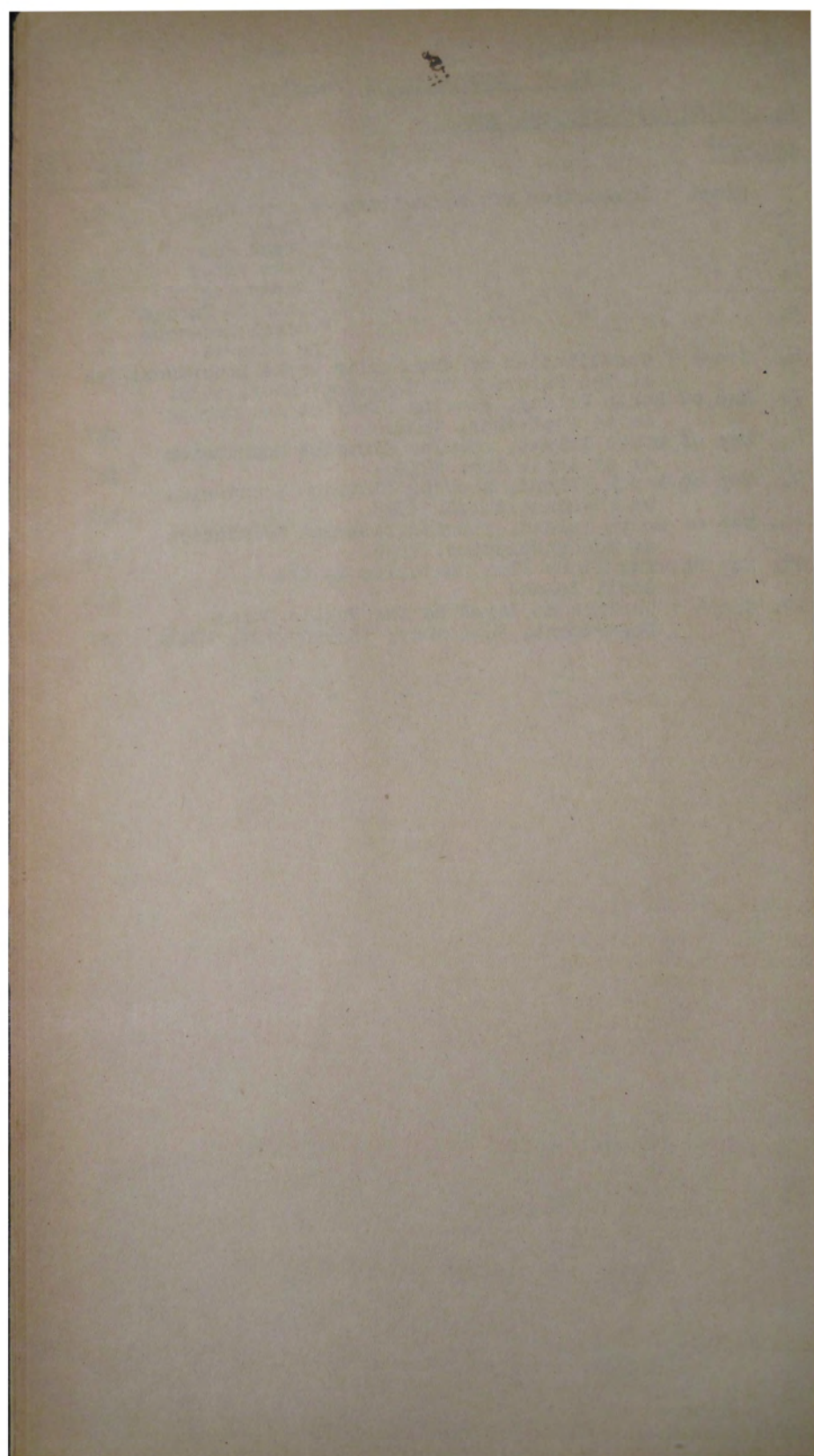
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2. Labour Legislation Suspension Emergency Regulations, 1940 (1940/123).
3. Defence Works Labour Legislation Suspension Order, 1942 (1942/65).
4. ditto, Amendment No. 1 (1942/90).
5. ditto, Amendment No. 2 (1942/109).
6. ditto, Amendment No. 3 (1942/197).
7. Building Emergency Regulations, 1939, Amendment No. 2 (1942/64).
8. Essential Building Works Labour Legislation Modification Order, 1943.
9. Public Works Workers' Agreement, 1939.
10. Highway and Road Maintenance Workers' Agreement, 1939.
11. Public Works Workers' Agreement, 1945.

Part 5, Chapter 1.

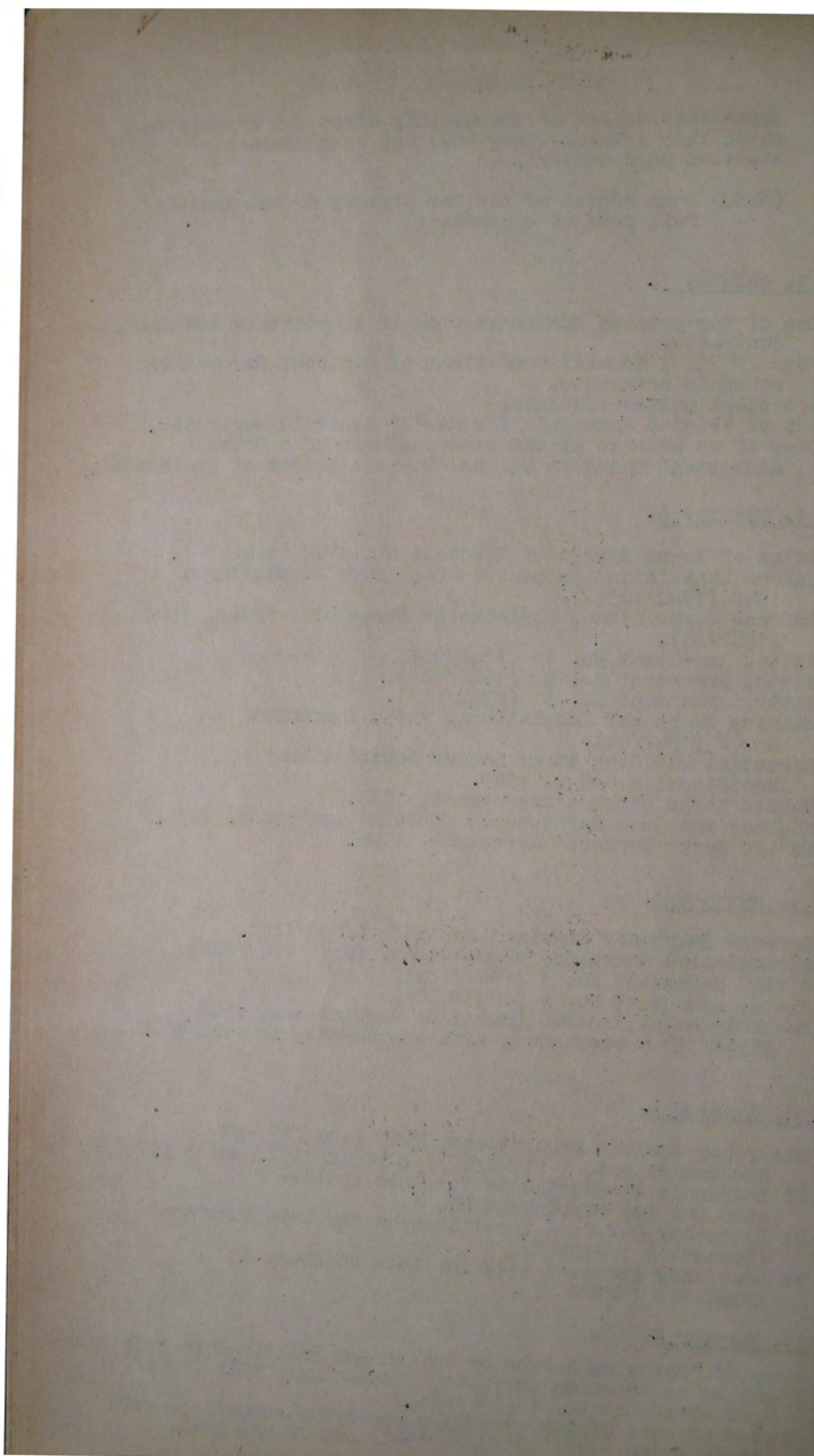
1. Defence Emergency Regulations, 1939 (1939/123).
2. Accommodation Emergency Regulations, 1941 (1941/244)
3. ditto, Amendment No. 1 (1942/182).
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5. Economic Stabilisation Emergency Regulations, 1942 (1942/335 - reprinted, with amendments, as 1944/36).

Part 6, Chapter 1.

1. Emergency Shelter Regulations, 1942 (1942/1) and Amendments Nos. 1 (1942/92), 2 (1942/189), and 3 (1942/297).
2. NZ Emergency Standard Code for Raid Shelter : NZSS E28 and Supplement No. 1.
3. NZ Emergency Standard Specification for Raid Shelters (Domestic) : NZSS E2.
4. NZ Emergency Standard Code for Raid Shelters at Hospitals : NZSS E33.

Part 6, Chapter 2.

1. Copy of 'Notes on Survey of Government Buildings in Wellington.'
2. Lighting Restriction Emergency Regulations, 1941 (1941/18) and Amendment No. 1 (1941/81).
3. Copies of Head Office circulars regarding camouflage work dated 7 Jan 1942, 18 March 1942, and 28 May 1942.



CHIEF ADMINISTRATIVE OFFICERS, P. W. D. 1939-1945.



J. WOOD, C.M.G. M.Inst.C.E.

*Engineer-in-Chief and Under
Secretary to Feb. 1941. (Ret'd.)*



W. L. NEWNHAM, M. INST. C.E.

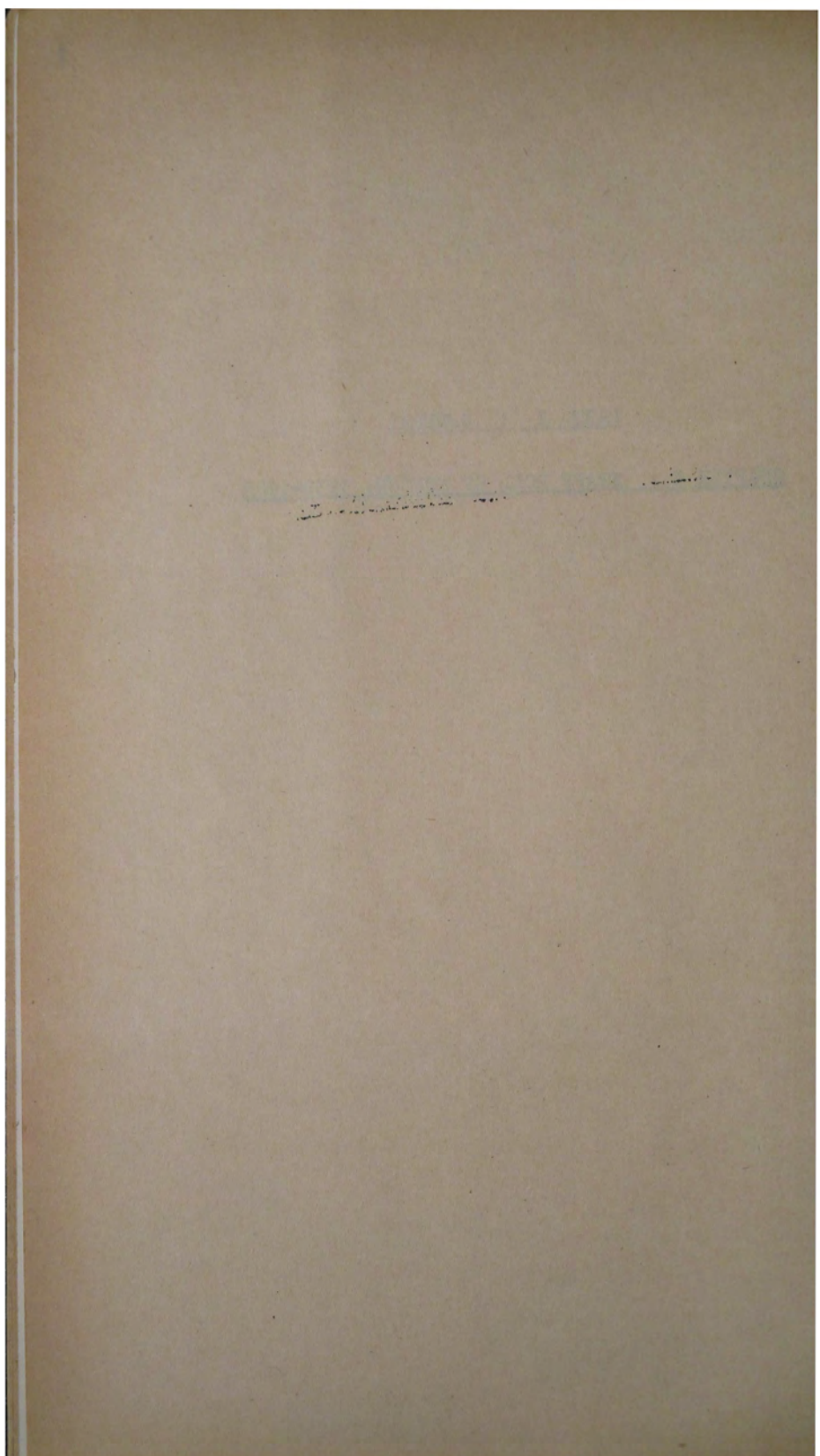


N. E. HUTCHINGS, C.B.E.



PART I : GENERAL

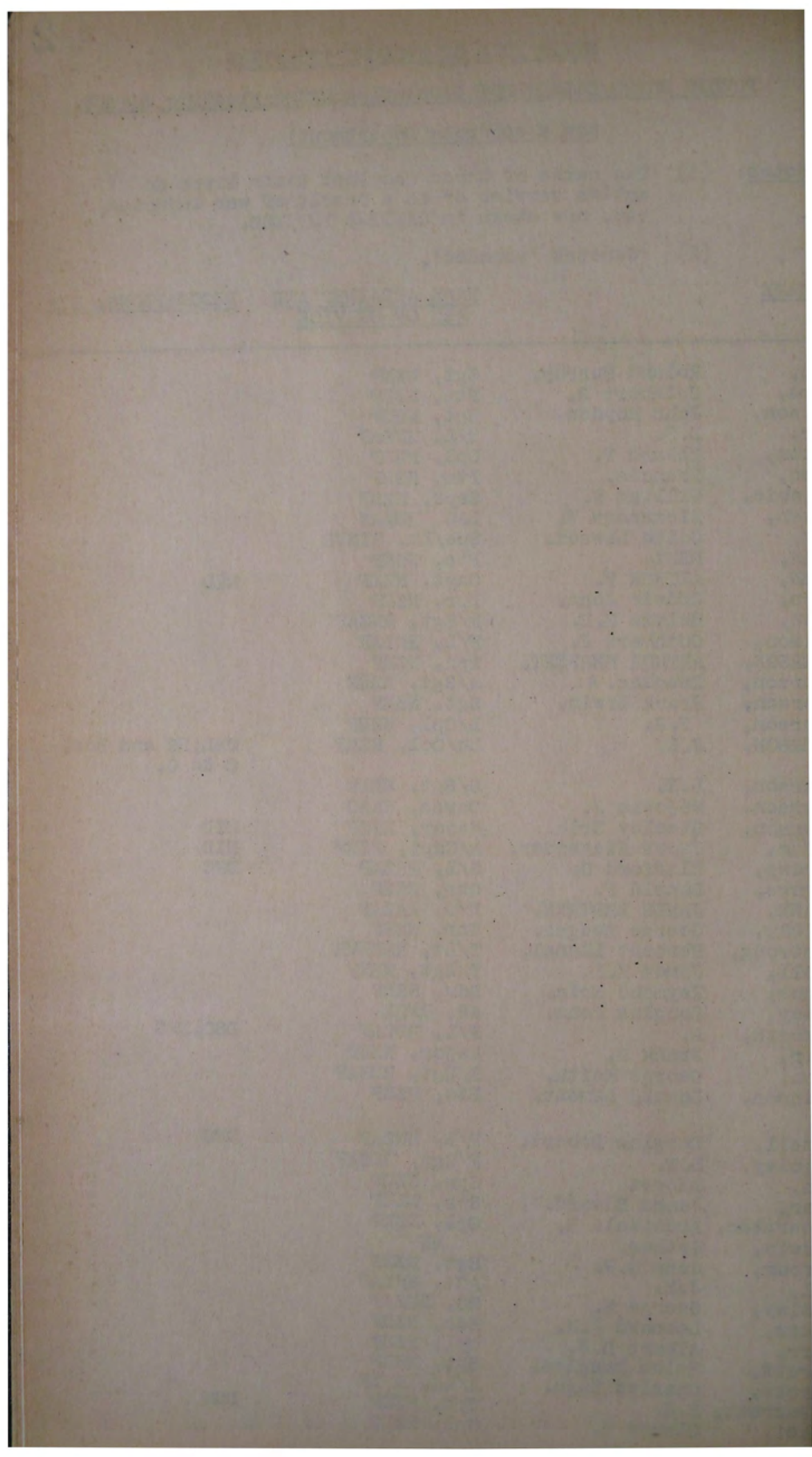
CHAPTER I : STAFF ROLL OF HONOUR, 1939-1945



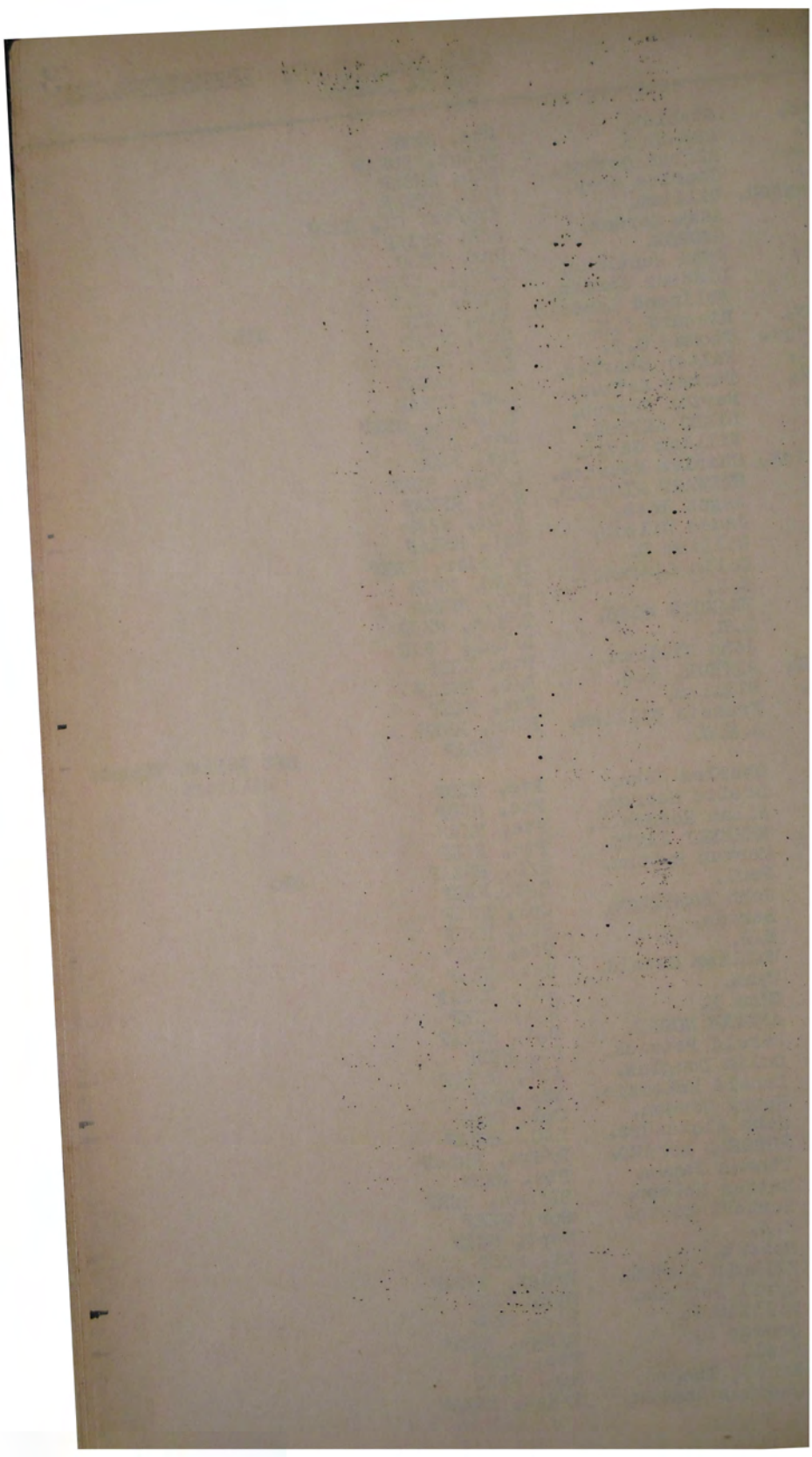
PUBLIC WORKS DEPARTMENT (including Hydro-electric Branch,
now a separate Department)

- Notes: (1) The names of those who lost their lives on active service or as a result of war injuries, etc. are shown in CAPITAL LETTERS.
- (2) *denotes 'wounded'.

| <u>NAME</u> | <u>RANK ATTAINED AND ARM OF SERVICE</u> | <u>DECORATIONS, ETC</u> |
|----------------------------|---|-----------------------------|
| able, Roland Murray. | Sgt, NZEF | |
| Adams, Cuthbert R. | Pte, NZEF | |
| Addison, John Royden. | Sgt, NZEF | |
| Agar, D.S. | S/L, RNZAF | |
| Aickin, Edward T. | Cpl, NZEF | |
| Aiken, Francis. | Pte, NZEF | |
| Aislabie, William R. | Capt, NZEF | |
| Aitken, Alexandra W. | LAC, RNZAF | |
| Aley, Colin Lawson. | Sub/Lt, RINVR | |
| ALLAN, REWI. | Pte, NZEF | |
| ALLEN, ARTHUR F. | Capt, NZEF | MID |
| Allen, Cedric John. | Tpr, NZEF | |
| Allen, Melvin R.H. | F/Sgt, RNZAF | |
| Allison, Cuthbert J. | F/L, RNZAF | |
| ANDERSON, ARTHUR HERBERT. | Tpr, NZEF | |
| Anderson, Douglas A. | A/Sgt, NZEF | |
| Anderson, Frank Irwin. | Sgt, NZEF | |
| Anderson, F.J. | L/Cpl, NZEF | |
| ANDERSON, J.E. | Lt/Col, NZEF | OBE; MC and Bar, C de G. |
| Anderson, L.E. | S/Sgt, NZEF | |
| Anderson, Majorie J. | Nurse, WAAC | |
| Anderson, Stanley Eric. | Major, NZEF | MID |
| Andrew, James Alexander. | A/Capt, NZEF | MID |
| Andrews, Clifford G. | S/L, RNZAF | DFC |
| Andrews, Donald F. | Gnr, NZEF | |
| ANNAND, JAMES BERTRAM. | W/O, RNZAF | |
| Appleby, George Hedger. | Gnr, NZEF | |
| Armstrong, Herbert Lionel. | T/Lt, RNZNVR | |
| Arroll, James M.K. | T/Sgt, NZEF | |
| Arthur, Raymond Eric. | Bdr, NZEF | |
| Ashley, Douglas John. | AB, RNZN | |
| Ashworth, A. | F/L, RNZAF | DSO; DFC |
| Askin, Frank R. | Major, NZEF | |
| Aston, George Keith. | F/Sgt, RNZAF | |
| Atkinson, Donald Lamont. | Pte, NZEF | |
| Bagnell, Douglas Robert. | F/L, RNZAF | DFC |
| Baguley, L.W. | F/Sgt, RNZAF | |
| Bain, Albert. | Spr, NZEF | |
| Baker, James Edward. | Spr, NZEF | |
| Balderston, Archibald H. | Cpl, NZEF | |
| Baldwin, Arthur. | MN | |
| Balfour, John G.F. | Sgt, NZEF | |
| Ball, J.M. | AC1, RNZAF | |
| Barclay, George S. | WO, RNZAF | |
| Barker, Leonard J.K. | Bdr, NZEF | |
| *Barr, Albert H.S. | Cpl, NZEF | |
| Barrett, Brian Douglas. | Sgt, NZEF | |
| Barrett, Charles Hugh. | A/LC, RNZN | |
| ***Barrett, H.K. | Cpl, NZEF | DCM |
| Basket, Claude T. | Cpl, NZEF | |



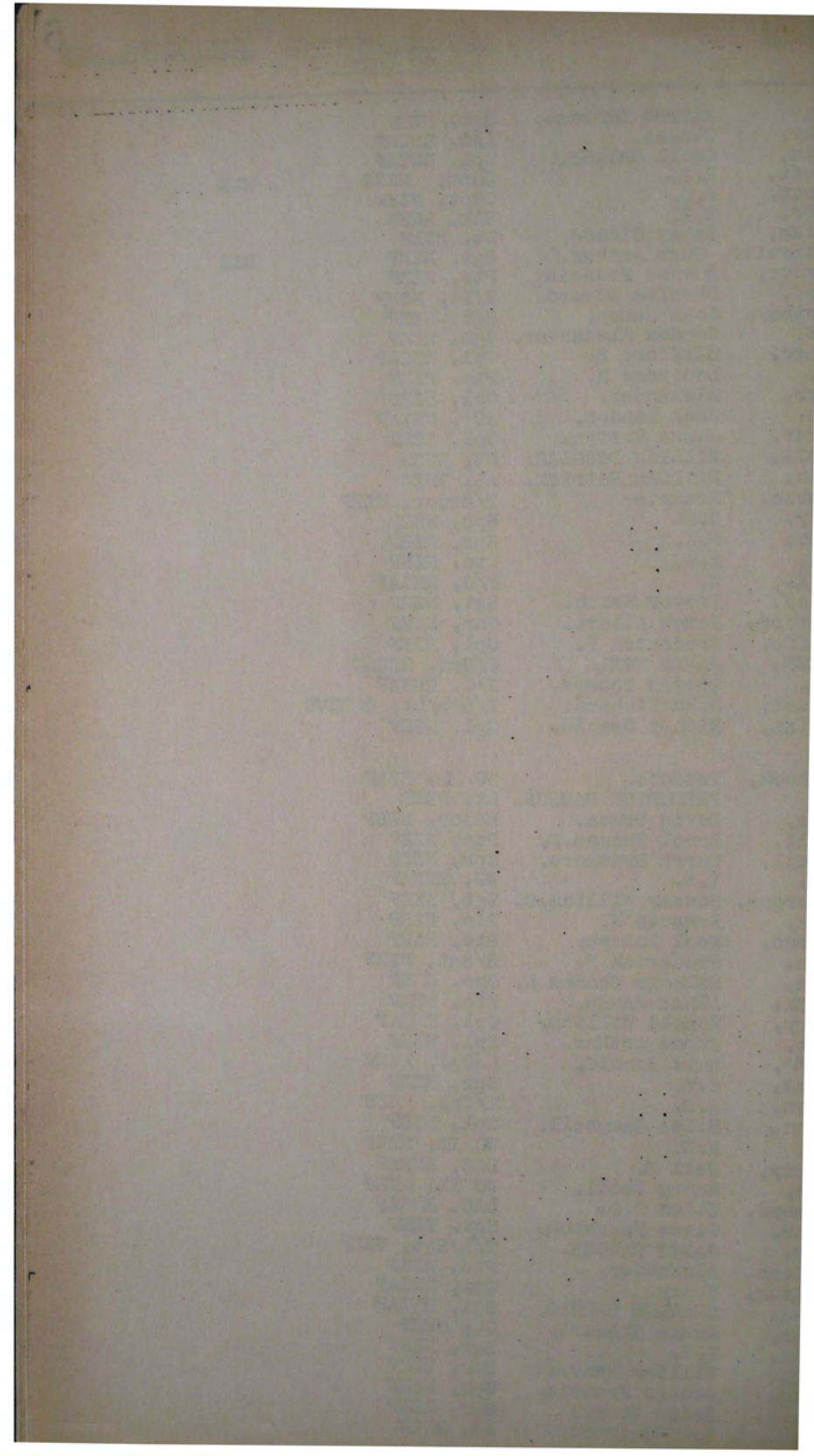
| | | | |
|------------|-------------------|------------------|--------------------------------|
| axter, | Stanley. | Pte, NZEF | |
| AYLY, | RONALD L. | F/Sgt, RNZAF | |
| eadle, | Alfred Gaynor. | F/L, RNZAF | |
| cale, | Charles Grey. | F/L, RNZAF | |
| edlington, | William. | Sto/1st Cl, RNZN | |
| egg, | Adam Gordon. | S/L, RNZAF | |
| ELL | GEORGE. | Gnr, NZEF | |
| ell, | John Septimus. | L/Cpl, NZEF | |
| ell, | Lindsay Gordon. | Capt, NZEF | |
| ellamy, | Wellwood Landale. | Pte, NZEF | MID |
| everidge, | Richard J.S. | Spr, NZEF | |
| ignell, | Thomas O.T. | F/L, RNZAF | |
| igwood, | Walter Charles. | F/L, RNZAF | |
| ilski, | Thomas Arthur. | LAC, RNZAF | |
| IRD, | Martin Joseph. | T/L/Cpl, NZEF | |
| ird, | LINDO ARTHUR. | Gnr, NZEF | |
| ishoprick, | William Gavin. | Sgt, NZEF | |
| ISSET, | Charles Maurice. | L/Cpl, NZEF | |
| lack, | STEWART RICHARD. | F/S, RNZAF | |
| lack, | Angus Ross. | 2/Lt, NZEF | |
| Blair, | James Wilson. | Cpl, RNZAF | |
| low, | William D. | A/Major, NZEF | |
| oddy, | Colin Clarence. | PORM, RNZN | |
| ORD, | E.R. | F/L, RNZAF | |
| ot, | FRANCIS MOSS. | T/Sgt, NZEF | |
| oucher, | L.W. | L/Cpl, NZEF | |
| DURGEOIS, | John William. | Pte, NZEF | |
| urlase, | ARTHUR, E.Q. | P/O, RNZAF | |
| oman, | William. | Pte, NZEF | |
| xer, | Francis William. | PORM, RNZN | |
| | A.H.C. | RNZAF | |
| | | | DFC Polish Virtute Militari |
| addell, | Charles John. | Pte, NZEF | |
| adley, | Leslie George. | Pte, NZEF | |
| eauley, | Allan Rosewell. | Pte, NZEF | |
| EDFORD, | HERBERT JAMES. | Pte, NZEF | |
| eed, | Mervan Ryburn. | F/L, RNZAF | |
| ennan, | Paul. | Sgt, NZEF | DFC |
| ridges, | John Hamilton. | Cpl, NZEF | |
| ien, | Bertie. | Pte, NZEF | |
| ien, | M.A. | Pte, NZEF | |
| oad, | William Oswald. | Sgt, NZEF | |
| oadly, | Wynn. | AC1, RNZAF | |
| ocket, | Elma N. | Sgt, NZEF | |
| ODIE, | ANDREW MOORE. | Sgt, RNZAF | |
| ookes, | Harold Patrick. | Lt, NZEF | |
| own, | Colin Douglas. | AC1, RNZAF | |
| own, | Donald McKenzie. | AB, RNZN | |
| rown, | Henry Gordon. | Cpl, NZEF | |
| own, | John Alexandra. | LAC, RNZAF | |
| OWN, | RUSSELL HOWARD. | F/Sgt, RNZAF | |
| own, | Thomas James. | Pte, NZEF | |
| ownlie, | Nathan McLean. | ED'man, NZEF | |
| unsden, | Herbert Edwin. | Spr, NZEF | |
| yant, | K.A. | Capt, NZEF | |
| ist, | Robert. | Lt, NZEF | |
| BRIDGE, | KENNETH ALFRED. | F/Sgt, RNZAF | |
| rden, | Cyril Bertram. | Spr, NZEF | |
| rgess, | William F. | Pte, NZEF | |
| rke, | George L. | T/Sgt, NZEF | |
| rke, | Paul. | Pte, NZEF | |
| rling, | Ernest Thomas. | Sgm, NZEF | |
| rnett, | Charles Andrew. | F/Sgt, RNZAF | |



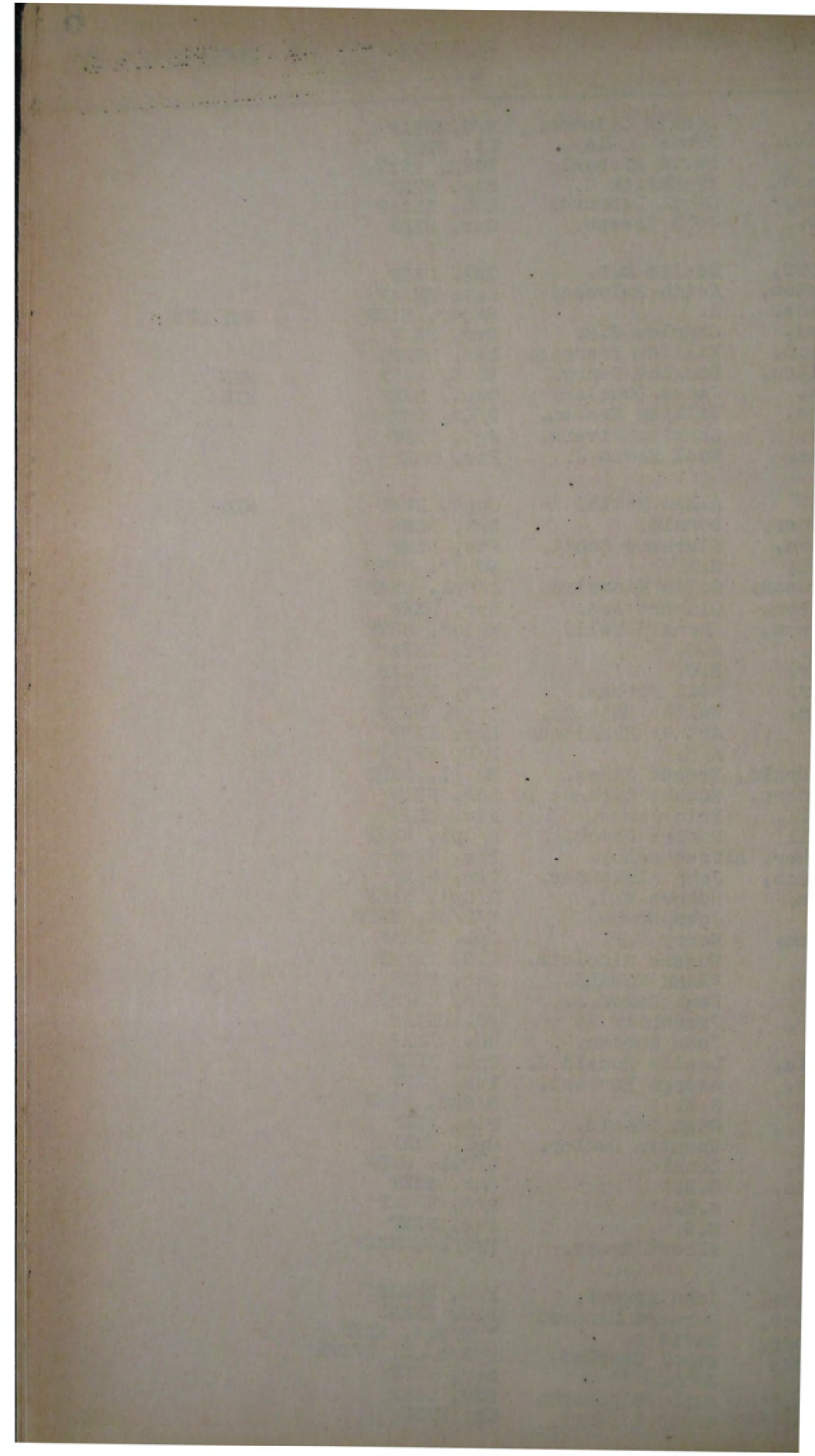
| | | | |
|-------------|-------------------|-----------------|------------------|
| Burns, | B.L. | T/Major, NZEF | |
| Burns, | Ross Tan. | Pte, NZEF | |
| Burrows, | William Arnold. | Pte, NZEF | |
| Burt, | H.C. | F/Sgt, RNZAF | |
| *Butcher, | Ewen. | Major, NZEF | |
| BUTLER, | BERTRAND WILLIAM. | F/Lt, RNZAF | |
| Butler, | James. | S/Sgt, NZEF | |
| Calderwood, | David. | Gnr, NZEF | |
| Cameron, | Allan Donald | Spr, NZEF | |
| Cameron, | John Edwin. | L/Cpl, NZEF | |
| Cameron, | J.M. | Pte, NZEF | |
| Campbell, | H.A. | Pte, NZEF | |
| Campbell, | John Robertson. | Dvr, NZEF | |
| Campbell, | H.H. | Gnr, NZEF | |
| Campbell, | Ian Hamilton. | Dvr, NZEF | |
| Cantlon, | George Cameron. | Pte, NZEF | |
| Carey, | Dudley Layton. | T/Sub/Lt, RNZAF | |
| Carle, | Eric Jordan. | Sgt, NZEF | |
| *Carmody, | James Joseph. | Spr, NZEF | |
| Carnell, | Newton Nelson. | Lt, NZEF | |
| Carr, | Graham Arthur. | Cpl, NZEF | |
| Carr, | John Maxwell. | 2/Lt, NZEF | |
| Carthew, | John Trewalla. | Sgt, NZEF | |
| Casey, | J.T. | Sgt, RNZAF | |
| Casey, | M.G. | T/Sub/Lt, RNZAF | |
| Cashman, | Robert Scott. | Lt, NZEF | |
| Cassels, | Arthur Valentine. | Dvr, NZEF | |
| Cassin, | Andrew Joseph. | Pte, NZEF | |
| Castle, | B.M. | Spr, NZEF | |
| Castles, | James Venton. | F/O, RNZAF | |
| Cawood, | Joseph. | Cpl, NZEF | |
| Chadwick, | Harold. | Cpl, NZEF | |
| Challis, | James Martin. | Cpl, NZEF | |
| Chalmers, | Cecil John. | Pte, NZEF | |
| Chapman, | Dudley John. | LAC, RNZAF | |
| Chapman, | McLeod Palm. | Cpl, NZEF | |
| CHATWIN, | D. | Pte, NZEF | |
| Cheyne, | Norman James. | Spr, NZEF | |
| Christie, | James A. | Dvr, NZEF | |
| Christie, | Kenneth. | Major, NZEF | MBE; MID (twice) |
| Church, | James B.E. | F/O, RNZAF | |
| Claridge, | H.G.A. | Lt, NZEF | |
| Clark, | Arthur James. | Pte, NZEF | |
| Clark, | Edwin Bartlett. | Sgt, NZEF | |
| Clark, | Leslie M. | LAC, RNZAF | |
| Clark, | William George. | Cpl, NZEF | |
| Clark, | William James. | Spr, NZEF | |
| Clarkson, | Anthony James. | WO II, NZEF | |
| Cleverly, | Rossland B. | S/Sgt, NZEF | MID |
| Climie, | J.K. | F/L, RNZAF | DFC |
| *Cochrane, | Wilfred John. | Sgt, NZEF | |
| Cole, | Alan. | Sgt, NZEF | |
| Cole, | Gordon H.C. | Spr, NZEF | |
| Cole, | Harold. | Lt, NZEF | |
| Colebourne, | Albert John. | A/S/L, RNZAF | |
| Coleman, | Geoffrey. | Gnr, NZEF | |
| Coleman, | H.A. | Pte, NZEF | |
| Collic, | Donald B. | S/L, RNZAF | DFC; MID |
| COLLIER, | J.A. | Gnr, NZEF | |
| Collins, | Eric Arthur. | Sgt, NZEF | |
| Collins, | R.J. | Capt, NZEF | |
| Congdon, | John Richard. | Sgt, NZEF | |
| Connolly, | Joseph. | Pte, NZEF | |
| Connolly, | Victor Francis. | Bdr, NZEF | |

| | | | |
|--------------|-------------------|------------------|-----|
| Book, | Alfred Ambrose. | Sgt, NZEF | |
| Dopley, | Thomas. | LAC, RNZAF | |
| Dorkin, | Cecil Walker, | Cpl, RNZAF | |
| Dorlett, | R.B. | Capt, NZEF | MBE |
| Dorlett, | F.C. | Capt, NZEF | |
| Dorner, | E.E. | Stk, RNZN | |
| Dornish, | Percy Claude. | Lt, NZEF | |
| Dornthwaite, | Hugh Arthur. | Sgt, NZEF | MID |
| Dosgrove, | Edward Francis. | Pte, NZEF | |
| Doupe, | Charles Edward. | 2/Lt, NZEF | |
| D Courtney, | John James. | Sgt, NZEF | |
| Dowie, | Gordon Alexander. | Sgm, NZEF | |
| Drammer, | Clifford S. | Cpl, RNZAF | |
| Draw, | Laurence H. | Pte, NZEF | |
| Drerar, | Alexander. | Cpl, NZEF | |
| Drisp, | Jack Landon. | AC1, RNZAF | |
| Drocker, | James Mostyn. | Cpl, NZEF | |
| DROMBIE, | WILLIAM DOUGLAS. | OS, RNZN | |
| Dronin, | William Patrick. | AB, RNZN | |
| Drosbie, | Francis. | T/Major, NZEF | |
| Drosby, | D.R. | Spr, NZEF | |
| DROSBY, | M.J. | Spr, NZEF | |
| Dross, | A.W. | Pte, NZEF | |
| DROZIER, | A. | F/O, RNZAF | |
| D Culley, | Trevor Keith. | Sgt, NZEF | |
| Dullimore, | James Albert. | Gnr, NZEF | |
| Dunliffe, | Frederick P. | Cpl, NZEF | |
| DUNNEEN, | JAMES NOEL. | F/Sgt, RNZAF | |
| Curle, | George Thomas. | F/O, RNZAF | |
| Cuthbert, | John Richard. | T/Sub/Lt, RNZNVR | |
| Cuttriss, | Sidney Oswald. | Cpl, NZEF | |

| | | |
|-------------|-------------------|---------------|
| Dabscheck, | Isadore. | WO II, NZEF |
| DAHL, | FREDERICK MAGNUS. | Lt, NZEF |
| Dallas, | David Bruce. | Major, NZEF |
| Dalzell, | Errol Thomas.P. | Pte, NZEF |
| *Daniell, | Harry Bradmore. | Spr, NZEF |
| Darby, | I.A. | WO, RNZAF |
| D'Auvergne, | Bonamy William.C. | Sgt, NZEF |
| Davies, | Kenneth W. | Pte, NZEF |
| Davisson, | Noel Joseph. | Pte, NZEF |
| Dawson, | Frederick F. | S/Sgt, NZEF |
| Dawson, | Malcolm Thomas A. | Gnr, NZEF |
| DERRICK, | ALLAN JAMES. | Pte, NZEF |
| *Devery, | Ronald William. | Cpl, RNZAF |
| Devitt, | James Arthur. | Cpl, NZEF |
| Diamond, | Hua Donald. | L/Cpl, NZEF |
| Diamond, | G.T. | Spr, NZEF |
| Dickson, | A.E. | L/Cpl, NZEF |
| Dickson, | Miles Campbell. | Cpl, NZEF |
| Dobbs, | M.W. | WO II, NZEF |
| Docherty, | Neil E. | LAC, RNZAF |
| Dodson, | Henry Cecil. | WO II, NZEF |
| Dollimore, | Eldon D.G. | LAC, RNZAF |
| Donahue, | James Naughton. | Sgt, NZEF |
| DONALD, | JAMES CARTER. | T/L/Sgt, NZEF |
| Donaldson, | Alexander. | Pte, NZEF |
| Donaldson, | Henry. | Sgt, RNZAF |
| DOUGLAS, | CHARLES HAROLD. | Sgt, RNZAF |
| Douglas, | James Stewart. | Lt, NZEF |
| Douglas, | R.I. | Sgt, NZEF |
| Dowler, | William Henry. | Dvr, NZEF |
| Dowling, | George Francis. | Spr, NZEF |
| Doyle, | Brian Henry. | Gnr, NZEF |
| Drake, | Eric Selwood. | AB, RNZN |



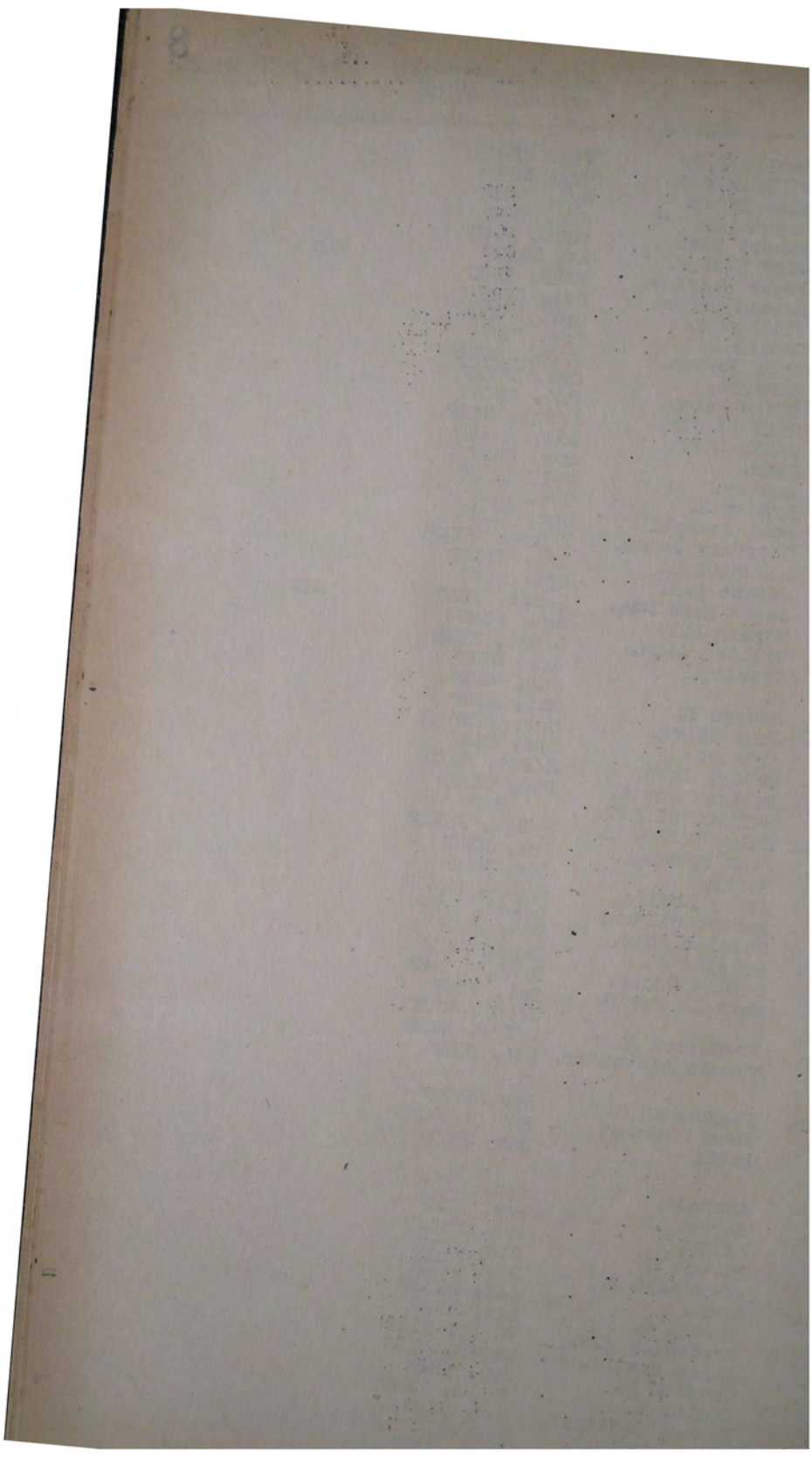
| | | | |
|-------------|-------------------|-----------------|---------|
| Duff, | Donald Clinton. | F/O, RNZAF | |
| Duffield, | Bruce Dudley. | Lt, NZEF | |
| Duggan, | David Michael. | PORM, RNZN | |
| Durward, | Frederick C. | Pte, NZEF | |
| Dutton, | Cyril Leonard. | LAC, RNZAF | |
| Dwyer, | John Joseph. | Gnr, NZEF | |
| Eckhoff, | Leslie R.N. | Cpl, NZEF | |
| Edginton, | Keith Selwood. | Sgt, RNZAF | |
| Edmonds, | A. | Major, NZEF | MC; MID |
| Edward, | Charles J.M. | Dvr, NZEF | |
| Egerton, | William Francis. | Sgt, NZEF | |
| Eggelton, | Douglas Henry. | WO I, NZEF | MID |
| Ellis, | James Douglas. | Capt, NZEF | MID |
| Elmore, | William Ernest. | F/Lt, RNZAF | |
| Ensor, | Charles Rivers. | Sgt, NZEF | |
| Evans, | Noel Elwin J. | Pte, NZEF | |
| Fagan, | Allan Keith. | Capt, NZEF | MID |
| Falconer, | Donald. | Sgt, NZEF | |
| Falloon, | Clarence Cecil. | Pte, NZEF | |
| Farach, | M.E. | WO II, NZEF | |
| Ferguson, | Colin Kinnaird. | L/Cpl, NZEF | |
| Ferguson, | Gilbert A.S. | Spr, NZEF | |
| Ferguson, | Ronald Hall. | Major, NZEF | |
| Ferry, | A.G. | Cpl, RNZAF | |
| Fisher, | D.C. | Cpl, RNZAF | |
| Fisher, | Neil Forbes. | Sgt, RNZAF | |
| Fisher, | Walter Malcolm. | Capt, NZEF | |
| Fisk, | Arthur Hamilton. | Spr, NZEF | |
| Fisk, | A.H. | F/L, RNZAF | |
| Fitzgerald, | Ernest James. | WO II, NZEF | |
| Flannery, | Edward Clement D. | Bdr, NZEF | |
| Flavell, | Eric James. | Pte, NZEF | |
| Flavell, | Robert James. | L/Cpl, NZEF | |
| Fletcher, | Alfred Manby. | Pte, NZEF | |
| Florance, | John Alexander. | Tpr, NZEF | |
| Fookes, | Robert W.J. | L/Cpl, NZEF | |
| Ford, | John Norman. | T/2/Lt, NZEF | |
| Forsman, | Harry I.F. | Cpl, RNZAF | |
| Fort, | Eugene Sinclair. | LAC, RNZAF | |
| FOSTER, | FRANK RONALD. | Gnr, NZEF | |
| Foster, | Paul Saxon A. | F/O, RNZAF | |
| Fowler, | Frederick W. | WO, RNZAF | |
| Fox, | John Norman. | WO, RNZAF | |
| Francis, | Leslie Ronald J. | Cpl, NZEF | |
| Fraser, | George Herbert. | Pte, NZEF | |
| Fraser, | G.M. | S/Sgt, NZEF | |
| Fraser, | Hugh Donald. | Pte, NZEF | |
| Fraser, | Quentin Dudley. | Cpl, NZEF | |
| Frazer, | Donald. | L/Cpl, NZEF | |
| Freeman, | C.S. | Gnr, NZEF | |
| Friis, | G.H. | P/O, NZEF | |
| Fuller, | M.R. | Pte, NZEF | |
| Fulton, | Albert Henry. | T/2/Lt, NZEF | |
| Galbreth, | John Armour. | F/O, RNZAF | |
| Gardiner, | Bernard Lennox. | LAC, RNZAF | |
| Gardiner, | David A. | T/S/Sgt, NZEF | |
| Garlick, | Athol Charles. | T/Sub/Lt, RNZVR | |
| Gavey, | John. | Spr, NZEF | |
| Gawith, | Herbert Joseph. | Bdr, NZEF | |
| Gibson, | Herbert Lennox. | Lt, NZEF | |



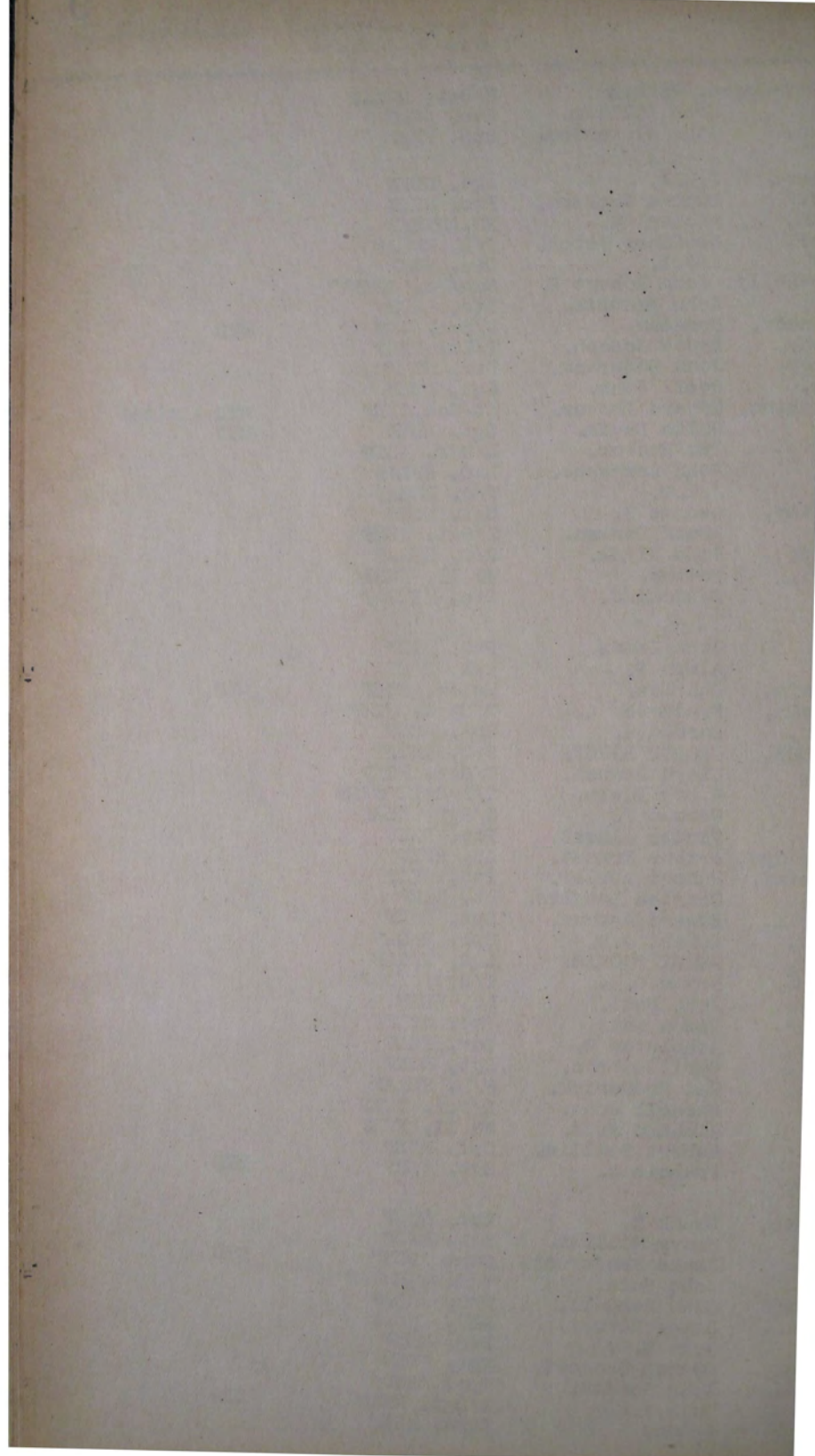
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|--------------|------------------|------------------|--------------------------------|
| Gifford, | Cyril Arthur. | Pte, NZEF | |
| GIFFORD, | E. ALGERNON. | F/Sgt, RNZAF | |
| Gilbert, | William Andrew. | Spr, NZEF | |
| Gilchrist, | James Andrew. | A/Sgt, NZEF | |
| Gillespie, | Robert Kay. | Pte, NZEF | |
| Gillick, | Kenneth John. | Cpl, RNZAF | |
| Gillions, | Rodney S. | WO, RNZAF | |
| Glennie, | Bryce Donald. | Dvr, NZEF | |
| Godfrey, | Harold Bateman. | F/L, RNZAF | |
| Goldsmith, | Henry Rahiri. | LAC, RNZAF | MID |
| Gooch, | John Edward. | LAC, RNZAF | |
| Good, | William Alan. | F/Sgt, RNZAF | |
| Goodison, | Robert James. | Spr, NZEF | |
| Gordon, | John Francis. | Bdr, NZEF | |
| *Gordon, | Nathaniel. | Sgt, NZEF | |
| Gordon, | N.R. | Spr, NZEF | MM |
| Gordon, | Ross Sloan. | T/Cpl, NZEF | |
| Gordon, | Thomas Joseph. | Cpl, NZEF | |
| Gordon, | William Errol. | Spr, NZEF | |
| Gosney, | Andrew Lawrence. | S/Sgt, NZEF | |
| Gough, | Hector John. | T/Sub/Lt, RNZNVR | |
| Gough, | Maurice William. | L/Cpl, NZEF | |
| *Gowan, | James Gerard. | Major, NZEF | MC; MID |
| Gower, | Leonard George. | Cpl, NZEF | |
| *Graham, | Albert A. | Spr, NZEF | |
| Graham, | Richard Douglas. | Sgt, RNZAF | |
| Grant, | Robert S. | S/L, RNZAF | |
| Grattan, | James Alfred. | Spr, NZEF | |
| Grattan, | W.L. | WO, RNZAF | |
| Gray, | Robert Balfour. | AC1, RNZAF | |
| GRAY, | RODERICK WALTER. | F/Sgt, RNZAF | |
| Greenslade, | Maxwell Arthur. | F/O, RNZAF | |
| Greenwood, | Charles H. | Spr, NZEF | |
| Gregan, | Patrick J. | Sgt, RNZAF | |
| Grieve, | Donald Gordon. | F/Sgt, RNZAF | |
| Griffiths, | Norman Percy. | Sgt, NZEF | |
| Griffiths, | William M. | WO II, NZEF | |
| Gunn, | Halsey R. | Cpl, RNZAF | |
| Gustofson, | Neil. | F/O, RNZAF | |
| Guthrie, | Ewan John C. | F/Lt, RNZAF | |
| Guthrie, | R. | Gnr, NZEF | |
| Habridge, | Brian C. | Cpl, RNZAF | |
| Hagenson, | Donald Ernest. | F/O, RNZAF | MID |
| Haldane, | Vernon Orville. | F/O, RNZN | |
| Hall, | Albert Dover. | Pte, NZEF | |
| Hall, | James David. | Gnr, NZEF | |
| Halley, | David J.B. | Major, NZEF | |
| Hamblett, | Selwyn George. | T/Lt(A), RNZNVR | |
| Hannon, | Neale Kemble. | T/Sub/Lt, RNZN | |
| **Hansen, | F.M.H. | Brig, NZEF | OBE; DSO (and Bar); MM; MID |
| *Hansen, | Neil Gilbert. | Lt, NZEF | |
| *Hard, | Douglas Laurie. | S/Sgt, NZEF | |
| *Harper, | Lester Norman. | L/Bdr, NZEF | MID |
| Harris, | Alexandra W. | Cpl, NZEF | |
| Harris, | Charles A. | WO, RNZAF | |
| Harris, | Edmund A.N.H. | L/Cpl, NZEF | |
| Harris, | Norman Gilbert. | A/L/Cpl, NZEF | |
| Harrison, | James Alexander. | S/Sgt, NZEF | |
| Harrison, | Osmond William. | F/O, RNZAF | |
| Harvey, | Archibald M. | Spr, NZEF | |
| Harwood, | L.A.J. | Spr, NZEF | |
| *Hattersley, | Stanley G. | A/Cpl, NZEF | |
| Haven, | Raymond Albert. | Pte, NZEF | |

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|------------|-------------------|--------------|-----|
| Lawker, | Leslie J.B. | Pte, NZEF | |
| LAYDEN, | WILLIAM E.G. | Cpl, NZEF | |
| Layes, | Alan Edgar. | Sgt, NZEF | |
| Layman, | Eugene R. | Spr, NZEF | |
| Leath, | Robert Noel. | FORM, RNZN | |
| LECTOR, | JOHN ROSS M. | Lt, NZEF | |
| Legley, | Peter Charles. | FORM, RNZN | MID |
| Leine, | Ronald Oscar. | Sgt, NZEF | |
| Lenderson, | William W. | Cpl, RNZAF | |
| Lennessy, | Danial L. | Tpr, NZEF | |
| Lenry, | Eric Newton. | T/Cpl, NZEF | |
| Lenry, | Herbert. | Cpl, RNZAF | |
| Lenshall, | Edwin Percy. | P/O, RNZAF | |
| HERBERT, | CHARLES JOHN. | L/Sgt, NZEF | |
| EWETT, | JAMES DUFF. | LAC, RNZAF | |
| ewison, | John. | Spr, NZEF | |
| ewitson, | Dudley, | Cpl, NZEF | |
| eyworth, | Sydney B. | Cpl, NZEF | |
| ibbs, | Noel Joseph. | Spr, NZEF | |
| ickford, | Geoffery James. | F/Sgt, RNZAF | |
| IGGINS, | LANCELOT H. | S/L, RNZAF | |
| ighet, | Joseph M.H. | Sgt, NZEF | |
| ighstead, | Angus Hugh Mac. | S/Sgt, NZEF | MID |
| *Hill, | Norman H.R. | Sgt, NZEF | |
| Hill, | William Alan. | L/Cpl, NZEF | |
| Hodge, | Charles. | Sgm, NZEF | |
| Hogan, | J. | Gnr, NZEF | |
| Hollis, | George E. | Gnr, NZEF | |
| Holt, | John Clive. | Sgt, NZEF | |
| Hood, | Arthur. | Spr, NZEF | |
| Hopkins, | Robert John. | S/Sgt, NZEF | |
| Hopkinson, | Wallace David. | Pte, NZEF | |
| ORTON, | PATRICK WILMOT. | RAF | |
| OTHERSALL, | FRANCIS EDWARD. | F/Sgt, RNZAF | |
| otter, | John Spence. | Tpr, NZEF | |
| owat, | Merle. | Bdr, NZEF | |
| owe, | Harry Leslie. | F/Sgt, RNZAF | |
| owle, | Robert Wilson. | L/Bdr, NZEF | |
| ubbard, | Charles John. | Pte, NZEF | |
| udson, | Douglas A. | Capt, NZEF | |
| unter, | Leslie Oscar. | F/Lt, RNZAF | |
| unter, | Maxwell David. | Cpl, NZEF | |
| UNTER, | R. | T/Cpl, NZEF | |
| utton, | Frederick A. | S/Sgt, NZEF | |
| yslop, | Thomas Alexander. | Pte, NZEF | |
| remonger, | Alexander W. | Spr, NZEF | |
| rvine, | John Lindsay. | F/O, RNZAF | |
| very, | Bill. | Gnr, NZEF | |

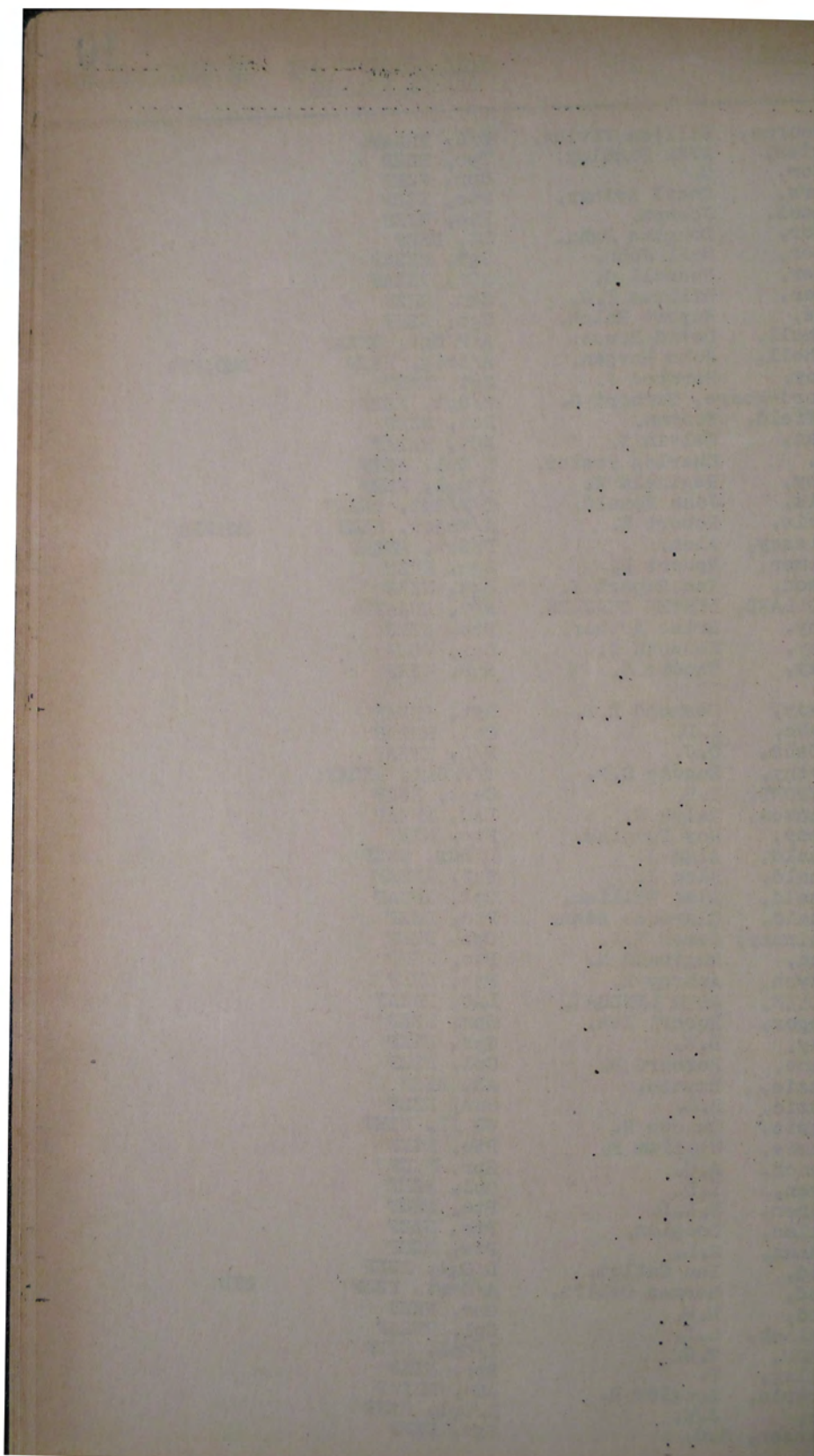
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| ackson, | Ambrose. | Cpl, NZEF |
| ackson, | Harry. | Pte, NZEF |
| ACKSON, | KEITH. | F/O, RNZAF |
| ameson, | Horace C. | Pte, NZEF |
| Jeff, | Archibald R. | Dvr, NZEF |
| enkinson, | John. | LAC, RNZAF |
| ensen, | Harold C. | Sgt, NZEF |
| essett, | Frederick J.W. | WO II, NZEF |
| ohnston, | Allan Hastie. | Major, NZEF |
| ones, | Charles L. | Spr, NZEF |
| ones, | Dudley M. | WO II, NZEF |
| ones, | Edward Hastings. | Spr, NZEF |
| ones, | Edgar Maxwell. | Lt, NZEF |
| ones, | Frederick W.O. | Capt, NZEF |
| ONES, | RALPH I. | F/O, RNZAF |



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|-----------------------------|-----------------|-------------|
| Burnett-Jones, William. | F/Sgt, RNZAF | |
| Jopp, John William. | Pte, NZEF | |
| Jordon, John Alexander. | Spr, NZEF | |
| Kassler, J.W.A. | Sgt, NZEF | |
| **Kay, Thomas Jackson. | Pte, NZEF | |
| Keegan, Michael H. | WO, RNZAF | |
| Keller, Geoffrey Peter. | F/L, RNZAF | |
| Kelly, F.P.E. | Dvr, NZEF | |
| Blake-Kelly, John Robert P. | Sub/Lt, RNZIMVR | |
| Kelly, John Francis. | Pte, NZEF | |
| **Kennedy, Brendan. | L/Sgt, NZEF | MID |
| Kennedy, Bruce Joseph. | T/Lt, NZEF | |
| Kennedy, John Roderick. | Dvr, NZEF | |
| Kenny, Cecil John. | Sgt, NZEF | |
| Kensington, Edward Trevor. | Lt/Col, NZEF | MID (twice) |
| Kerr, Colin Davis. | Sgt, NZEF | MID |
| Kidd, Ian Hector. | L/Bdr, NZEF | |
| King, John Lawrence. | LAC, RNZAF | |
| King, J.R.T. | F/O, RNZAF | |
| Knightly, George S. | Sgt, NZEF | |
| Knox, Bruce Harman. | T/Sgt, NZEF | |
| Koford, John Nigel. | F/O, RNZAF | |
| Krough, Hutton. | WO II, NZEF | |
| Kyle, Desmond J. | Pte, NZEF | |
| Land, Owen James. | Pte, NZEF | |
| Lane, Alwyn P. | Tel, RNZN | |
| Langbein, Charles. | Major, NZEF | MID |
| Langbein, Frederick A. | T/Capt, NZEF | |
| Lanyon, Harold S. | Spr, NZEF | |
| LAWRENCE, GEORGE BRUCE. | F/O, RNZAF | |
| Leask, Lloyd Samuel. | T/Sgt, NZEF | |
| Lee, Harry Edwin. | T/L/Cpl, NZEF | |
| Lee, Norman F. | S/Sgt, NZEF | |
| LePage, Victor Albert. | Pte, NZEF | |
| Lethbridge, Arthur Ernest. | AB, RNZN | |
| *Levestam, Hubert Ashley. | Pte, NZEF | |
| Lewis, Charles Douglas. | Lt, NZEF | |
| *Liddell, Edward Arthur. | Sgt, NZEF | |
| Lilley, Robert J.H. | Cpl, RNZAF | |
| LIPIT, DEREK THOMAS. | LAC, RNZAF | |
| Lockett, Bryan C.B. | T/Sgt, NZEF | |
| *Lockie, John Paul. | Lt, NZEF | |
| Lorimer, James Watt. | Pte, NZEF | |
| **Lowe, Atholston R. | Gnr, NZEF | |
| *Lucas, Cyril Gibson. | Sgt, NZEF | |
| Ludwig, Max Frederick. | F/L, RNZAF | |
| Lynch, Machell John. | L/Sgt, NZEF | |
| Lynch, Richard Avis. | WO II, NZEF | |
| Lyon, Robert Baillie. | Cpl, NZEF | |
| Lyons, Francis R. | Sgt, NZEF | MID |
| *Mabbett, Frank C. | Tpr, NZEF | |
| Macey, Henry William. | Sgt, NZEF | |
| Macky, James Henderson. | Capt, NZEF | MID |
| Marsh, John Huia. | T/F/O, RNZAF | |
| Marwick, John Rendall. | F/O, RNZAF | |
| Mason, James Robert. | AC2, RNZAF | |
| Mason, John W.F. | Pte, NZEF | |
| Masters, Norman Leonard. | Sgt, NZEF | |
| Mathewson, John Gordon. | Tpr, NZEF | |
| Mears, Hugh R.B. | S/Sgt, NZEF | MID |
| Meers, Lydon. | Sgmn, NZEF | |



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|----------------|-----------------|----------------|----------|
| Melbourne, | William Vivian. | F/L, RNZAF | |
| Menzies, | Alan Findlay. | Tpr, NZEF | |
| Mercer, | C. | Spr, NZEF | |
| Meyers, | Cecil Arthur. | Pte, NZEF | |
| Michael, | Joseph. | Pte, NZEF | |
| Miller, | Douglas John. | Lt, NZEF | |
| Miller, | Neil John. | Sgt, RNZAF | |
| Miller, | Russell G. | AC1, RNZAF | |
| Miller, | William T.J. | Sgm, RNZN | |
| Mills, | Rupert Ralph. | Sgt, NZEF | |
| Mitchell, | David Bruce. | A/F/Sgt, RNZAF | |
| Mitchell, | John Morgan. | A/Brig, NZEF | DSO; MID |
| Molloy, | Bernard J. | Sgt, NZEF | |
| Gifford-Moore, | Herbert G. | S/Sgt, NZEF | |
| Moorfield, | Norman. | Pte, NZEF | |
| Morgan, | Kelvin G. | AC1, RNZAF | |
| Mori, | Charles Foster. | L/Cpl, NZEF | |
| Morley, | Reginald W. | T/Cpl, NZEF | |
| Morris, | John Ronald. | T/F/Sgt, RNZAF | |
| *Morris, | Robert W. | A/Major, NZEF | MC; MID |
| Morrissey, | Alan. | F/Sgt, RNZAF | |
| Mortimer, | Robert L. | Sgm, RNZN | |
| Muirson, | Ian Rupert M. | Sgt, NZEF | |
| MULHOLLAND, | LESTER CHARLES. | F/O, RNZAF | |
| Murphy, | Brian Arthur. | Pte, NZEF | |
| Murray, | Kenneth G. | Spr, NZEF | |
| Murray, | Thomas S. | Spr, NZEF | |
| MacAvoy, | Desmond W.E. | Sgt, RNZAF | |
| MacCabe, | J.D. | Cpl, RNZAF | |
| *MacCabe, | O.J. | F/L, RNZAF | |
| McCarthy, | Eugene D.P. | T/F/Sgt, RNZAF | |
| MCOLYMONT, | R.B. | Capt, NZEF | |
| McCracken, | Ralph H. | LAC, RNZAF | |
| McCurdy, | Roy Douglas. | Pte, NZEF | |
| McDonald, | Alan J. | L/Bdr, NZEF | |
| McDonald, | Alec J. | Sgt, RNZAF | |
| McDonald, | Alan William. | Cpl, RNZAF | |
| McDonald, | Clarence Adam. | Pte, NZEF | |
| McElhinney, | James H.V. | Cpl, NZEF | |
| McEwen, | Reginald M. | Pte, NZEF | |
| McFadyen, | Aubrey R. | Pte, NZEF | |
| MCFADYEN, | JOHN LINDSAY. | LAC, RNZAF | |
| McGregor, | Robert Ian. | Spr, NZEF | |
| MacKay, | D.W. | Spr, NZEF | |
| McKenna, | Bernard B. | Cpl, NZEF | |
| McKenzie, | Burnie. | AB, RNZN | |
| McKenzie, | D.D. | Gnr, NZEF | |
| McKenzie, | Duncan H. | WO II, NZEF | |
| McKenzie, | William F. | Pte, NZEF | |
| McKinnon, | A.C. | Spr, NZEF | |
| McLaren, | I.D. | Cpl, NZEF | |
| McLauren, | K.E.D. | Pte, NZEF | |
| McLellan, | Douglas. | Pte, NZEF | |
| McLennan, | R.L. | Pte, NZEF | |
| McLeod, | Ian Callum. | L/Sgt, NZEF | |
| McLeod, | Norman Collin. | A/Capt, NZEF | MID |
| McLeod, | N.M. | Gnr, NZEF | |
| McLintock, | L.L. | Cpl, RNZAF | |
| MCMAHON, | W.S. | L/Cpl, NZEF | |
| McMillan, | T. | Spr, NZEF | |
| McMurtrie, | Douglas R. | AC1, RNZAF | |
| McNab, | J.M. | L/Cpl, NZEF | |
| McPherson, | C.C. | Sgt, NZEF | |



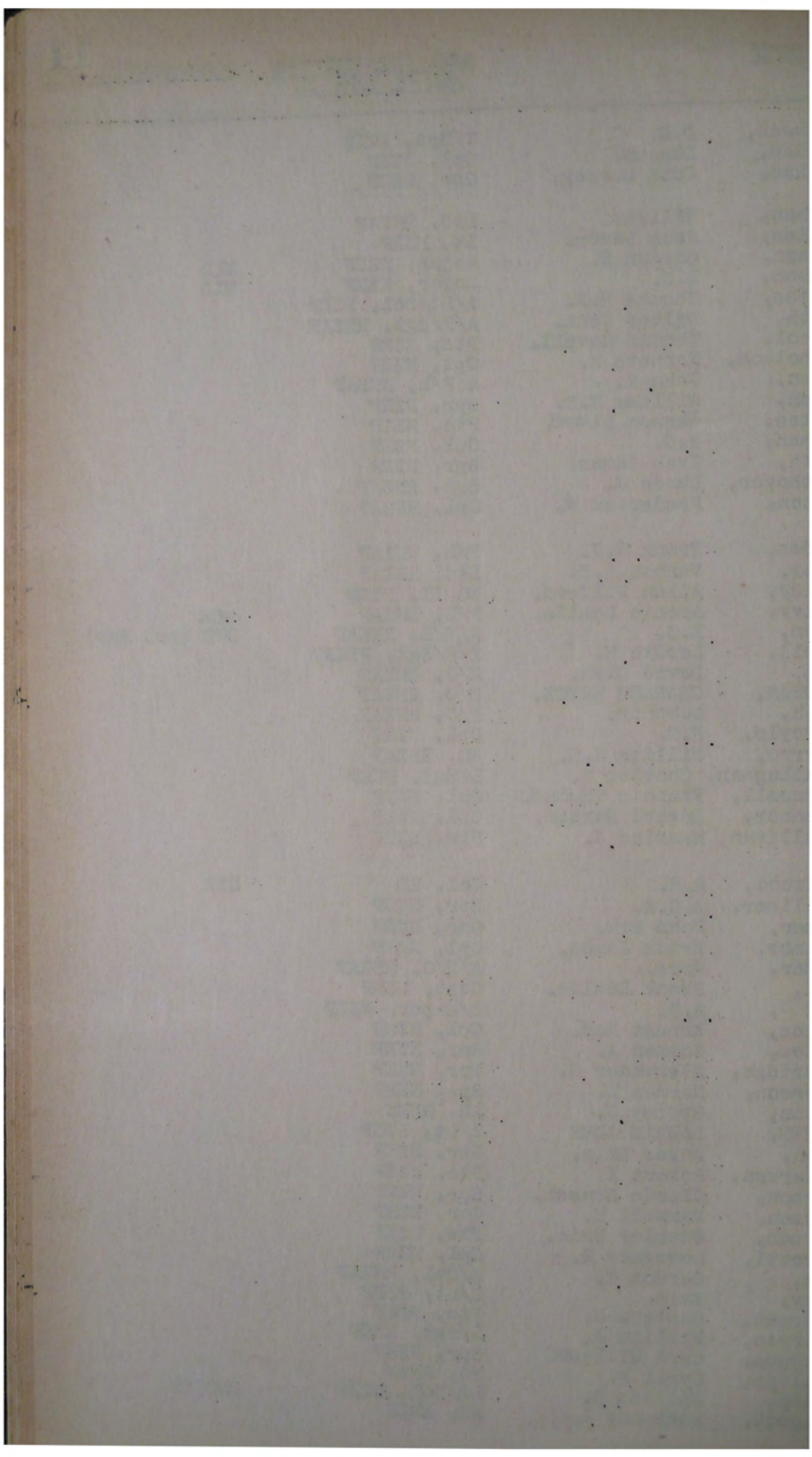
NAME

RANK ATTAINED AND
ARM OF SERVICE

DECORATIONS, ETC

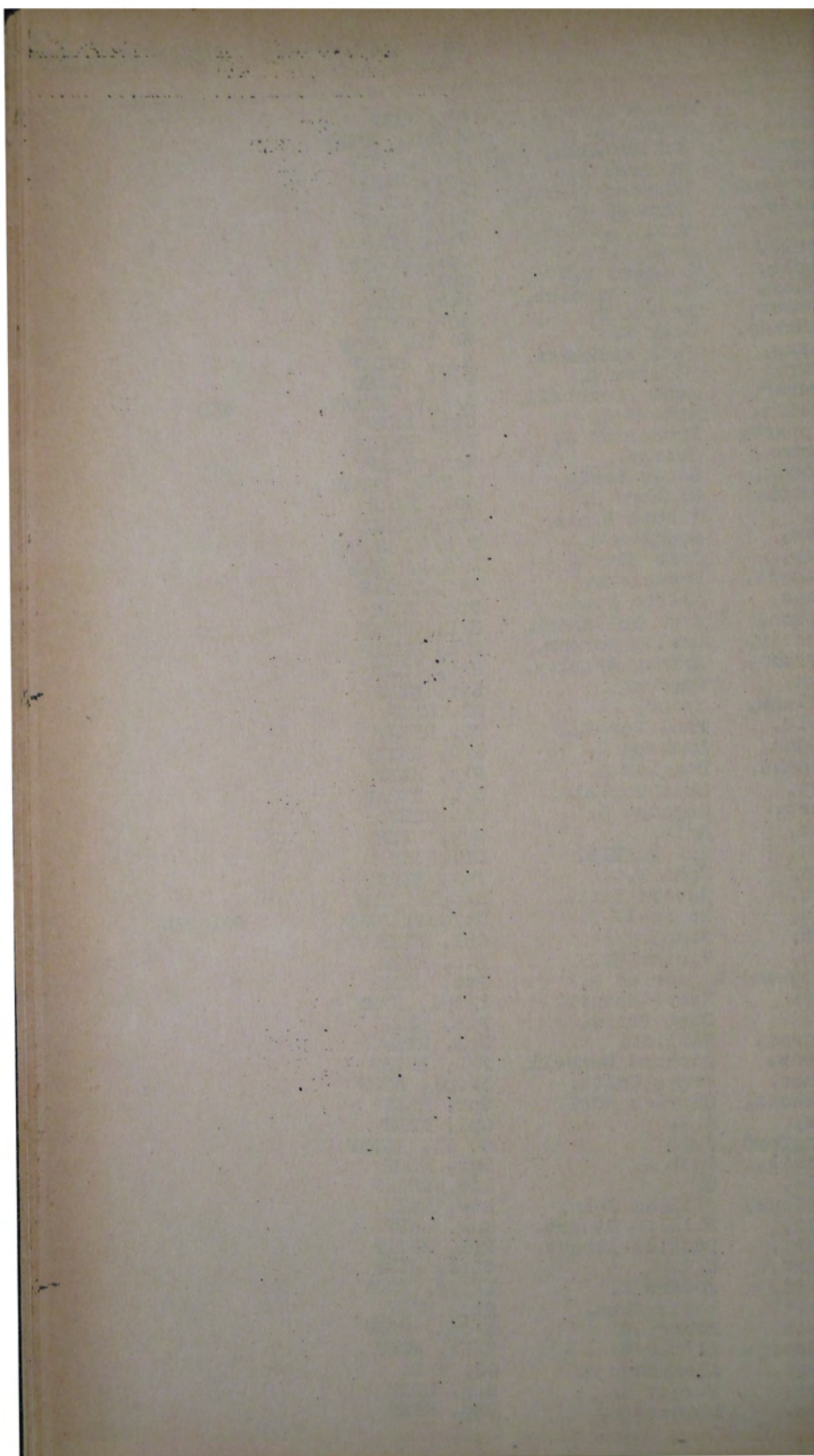
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| McQueen, | D.E. | T/Sgt, NZEF | |
| *McRae, | Duncan. | Cpl, NZEF | |
| MacRae, | John Murray. | Gnr, NZEF | |
| Nathan, | William. | LAC, RNZAF | |
| Naylor, | Jack Lever. | Lt, NZEF | |
| Nelson, | Gordon W. | Major, NZEF | MID |
| Nelson, | L.N. | Major, NZEF | MID |
| Nevins, | Thomas H.F. | A/Lt/Col, NZEF | |
| Newth, | Walter John. | A/E/Sgt, RNZAF | |
| Nichol, | Thomas Cavell. | Pte, NZEF | |
| Nicholson, | Kenneth H. | Cpl, NZEF | |
| Nixon, | John R. | A/E/L, RNZAF | |
| Nixon, | William H.S. | Spr, NZEF | |
| Noakes, | Vernon Ll-cyd. | Pte, NZEF | |
| Norman, | R.G. | Cpl, NZEF | |
| North, | Ivan James. | Spr, NZEF | |
| Northover, | Lance J. | Sgt, RNZAF | |
| Norton, | Frederick W. | Cpl, RNZAF | |
| Oakden, | Frank W.J. | F/L, RNZAF | |
| Oakey, | Vernon A.B. | LAC, RNZAF | |
| Oakley, | Allan Wilfred. | WO II, NZEF | |
| Ogilvy, | Archie Leslie. | F/L, RNZAF | DCM |
| Orman, | K.G. | A/E/L, RNZAF | DFC (and Bar) |
| Oswell, | Leslie H. | T/E/Sgt, RNZAF | |
| Owen, | David Glyn. | F/O, RNZAF | |
| OXENHAM, | CHARLES BRYCE. | F/O, RNZAF | |
| Ozich, | Lubomir. | F/O, RNZAF | |
| *O'Boyle, | N.T. | Cpl, NZEF | |
| O'Byrne, | William K.C. | WO, RNZAF | |
| O'Callaghan, | Charles V. | L/Sgt, NZEF | |
| O'Connell, | Francis Thomas. | Cpl, NZEF | |
| O'Connor, | Edward Martin. | Cpl, NZEF | |
| O'Sullivan, | Maurice J. | Pte, NZEF | |
| Packwood, | R.H. | Col, RE | OBE |
| *Palliser, | A.C.A. | Spr, NZEF | |
| Palmer, | John Rex. | Gnr, NZEF | |
| *Palmer, | Brice James. | Cpl, NZEF | |
| Palmer, | Ross. | A/E/O, RNZAF | |
| Park, | Frank Leslie. | Capt, NZEF | |
| Park , | A.G. | T/Major, NZEF | |
| Parkes, | Ernest Roy. | Cpl, NZEF | |
| Parkes, | Norman A. | Gnr, NZEF | |
| Partridge, | Alexander G. | Tpr, NZEF | |
| Paterson, | Norman L. | Spr, NZEF | |
| Patton, | Sydney J. | AB, RNZN | |
| PATTEN, | BARRIE JOHN | 2/Lt, NZEF | |
| Paton, | Angus Eric. | Spr, NZEF | |
| Patterson, | Robert A. | Pte, NZEF | |
| Pearson, | Claude Ernest. | Spr, NZEF | |
| Pearson, | Maxwell H. | Gnr, NZEF | |
| Pearson, | Stanley Eric. | Pte, NZEF | |
| Pedrotti, | Lawrence R. | Cpl, NZEF | |
| Peek, | Gordon T. | A/Cpl, RNZAF | |
| Percy, | Evin. | 2/Lt, NZEF | |
| Petersen, | Gustave J. | Pte, NZEF | |
| *Petersen, | William J. | L/Sgt, NZEF | |
| Peterson, | Carl William. | Spr, NZEF | |
| Phillips, | Cyril P. | PO, RNZN | |
| *Philp, | William D. | Lt/Col, NZEF | DSO; ED |
| Philpott, | Lawrence J. | AB, RNZN | |

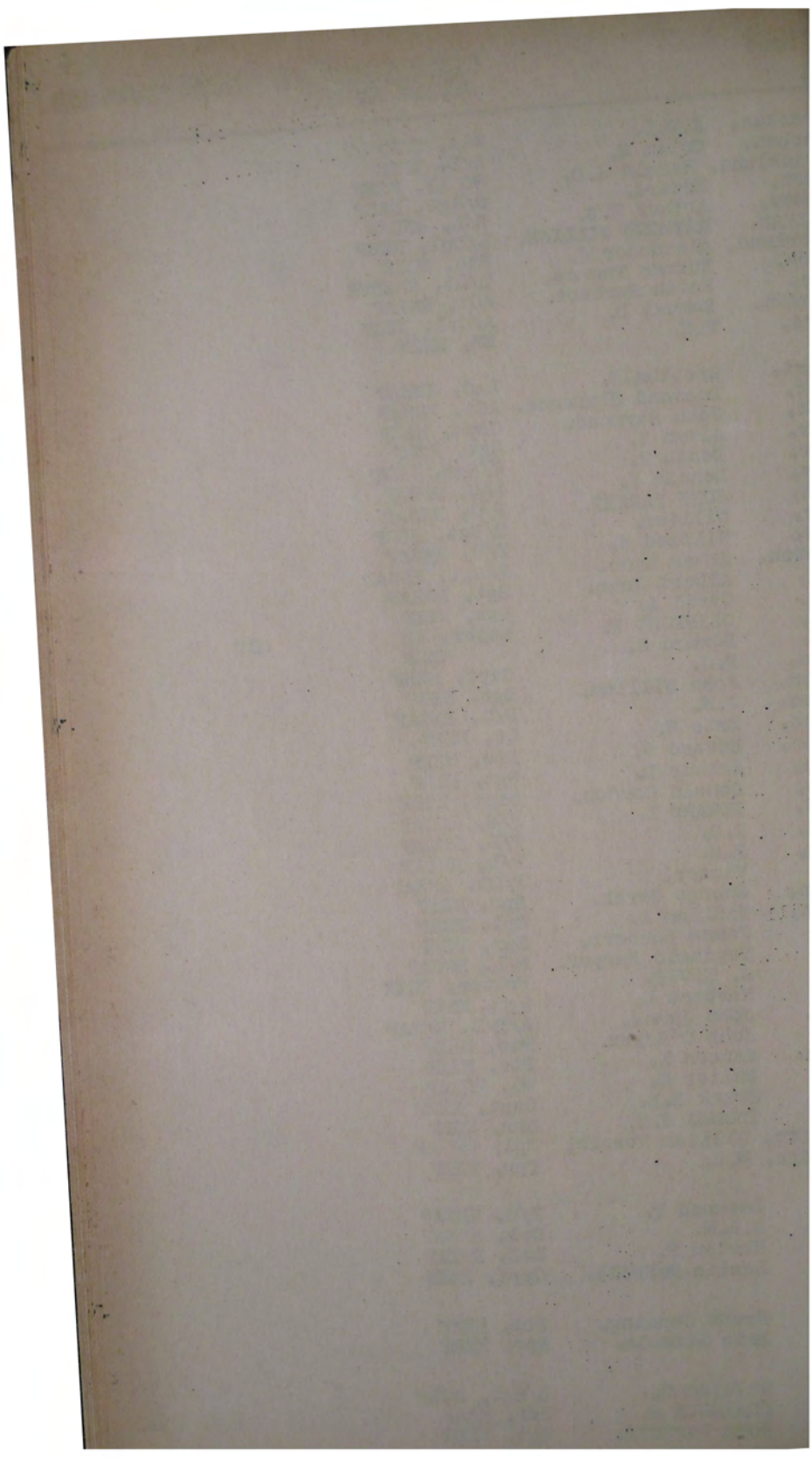


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|----------------|----------------|------------------|---------------------------|
| Pollard, | John P.W. | F/L, RNZAF | |
| Potter, | Norman C. | Dvr, NZEF | OBE |
| Potts, | James Mervyn. | Lt, NZEF | |
| Powell, | John Cullen. | F/L, RNZAF | |
| Pratt, | G. James. | T/Capt, REMT | MID |
| Prichard, | William H. | Cpl, RNZAF | |
| PROCTOR, | DENNIS S. | T/Sgt, RNZAF | |
| Prosser, | Clarence D. | T/Sub/Lt, RNZNVR | |
| Quirke, | Milton R. | WO II, NZEF | |
| Quist, | Robert T. | Sgt, NZEF | |
| Rabone, | Thomas C.V. | Lt/Col, NZEF | MID |
| Rathbun, | James. | Cpl, NZEF | |
| Rawles, | Donald James. | LAC, RNZAF | |
| Rawlings, | Harold V. | Gnr, NZEF | |
| Ray, | Robert Cecil. | L/Cpl, NZEF | |
| RAYNOR, | NORMAN K.S. | Pte, NZEF | |
| Reddell, | Stanley T. | T/Lt, RNZNVR | |
| Reece, | Evan Edgar. | T/Cpl, NZEF | |
| Reed, | James B.A. | LAC, RNZAF | |
| REID, | SAMUEL C. | Pte, NZEF | |
| Renner, | Frederick C.M. | Spr, NZEF | |
| Renwick, | George C. | Sgt, NZEF | |
| Reynolds, | Jack B. | WO, RNZAF | |
| Reynolds, | Michael M. | Sgt, NZEF | |
| Rhoades, | John Richard. | F/L, RNZAF | DFC |
| Rich, | Lewis A.G. | WO II, NZEF | |
| Richards, | Leslie N. | Gnr, NZEF | |
| Richardson, | George K. | A/F/Sgt, RNZAF | |
| Richardson, | Joseph A. | Cpl, NZEF | |
| Riddell, | James O. | S/L, NZEF | |
| Roberts, | Adrian C. | AC1, RNZAF | |
| Roberts, | Frank Kelly. | Capt, NZEF | |
| Robertson, | Hector B. | L/Cpl, NZEF | |
| Robieson, | Huia Frank. | Cpl, NZEF | |
| Robinson, | John Edward. | Sgt, NZEF | |
| Rockel, | Duncan G. | Pte, NZEF | |
| *Roe, | Joseph Leo. | Spr, NZEF | |
| Roper, | Clinton M. | Lt, NZEF | |
| Ross, | Alexander H. | LAC, RNZAF | |
| Ross, | David E. | Dvr, NZEF | |
| *Ross, | Duncan George. | 2/Lt, NZEF | |
| Ross, | Lawrence A.S. | Major, NZEF | |
| Ross, | Walter Hugh. | Spr, NZEF | |
| *Rowlatt, | Cecil George. | Sgt, NZEF | |
| Rush, | Martin H. | Pte, NZEF | |
| RUSSELL, | CECIL GEORGE. | F/O, RNZAF | |
| Russell, | Trevor H. | Cpl, RNZAF | |
| RYAN, | ALEXANDER J. | F/O, RNZAF | |
| Ryan, | Cecil H.P. | Sgt, NZEF | |
| Ryan, | Martin Henry. | Lt, NZEF | |
| Ryan, | Winton H. | Major, NZEF | OBE Greek Silver Cross |
| SADLER, | EDWARD LESLIE. | F/O, RNZAF | |
| Sandelin, | Eric Gordon. | Capt, NZEF | |
| Sargent, | George R. | A/LA, RNZN | |
| SAUL, | NORMAN P. | Sgt, RNZAF | |
| Saunders, | R.H. | T/Lt, NZEF | |
| Scantlebury, | L.D.B. | PORT, RNZN | |
| Scarrot, | Gilbert C. | Sgt, NZEF | |
| Schmidt, | Alen Robert. | T/Lt, RNZNVR | |
| Schnackenberg, | Ellis Carl. | S/L, RNZAF | |

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| Scott, | Henry Murray. | Lt, NZEF | |
| Scott, | James L. | A/Sgt, RNZAF | |
| Scott, | Walter Alan. | Capt, NZEF | |
| Scott, | Wilfred A. | Tpr, NZEF | |
| Scrivener, | Earnest Henry. | Cpl, NZEF | |
| Scully, | Raymond H. | Pte, NZEF | |
| Searl, | S.M. | Cpl, NZEF | |
| Searle, | Jack N.L. | Cpl, RNZAF | |
| Semple, | Leonard V. | Cpl, RNZAF | |
| Senior, | Henry Earnest. | Pte, NZEF | |
| Seymour, | Archie R. | Sgt, NZEF | |
| Shanahan, | Jack N. | WO II, NZEF | |
| Shanks, | Jack Medhurst. | Sgt, RNZAF | |
| Sharp, | William M. | 2/Lt, NZEF | |
| Shearer, | Adam Campbell. | A/Sgt, RNZAF | MID |
| Shelton, | Robert S. | Sgt, NZEF | |
| Sheppard, | Frederick J. | F/L, RNZAF | |
| Sherman, | George. | Sgt, NZEF | MID |
| Silcock, | Edgar Lewis. | A/F/L, RNZAF | |
| Silcock, | Richard G. | WO, RNZAF | |
| Sim, | Robert Blair. | Spr, NZEF | |
| Simes, | Douglas G. | T/P/O, RNZAF | |
| Simes, | Eric Edwin. | L/Cpl, NZEF | |
| Simmonds, | Francis A. | AC1, RNZAF | |
| Simons, | Alfred Pohi. | Spr, NZEF | |
| Simpson, | Evan Rollenton. | S/L, RNZAF | |
| Sinclair, | Leslie Gordon. | F/L, RNZAF | |
| Siverson, | Arthur Stanley. | Sgt, NZEF | |
| Skeen, | Gordon. | Spr, NZEF | |
| Skellern, | Sydney R. | AB, RNZN | |
| *Skelt, | Paul Derek. | WO, RNZAF | |
| Sladden, | Dickson H. | P/O, RNZAF | |
| Slocombe, | Douglas C. | Pte, NZEF | |
| Smart, | Eric Copland. | S/L, RNZAF | |
| *Smart, | Leonard C. | Lt, NZEF | |
| Smith, | Eric. | Sgt, NZEF | |
| SMITH, | IAN DENNIS. | LT, NZEF | |
| Smith, | John W.G. | Tpr, NZEF | |
| Smith, | Robert Kirk. | L/Cpl, NZEF | |
| Smith, | Reginald T. | Lt/Col, NZEF | OBE; MID |
| Smith, | Stanley. | Cpl, NZEF | |
| Smith, | Victor W. | Pte, NZEF | |
| Harvey-Smith, | Adrian M. | Pte, NZEF | |
| Snow, | Reeve Robert. | L/Cpl, NZEF | |
| Sole, | Owen Parry. | Pte, NZEF | |
| Sorenson, | William. | Cpl, NZEF | |
| Sparrow, | Richard Maxwell. | F/L, RNZAF | |
| Spencer, | James Keith. | L/Cpl, NZEF | |
| Spershott, | Charles Noel. | Spr, NZEF | |
| Spite, | A.B. | Cpl, NZEF | |
| Springford, | J.R. | WO II, RNZAF | |
| Stansell, | Jack A. | Gnr, NZEF | |
| Steele, | W. | LAC, RNZAF | |
| *Steffens, | William John. | Pte, NZEF | |
| Steven, | William Stuart. | Gnr, NZEF | |
| Stewart, | Douglas Robert. | F/O, RNZAF | |
| Stewart, | D.W. | Capt, NZEF | |
| Stewart, | Howard L. | L/Bdr, NZEF | |
| Stewart, | Lewis John. | Pte, NZEF | |
| Stewart, | Robert M. | L/Cpl, NZEF | |
| St. George, | Alfred G. | 2/Lt, NZEF | |
| Stirrat, | Alexandar G. | OS, RNZN | |
| Stiver, | Percey E. | Spr, NZEF | |
| Stokes, | Leonard H. | Pte, NZEF | |



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| *Strachan, A.W.L. | Pte, NZEF | |
| Strachan, Colin M. | A/L, RNZN | |
| *Strickland, Harold J.C. | WO II, NZEF | |
| Stuart, Edward. | S/Sgt, NZEF | |
| Stuckey, Arthur W.S. | F/L, RNZAF | |
| SULLIVAN, RAYMOND WILLIAM. | L/Cpl, NZEF | |
| Sutherland, Alexander J. | Pte, NZEF | |
| Sutton, Norman Thomas. | T/Lt, RNZNVR | |
| Swain, Keith Herbert. | AC1, RNZAF | |
| Swainson, Samuel D. | A/Cpl, NZEF | |
| Swears, P.H. | EM, RNZN | |
| Taggart, Archibald. | LAC, RNZAF | |
| Talbot, Desmond Clarence. | AC1, RNZAF | |
| Talbot, John Raymond. | Capt, NZEF | |
| Taylor, Alwyn V. | Sgt, NZEF | |
| Taylor, Denis F. | F/Sgt, NZEF | |
| Taylor, Donald K. | LAC, RNZAF | |
| TAYLOR, JOHN BARKER. | F/O, RNZAF | |
| Taylor, William. | T/Sgt, NZEF | |
| Taylor, Wilfred S. | F/O, RNZAF | |
| Templeton, James Lyon. | F/Sgt, RNZAF | |
| Terrel, Albert John. | Sgt, RNZAF | |
| Thomas, Cyril A. | Spr, NZEF | |
| THOMAS, CLIFFORD W. | Major, RE | MID |
| Thomas, Edward S. | NZEF | |
| *Thomas, R.J. | Capt, NZEF | |
| Thomason, John William. | Sgt, NZEF | |
| Thomason, J.W. | F/O, RNZAF | |
| Thompson, Eric H. | Lt, NZEF | |
| Thompson, Edward W. | Pte, NZEF | |
| Thomson, Arthur D. | Sgt, NZEF | |
| Thomson, Donald Gordon. | Capt, NZEF | |
| THOMSON, EDWARD L. | F/S, RNZAF | |
| Thomson, R.G. | F/L, RNZAF | |
| Thomson, F.M. | F/L, RNZAF | |
| Thorne, Victor. | F/Lt, RNZAF | |
| Thornton, George Garth. | Spr, NZEF | |
| Thornton, William A. | Cpl, NZEF | |
| Thorpe, James Herbert. | Spr, NZEF | |
| Tonks, Reginald Harper. | F/L, RNZAF | |
| TOOMEY, A. KEVIN. | Writer, RNZN | |
| Towart, Herbert L. | Sgm, NZEF | |
| Treloar, John James. | A/F/L, RNZAF | |
| Trevor, John O'Bryen. | Pte, NZEF | |
| Trollope, Raucon K. | Pte, NZEF | |
| Troon, Walter E. | WO, RNZAF | |
| Tuck, Frank E.N. | Capt, NZEF | |
| TUDHOPE, THOMAS W.M. | Gnr, NZEF | |
| Tunnicliffe, William Morris. | Cpl, NZEF | |
| Tunnicliffe, W.M. | Tpr, NZEF | |
| Umbers, Desmond T. | F/O, RNZAF | |
| Upchurch, D.L.M. | Cpl, RNZAF | |
| Urry, Newton F. | LAC, RNZAF | |
| Uttley, Leslie McNeill. | Capt, NZEF | |
| *Vale, Frank Cuning. | Pte, NZEF | |
| Vincent, Eric Lincoln. | Spr, NZEF | |
| Wahl, William O. | S/Sgt, NZEF | |
| WALKER, CLARENCE A. | Bdr, NZEF | |
| Walker, John Bernard. | Sgt, NZEF | |

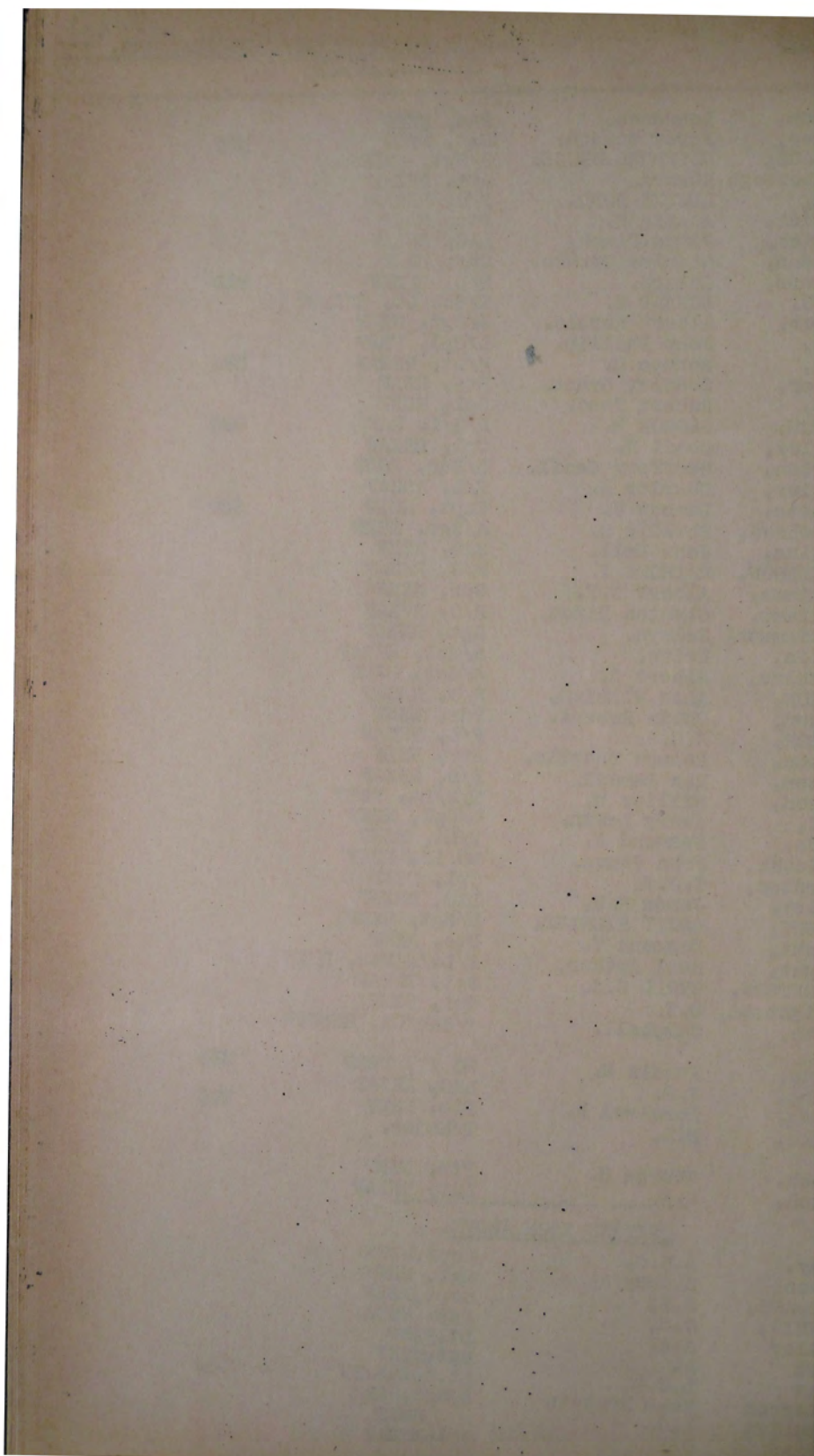


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|--------------|-----------------|-------------------|-----|
| Walker, | Lawrence. | Pte, NZEF | |
| Walker, | Percy Gordon. | Sgt, NZEF | |
| WALLACE, | CLIFFORD BRUCE. | S/Sgt, NZEF | MID |
| Wansborough, | Howard. | AC1, RNZAF | |
| WARE, | LESTER BOND. | P/O, RNZAF | |
| Warwick, | Austin N. | Pte, NZEF | |
| Warwick, | James Finch. | LAC, RNZAF | |
| *Watson, | Stanley Gordon. | Gnr, NZEF | |
| Watters, | Joseph. | S/L, RNZAF | |
| WATTS, | DONALD G. | T/Sub/Lt, RNZAFVR | MID |
| Weaver, | Albert Harold. | S/Sgt, NZEF | |
| Webb, | John Phillip. | L/Cpl, NZEF | |
| Webb, | Norman D. | F/Lt, RNZAF | DFC |
| Webber, | Stanley Grant. | Pte, NZEF | |
| West, | Robert Theo. | Cpl, NZEF | |
| WESTON, | GEORGE E. | A/S/L, RAF | DFC |
| Whalley, | Cecil R. | Cpl, RNZAF | |
| Wharton, | Geoffery Cecil. | L/Bdr, NZEF | |
| Wheeler, | Charles M. | F/L, RNZAF | |
| **White, | Duncan U. | Capt, NZEF | DSO |
| Whitehead, | Phillip S. | A/Sgt, NZEF | |
| Wilkins, | John Bell. | Sgt, NZEF | |
| WILKINSON, | RAYMOND I. | F/O, RNZAF | |
| Williams, | Albert T.F. | Spr, NZEF | |
| Williams, | Clynton Dixon. | F/O, RNZAF | |
| Williamson, | Selwyn. | Sgt, RNZAF | |
| Willis, | Keith. | A/Cpl, RNZAF | |
| Wilshire, | Albert S. | A/Sgt, NZEF | |
| WILSON, | ALAN WILLIAM. | F/O, RNZAF | |
| Wilson, | Colin Robert. | Bdr, NZEF | |
| WILSON, | N.C.B. | F/O, RNZAF | |
| Wilson, | Robert Beattle. | Spr, NZEF | |
| Wilson, | Rex Samuel. | P/O, RNZAF | |
| Wilson, | William W. | T/2/Lt, NZEF | |
| Wood, | Henry Lewin. | L/Cpl, NZEF | |
| Woods, | Desmond J. | T/Lt, NZEF | |
| Woolcock, | John James. | WO II, NZEF | |
| *Wordley, | T.J.T. | Cpl, NZEF | |
| Worley, | James H.W. | LAC, RNZAF | |
| WRIGHT, | DAVID RICHARD. | L/Sgt, NZEF | |
| Wright, | Desmond V. | Pte, NZEF | |
| Wright, | Noel Arthur. | A/Ld/A'Man, RNZN | |
| WRIGHTSON, | CYRIL C.A. | Sgt, RNZAF | |
| *Wrightson, | D.W. | Cpl, NZEF | |
| Wyeth, | Campbell. | T/Sub/Lt, RNZAFVR | |
| Young, | Arnold M. | WO II, NZEF | MID |
| Young, | P.F. | LAC, RNZAF | |
| Young, | Percival F. | Pte, NZEF | MID |
| Yorke, | H.L. | T/Major. | |

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| Zauch, | George S. | Pte, NZEF | |
| Zouch, | G.S. | LAC, RNZAF | |

OMITTED FROM ABOVE.

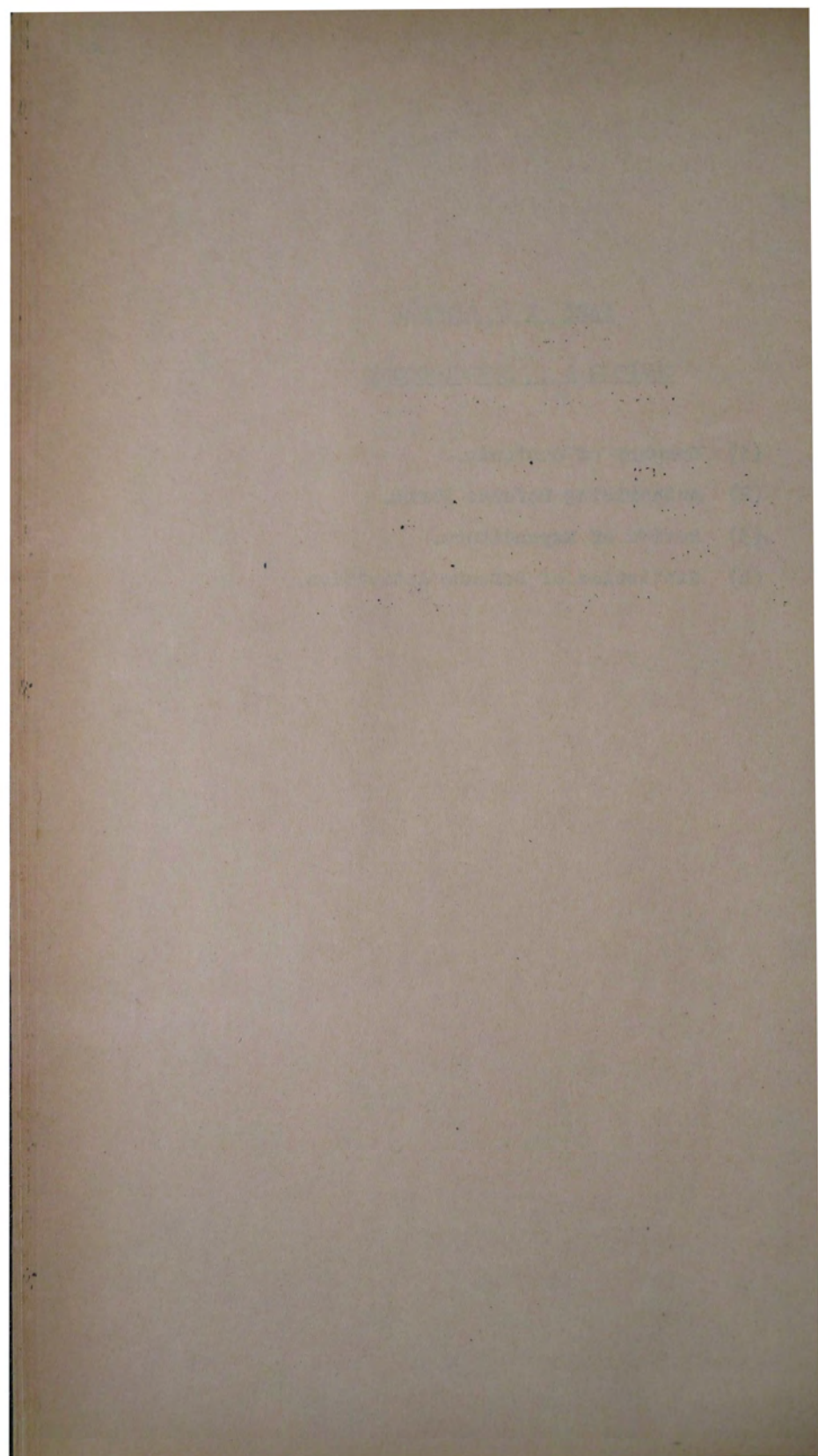
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| Bray, | A.N.G. | Capt, NZEF | |
| Evans, | Sydney | Sgt, NZEF | |
| HERMANS, | R.E. | Capt, NZEF | |
| HORNIG, | C.B. | Capt, NZEF | |
| Keller | A.A. | Lt, NZEF | |
| Kuch | A. | Sgt, NZEF | |
| *Malt | L.C.E. | Lt.Col, NZEF | DSO |
| *McLernon | Hugh Francis | S/Sgt, NZEF | |
| McMullen | L.G. | NZEF | |
| Nodder | C.R. | Cpl, RNZAF | |



PART I : GENERAL

CHAPTER 2 : INTRODUCTORY

- (1) Summary of Contents.
- (2) Authorising Defence Works.
- (3) Review of Expenditure.
- (4) Statistics of Defence Activities.



INTRODUCTORY.1. SUMMARY OF CONTENTS.

The Official War History of the Public Works Department is divided into six parts: (1) General, (2) Defence Works for the Army, (3) Defence Works for the Navy, (4) Works for the U.S. Forces, (5) Accommodation, and (6) Civil Defences and Miscellaneous. The story of aerodromes and associated works carried out on behalf of the RNZAF forms the subject of a separate self-contained narrative.

So comprehensive were the war-time activities of the Department, embracing as they did almost every phase of defence and civil defence construction, that it is not easy to summarise them succinctly...

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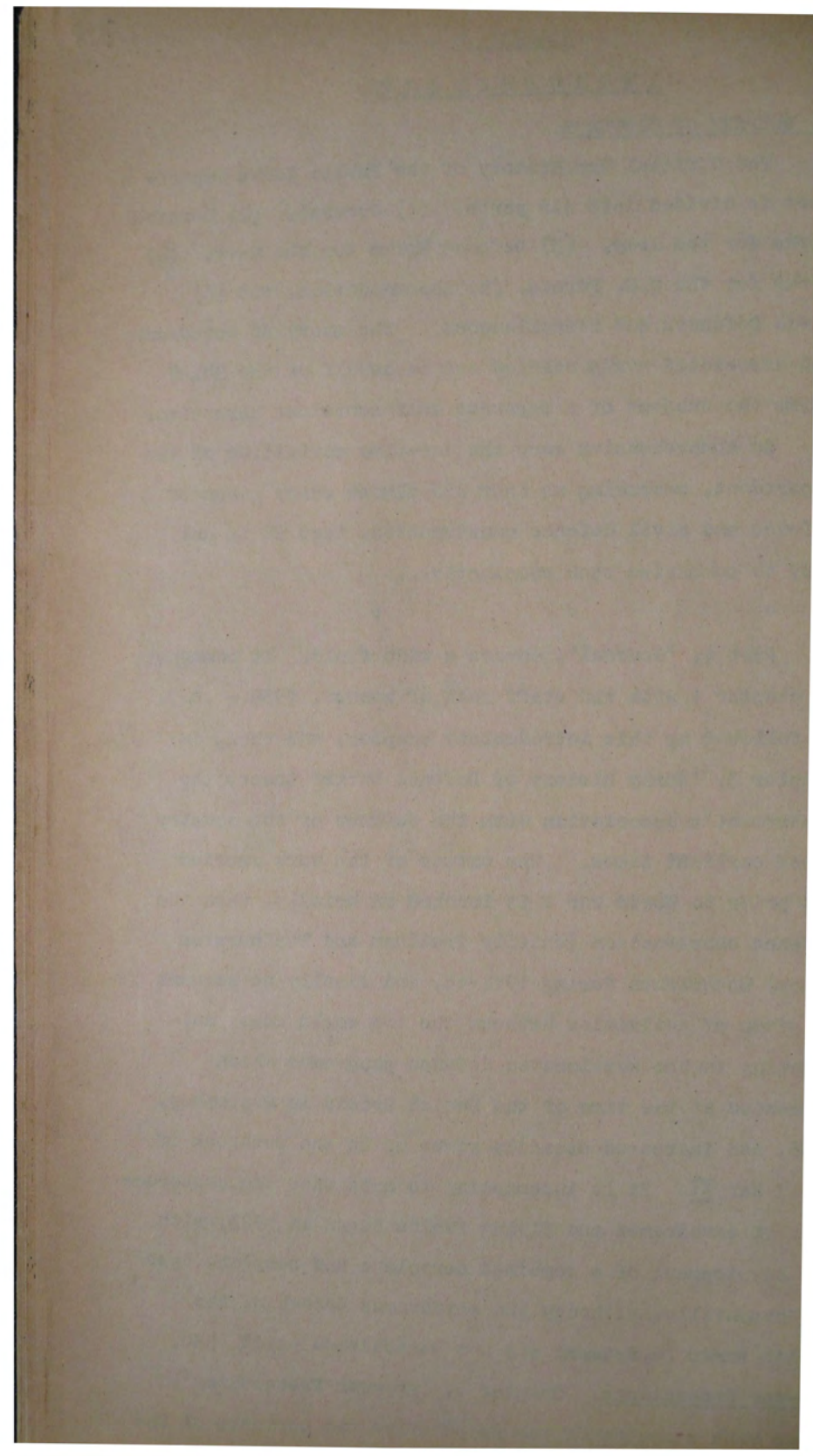
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Part 1, 'General', covers a wide field. It commences in chapter 1 with the staff roll of honour, 1939 - 1945, is followed by this introductory chapter, and then, in chapter 3, 'Early History of Defence Works' traces the Department's association with the defence of the country since earliest times. The extent of the work carried out prior to World War 1 is touched on briefly, then the defence construction (chiefly Trentham and Featherston camps) undertaken during 1914-18, and finally an account is given of activities between the two world wars, culminating in the accelerated defence programme which commenced at the time of the Munich Crisis in September, 1938, and increased steadily right up to the outbreak of World War II. It is interesting to note that the construction of aerodromes and flying fields began in 1923, with the development of a combined aeroplane and seaplane base at Hobsonville, although the Aerodromes Branch of the Public Works Department was not established until 1936.

Pre-war Precautions. Chapter 4, 'Pre-war Precautions', opens with a review of the preparation and contents of the



'Public Works Department War Book' - one of a series of secret documents issued in August, 1939 with the object of clarifying the action to be taken by various Government Departments in the event of war. Reference to a Building Co-ordination Committee set up in 1937 is included in the chapter not because the subject had any direct connection with the war but because, as a matter of interest, this move foreshadowed the effect shortage of skilled labour was later to have on the defence construction programme. The Building Production Committee, set up in 1938 under the Organisation for National Security, did, however, have a very definite bearing on the war. It was this committee which investigated the question of building construction generally, with particular emphasis on defence requirements under war-time conditions. Emergency regulations to control building operations were drafted, a suggested table of priorities was drawn up, and a survey made of building materials available. When the war broke out, sufficient spadework had been done to enable the newly appointed Building Controller to take over smoothly and effectively the administration of the Building Emergency Regulations which played a vital part in the implementation of the whole defence construction programme.

'Organisation, Control, and War-time Functions of the Public Works Department' is the heading of chapter 5. This is divided into five sections: (1) Constitution, (2) Head Office organisation, (3) War-time functions of Head Office branches, (4) District offices, and (5) post-war reorganisation. Section 3 is specially important in that it goes further than merely outlining the routine functions and responsibilities of Head Office technical and other branches during the war. The opportunity has been taken to record certain aspects of the Depart-

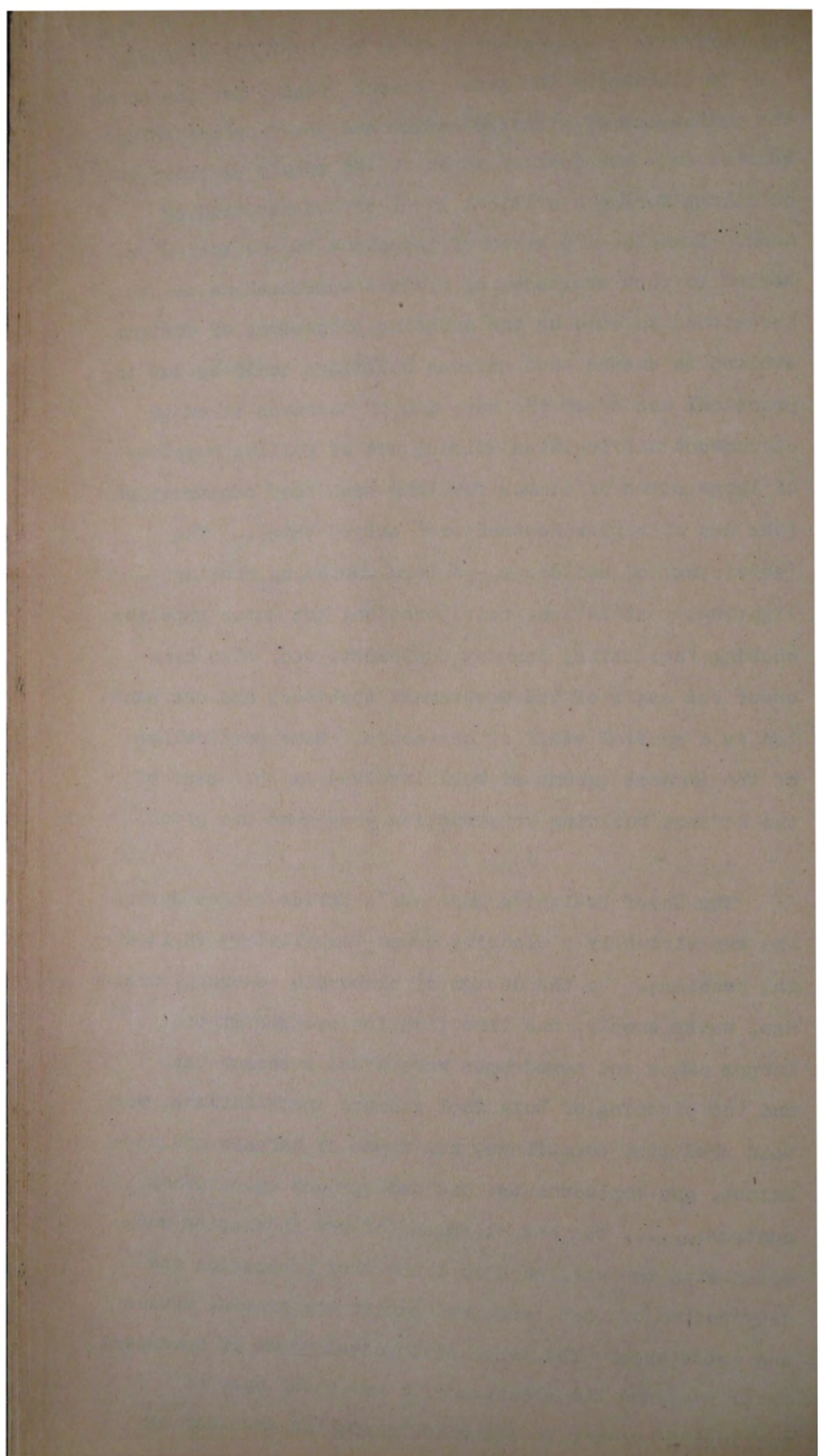
THE HISTORY OF THE
CITY OF BOSTON
FROM THE FIRST SETTLEMENT
TO THE PRESENT TIME
IN TWO VOLUMES
BY NATHANIEL BENTLEY
VOL. I.
BOSTON: PUBLISHED BY
J. B. ALLEN, 1825.

appropriately to any other part of the Official History.

In discussing the Architectural Branch, for instance, the principles of standardisation and pre-fabrication are touched on - two factors to which the speedy erection of buildings during a critical stage of the war owed so much. Examples are given of ingenious improvisation resorted to when shortages of certain essential materials threatened to hold up the building programme; of designs evolved to ensure that defence buildings could be put to practical use after the war; and of measures taken to circumvent difficulties arising out of failing supplies of large sizes of timber for long span roof construction (the use of timber 'connectors' solved this). The 'servicing' of buildings - a term embracing heating, lighting, ventilation, refrigeration, hot water supplies, cooking facilities, laundry equipment, etc. also came under the aegis of the Government Architect and was handled by a special staff of engineers. Some particulars of the immense amount of work involved in this side of the defence building construction programme are given.

* * * *

The Chief Designing Engineer's office became during the war virtually a clearing house for military engineering problems. To the design of elaborate sewerage, drainage, water supply, and fire fighting systems at the larger camps and aerodromes were added research into and the planning of bulk fuel storage installations, air raid shelters, camouflage, new types of hangars and magazines, gun emplacements, and underground operational centres..... The establishment of new industries connected with the war, such as linon flax production and dehydration of food, required expert engineering advice and assistance. The large-scale development of Devonport Naval Base and the erection of a new Naval base at Wellington brought in their train complex engineering



problems which the Naval authorities gratefully referred to the Design Branch of the Department. The actual construction of radar stations is described ^{elsewhere} in the Official History, but the background to the Department's contribution to this most important work - design and supervision of erection - belongs to the story of the Chief Designing Engineer's office and is referred to in some detail.

* * * *

At the outbreak of war the Dominion fortunately had at its disposal a good supply of modern mechanical plant. But this soon became irreplaceable, and it was thanks to the Department's Mechanical Engineering Branch that the machinery was kept in service and put to the fullest possible use. This branch was also actively associated - in conjunction with the engineering services section of the Architectural Branch - with the installation of power generating plants and the provision of lighting, refrigeration, and heating and cooking facilities in defence establishments. The branch carried out many noteworthy jobs of a special nature for the Armed Forces, ranging from the construction of launches and barges, trailers, hoists, cranes, trollies, and tanker wagons, to the manufacture of control and hydraulic equipment for radar stations and the building of a moving tank target control range.

* * * *

Passing reference only is given in chapter 5 to the Aerodromes, Hydro-electric and Housing Construction branches of the Department. These will be the subject of separate War Histories.

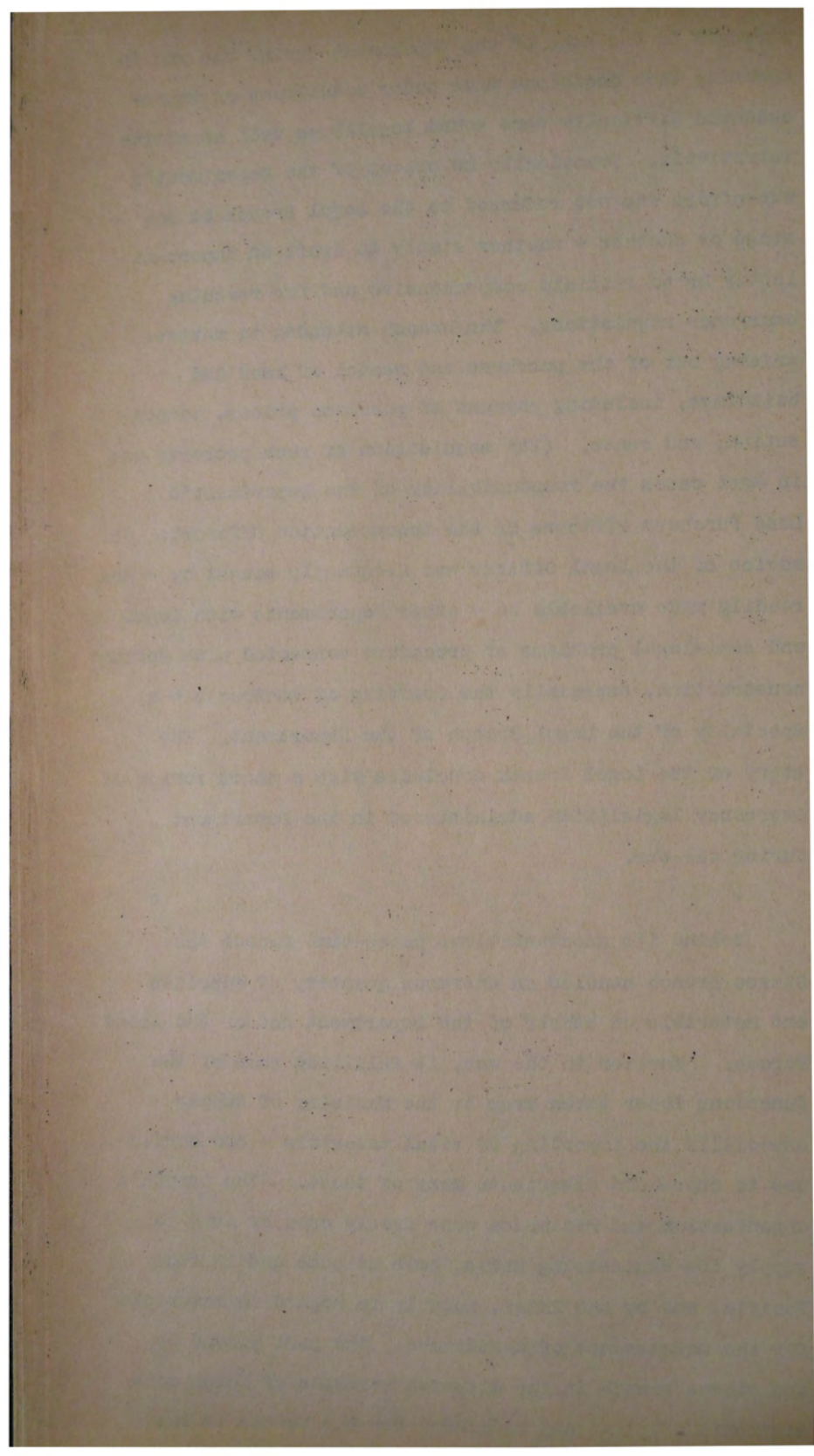
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Of the non-technical Head Office branches, the war-time functions of only three are set out at any length. The largest, the Legal Branch, was undoubtedly a tower of

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strength to the head of the Department during the war in ensuring that decisions made under conditions of unprecedented difficulty were sound legally as well as administratively. Practically no aspect of the Department's war-effort was not referred to the Legal Branch at one stage or another - whether simply to draft an important letter or to initiate comprehensive and far-reaching emergency regulations. The branch attended to matters arising out of the purchase and rental of land and buildings, including payment of purchase prices, compensation, and rents. (The acquisition of such property was in most cases the responsibility of the Department's Land Purchase Officers or the Accommodation Officer). The advice of the Legal Officer was frequently sought by - and readily made available to - other Departments with legal and semi-legal problems of procedure connected with defence construction, especially the drafting of contracts - a specialty of the Legal Branch of the Department. The story of the Legal Branch concludes with a short review of emergency legislation administered in the Department during the war.

* * * *

Behind its unostentatious peace-time facade the Stores Branch handled an enormous quantity of supplies and materials on behalf of the Department and of the Armed Forces. Earlier in the war, it fulfilled some of the functions later taken over by the Ministry of Supply - especially the importing of vital materials - and continued to store and distribute many of these. The branch's organisation and resources were freely used by Army to supply its engineering units, both at home and in the Pacific, and by the RNZAF, notably in regard to materials for the maintenance of aerodromes. The part played by the stores branch in the dispatch overseas of large consignments of plant and machinery for the Forces is told



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The extent of office, storage, and residential accommodation acquired for war purposes is the subject of a separate chapter in part 5 of this History. The constitution of the Accommodation Board and a broad outline of its functions and responsibilities are, however, touched on in the chapter now under discussion. Following this, mention is made of the other clerical branches of Head Office - accounts, Tenders Board, staff, records, employment, roads, and highways.

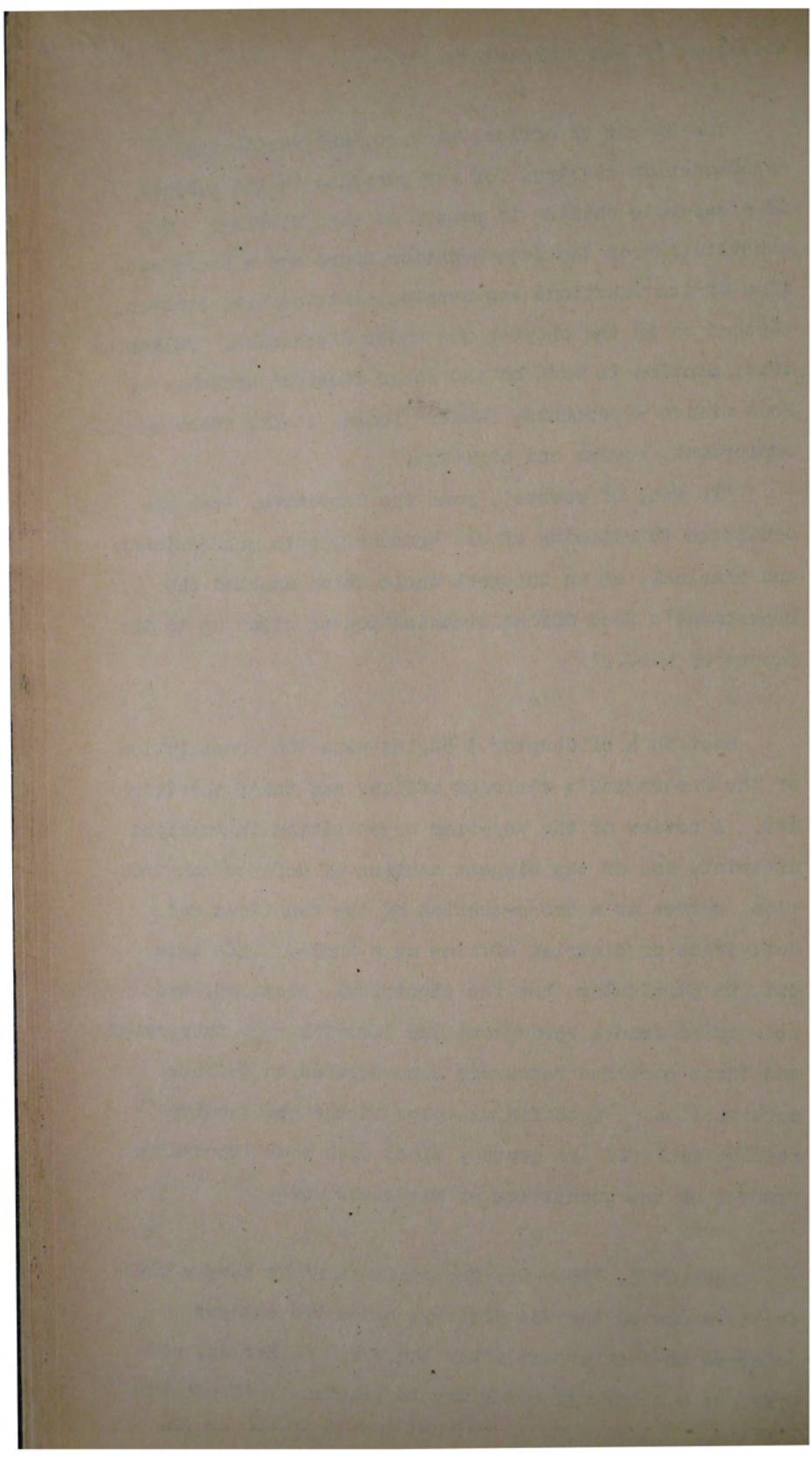
'It was, of course', runs the narrative, 'the co-ordinated functioning of all branches, both professional and clerical, as an integral whole which enabled the Department's Head Office organisation to stand up to the impact of war...'

* * *

Section 4 of chapter 5 begins with the constitution of the Department's district offices and their territories. A review of the war-time organisation in Auckland district, one of the biggest centres of defence construction, serves as a cross-section of the functions and activities of district offices as a whole. This sets out, in particular, how the electrical, plumbing, and associated trades throughout the district were integrated and their combined resources concentrated on defence construction. Specific examples of the spectacular results achieved are quoted, along with some impressive figures of the quantities of materials used.

* * *

Section 5, 'Post-War Reorganisation' is barely within the scope of the War History, since the changes referred to took effect after the war. It serves, however, as a necessary corollary to section 1, 'Constitution', which would help to clarify any confusion caused



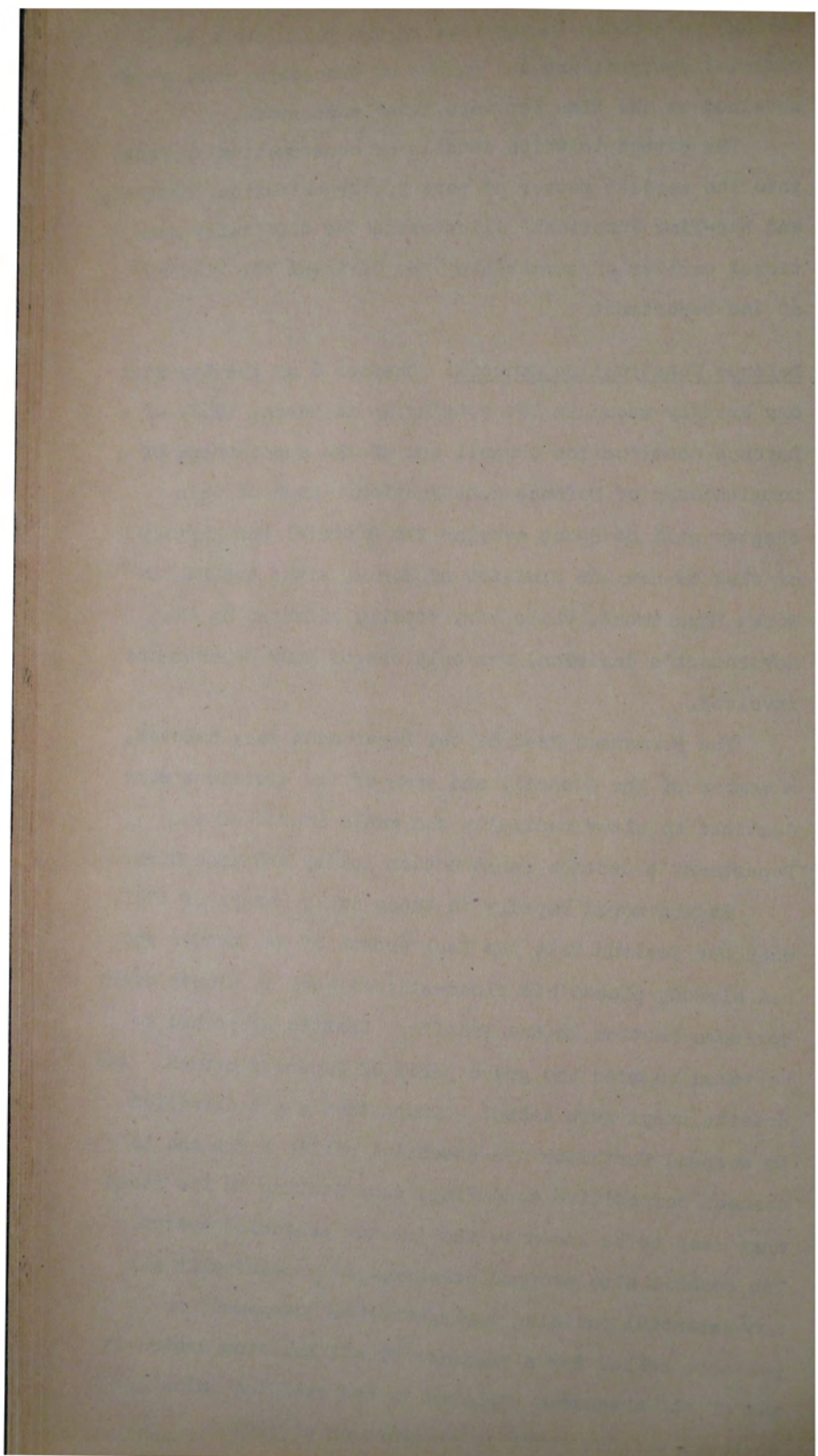
through references in the text of the War History to official designations and points of procedure, etc. which obtained at the time but were later superseded.

The extent to which details of construction obtrude into the subject matter of part 5, 'Organisation, Control, and War-Time Functions' illustrates the difficulty mentioned earlier of summarising the Official War History of the Department.

Defence Construction Council. Chapter 6 of the War History briefly recounts the setting up in March, 1942, of a Defence Construction Council and of the appointment of a Commissioner of Defence Construction. Much of this chapter will no doubt overlap the Official War History of what is now the Ministry of Works, since the Public Works Department, while very vitally affected by the Government's decision, was only one of many Departments involved.

The Permanent Head of the Department was, however, a member of the Council, and some of its decisions were destined to alter radically the whole course of the Department's defence construction policy and procedure.

Events moved rapidly in those early months of 1942, when New Zealand felt the foul breath of an invader who had already placed his blood-stained hand on almost every northern bastion in the Pacific. Drastic steps had to be taken to meet the grave peril of Japanese attack. And drastic steps were taken! Among them was a direction to suspend forthwith non-essential public works and to abandon competitive tendering, substituting in its stead what came to be known as the 'master schedule' system. The council also stopped construction on virtually all non-essential building works, whether Government or private; called for a register of all building contracts and of all tradesmen employed in the building industry; reviewed defence works in progress or projected;



established an order of priority; brought building materials under control; and reorganised the procedure for milling and supplying timber. These decisions were made or initiated at the first meeting of the council, held on 12 March 1942.

Of immediate concern to the Public Works Department was the curtailment of non-essential public works and the introduction of the master schedule system of contracting. The former was soon attended to. The latter, a highly complex subject, is dealt with in chapter 7 - one of the largest in the Official War History of the Department.

Defence Construction Contracts. In a note to Chapter 7, the historian describes the master schedule system of contracting as 'perhaps the most important administrative experiment in the history of the Department', and one which 'deserves to be fully recorded from the point-of-view of what was attempted as well as what was in fact accomplished.'

The fundamental principle behind the master schedule system was to dispense with competitive tendering in favour of allocating the work to a contractor, at a fixed price which would return a reasonable margin of profit. The obvious advantages of such a system were primarily;

- (1) time would not be wasted in preparing detailed plans and specifications, inviting and considering tenders, and having formal documents signed before the work started;
- (2) all available contractors would share in the work and not merely those able to quote the most favourable prices, and (3) any inflationary trend arising out of the absence of competition would be checked - contract prices would be the estimated actual cost plus 5% profit and 2½% overhead.

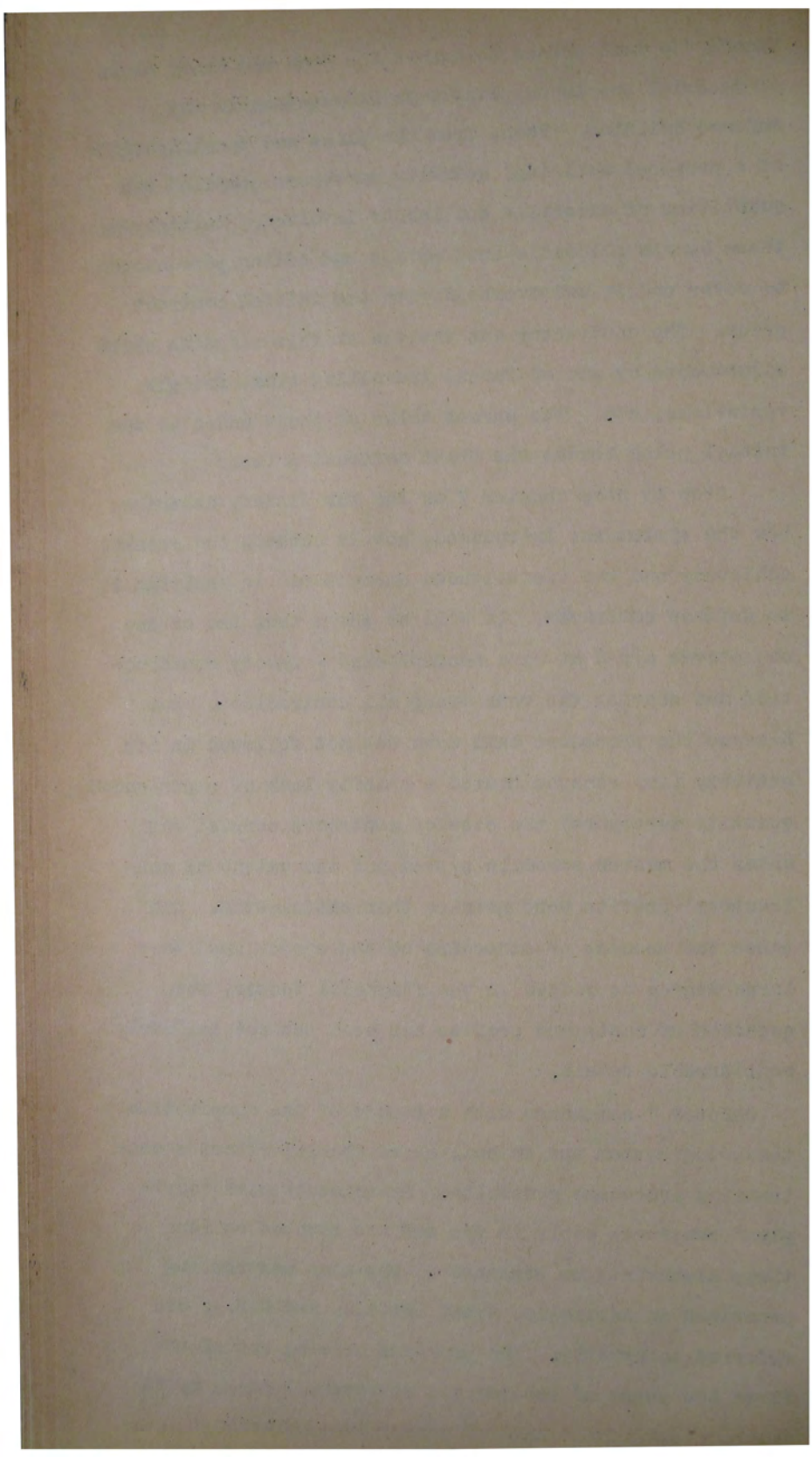
The key to the system was the master schedule itself. This document (there was one for each building district)

THE HISTORY OF THE
REIGN OF
HIS MAJESTY
GEORGE THE THIRD
BY
SAMUEL JOHNSON
ESQ.
IN TWO VOLUMES.
LONDON:
PRINTED BY A. MILLAR, IN ST. PAUL'S CHURCH-YARD, 1784.

listed the unit prices allowable for each and every class of material and labour likely to be required in any defence building. Then, from the plans and specifications of a proposed building, quantity surveyors compiled the quantities of materials and labour involved. Multiplying these by the allowable unit prices and adding percentages to cover profit and overhead gave the initial contract price. The contractor was invited at this stage to claim adjustments by way of fares, travelling time, freight variations, etc. The agreed value of these added to the initial price became the final contract price.

Step by step chapter 7 of the War History describes how the system was introduced, how it worked, the results achieved, and the vicissitudes encountered in applying it to defence contracts. It will be shown that two of the objectives aimed at were accomplished - speedy construction and sharing the work among all contractors. But because the procedure laid down was not followed in its entirety (for reasons stated - chiefly lack of experienced quantity surveyors) the cost of contracts carried out under the master schedule system and the extent of contractors' profits were greater than anticipated. And since the success or otherwise of the system must to a large degree be judged on the financial factor, the question of costs and profits has been set out in fairly considerable detail.

Chapter 7 commences with a resumé of the competitive tendering system and an outline of the Department's contracting procedure generally. Experiments with 'cost-plus' contracts early in the war are touched on (and their disadvantages stressed). War-time contracting practices in Australia, Great Britain, and U.S.A. are referred to briefly. The problems arising out of the first two years of the war are reviewed, leading up to the necessity for a radical change in contracting



procedure - the disabilities of competitive tendering under war conditions were becoming obvious to the Government Architect even before Pearl Harbour.

In a report dated 9 October 1941 he expressed his concern over the current trends of contracting and, in suggesting a remedy, presaged with remarkable accuracy some of the measures (manpower control and allocation of contracts) instituted six months later.

Section 4, dealing with the introduction of the master schedule system, sets out the precise procedure laid out (quoting from the 'conditions of contract' form specially drawn up for use in this type of contract). The main stipulation was that a fixed price, based on the approved unit rates, was to be determined in respect of each contract, subject to the Commission^{er} of Defence Construction reserving the right to vary such price under certain circumstances. For the sake of clarity the contents of circular instructions which later amended the conditions of contract are interpolated at the appropriate places.

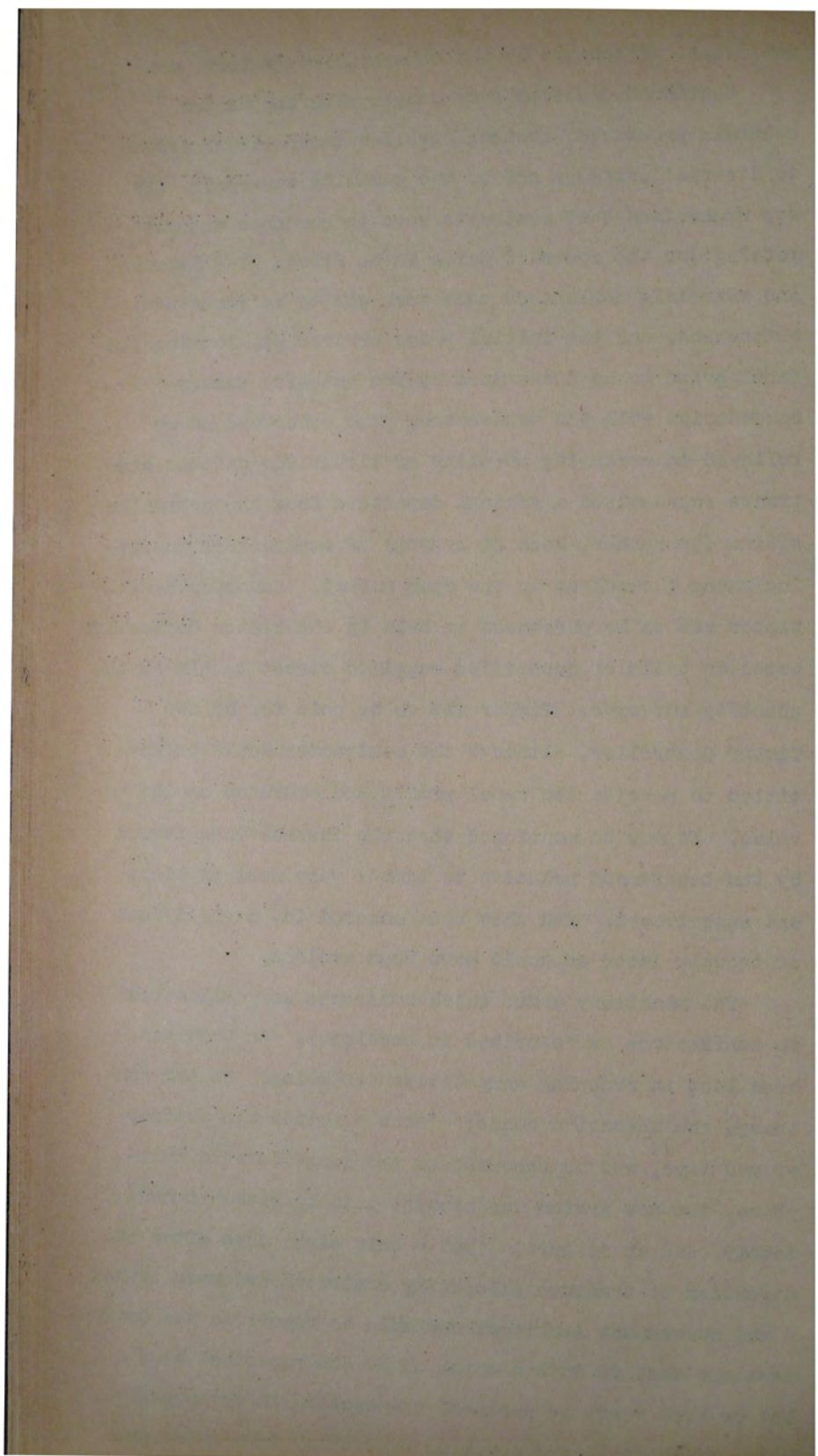
Particulars are then given of the engagement of quantity surveyors by the Department at Auckland, Wellington, and Dunedin. This section is followed by an account of how the master schedules were compiled. At each centre the quantity surveyors, with the assistance of officers of the Public Works and Housing Departments, studied labour rates and materials costs on the spot, and fixed unit prices appertaining to 11 different districts. It is of interest to note that the cost allowed for materials was the actual purchase price plus freight and cartage. This being so, the allowances for labour really governed the extent of profit capable of being earned. At this point in chapter 7 the preamble to each master schedule is quoted extensively and, where necessary, analysed and explained. Subsequent amendments to master

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schedules, authorised by the Commissioner, follow on.

Section 8 deals at some length with the master schedule procedure, quoting detailed instructions issued to district officers and to the quantity surveyors. It was emphasised that contracts were to commence without waiting for the contract price to be fixed. The labour and materials content of each work was to be measured beforehand, and the initial price arrived at, leaving the final price to be determined by the quantity surveyor in conjunction with the contractor. The procedure to be followed in arranging supplies of timber for defence contracts represented a radical departure from the erstwhile system (or rather, lack of system) of contractors competing among themselves in the open market. Henceforth, all timber was to be purchased in bulk by the Timber Controller, based on bills of quantities supplied direct to him by the quantity surveyor. Timber was to be paid for by the Timber Controller, although the contractor would be entitled to receive the usual profit and overhead on its value. It may be mentioned that the instructions issued by the Department relative to timber were most explicit and unequivocal. Had they been adhered to, a great deal of trouble later on would have been avoided.

The machinery under which contracts were allocated to contractors is described in section 9. No time had been lost in dropping competitive tendering. On the contrary, the narrative reads: 'With a noticeable absence of red tape, and by recourse to the long-distance telephone, the new system was brought into operation immediately, and on 16 April 1942 - only eight days after the direction to commence allocating contracts had been issued - the Government Architect was able to report to the Commissioner that to date a total of 82 contracts had been let or were ready to proceed, aggregating an estimated

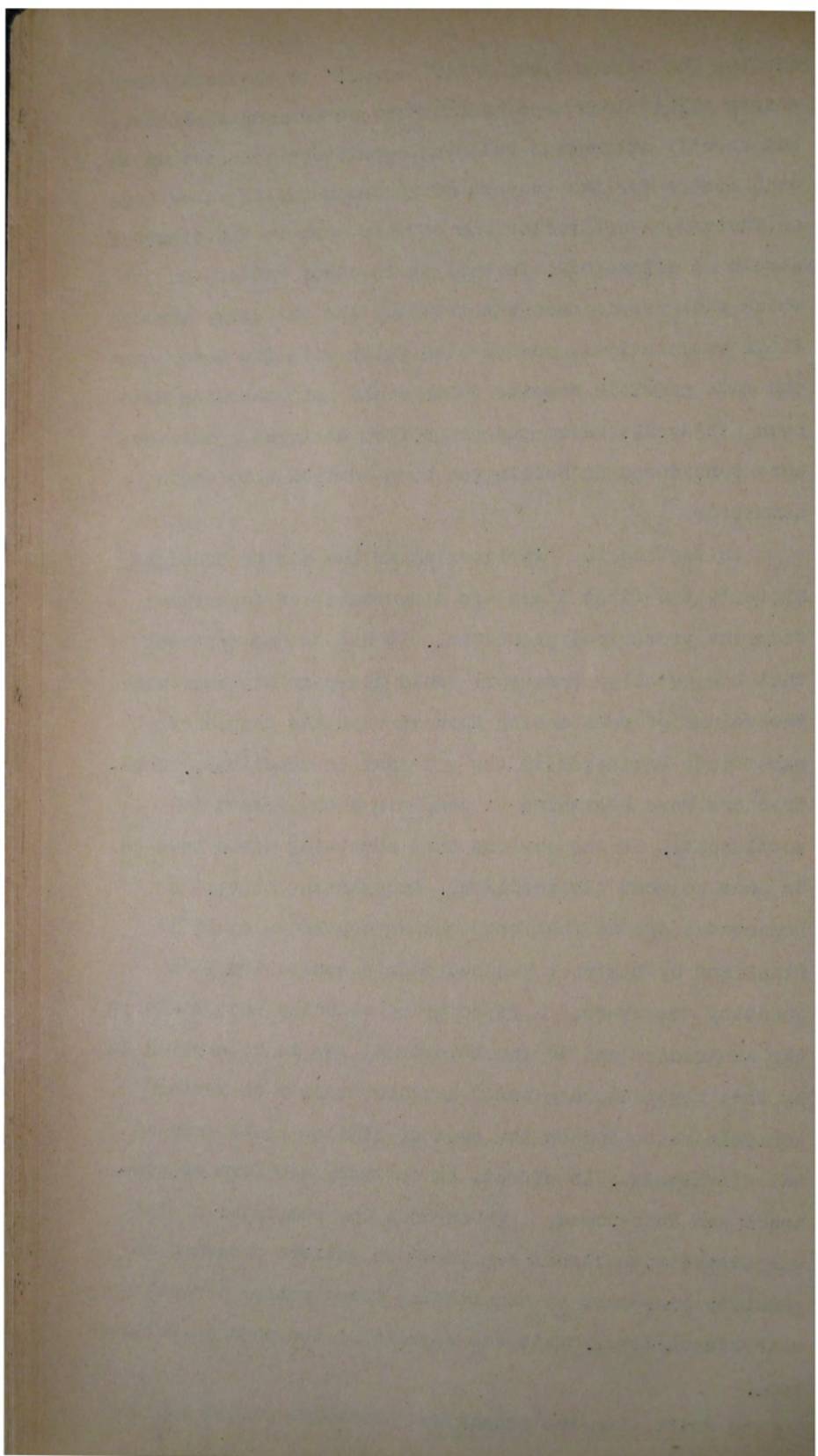
and covering everything from a latrine



costing £45 to a £60,000 RNZAF store.' In the transitory stages allocations were made by the Government Architect, but shortly afterwards building committees were set up in each centre for the purpose of recommending to which firm or individual contractor any defence work in the district should be allocated. In this as in other matters on which their assistance was invited, the builders, through their associations, co-operated fully with the Government and made possible results which could not otherwise have been achieved. Recommendations from district committees were considered in Wellington by a central allocation committee.

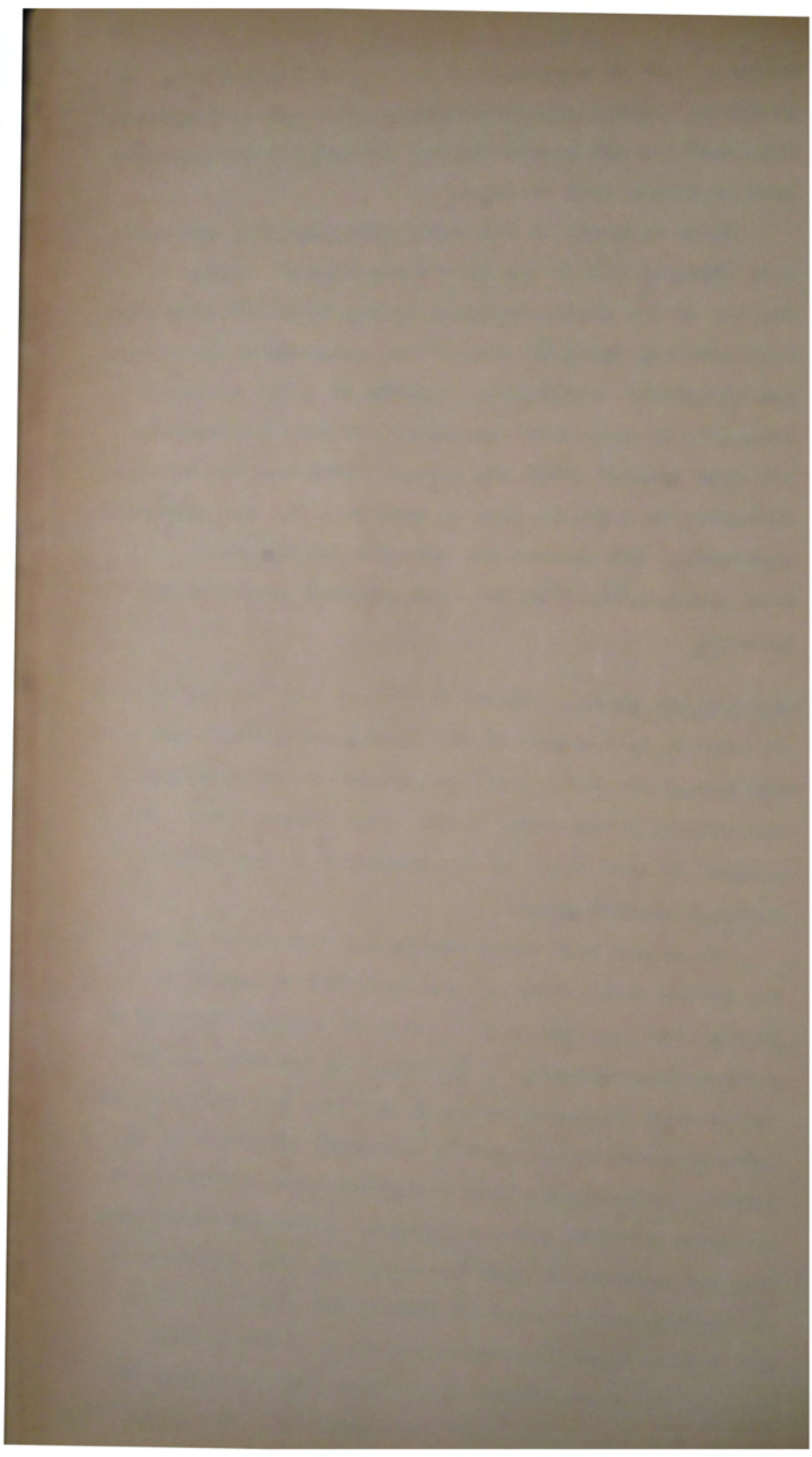
In section 10, 'Application of the Master Schedule System', the first signs are discernable of departures from the prescribed procedure. It had become apparent that the quantity surveyors could not possibly cope with the volume of work coming forward with the degree of exactitude envisaged in the original instructions. Contractors were beginning to complain about delays in settlement. It was obvious that something would have to be done to meet the position. Recognising this, the Department agreed that outstanding contracts could be finalised by District Engineers in consultation with quantity surveyors. A fixed price mutually acceptable to the contractor and to the Department was to be arrived at by free negotiation - based not necessarily on master schedule rates but on the cost of similar works carried out previously. In effect, an entirely new form of contract was introduced. Throughout the remainder of the war District Engineers continued to relieve pressure on quantity surveyors by negotiating fixed prices direct with contractors. This was especially the case in Wellington.

The drift from the prescribed procedure gained impetus as the onus for supplying priced schedules of quantities



(in terms of master schedule unit rates) passed from the quantity surveyor to the contractor, if indeed it had ever really rested with the former. In practice, no attempt had been made to fix the final price beforehand. The contractor proceeded with the work as soon as the contract had been allocated to him. Progress payments were arranged on the certificate of departmental officers, based on a measurement of the work carried out plus the value of materials on the site. When the contract had been completed - and not until then, the contractor submitted his final claim to the quantity surveyor, who checked it and eventually advised the Department of the figure passed for settlement. To obtain his timber, the contractor simply placed a requisition on the Timber Controller, and it was the Public Works Department which later had the unenviable job of attempting to reconcile timber ordered and supplied with timber actually built into the work.

By late 1943 it was apparent that the master schedule had proved its worth, in that the immense defence building programme had proceeded without let or hindrance during 18 months of unprecedented difficulty. But the very speed with which these results had been achieved left in its train many problems as pressing as they were vexatious. Hundreds of contracts throughout the country were awaiting finalisation and builders were becoming impatient over delays in payment. Large shortages of timber had been brought to the attention of the Department. The master schedule unit prices had already been scaled down but were still being criticised as excessive, and allegations arose that serious over-measurement and misapplication of the contract conditions had taken place. The ugly question began to be asked: was profiteering going on? It was proposed that a Parliamentary committee investigate



for instance, to stop shrewd workmen from enjoying a fortnight's paid holiday every three months! The weekly hours of work were reduced to 48 in June, 1942, the Amendment concerned re-introducing payment of overtime for all hours worked beyond those prescribed. The 40 hour week was not officially reverted to on defence works until the end of the war.

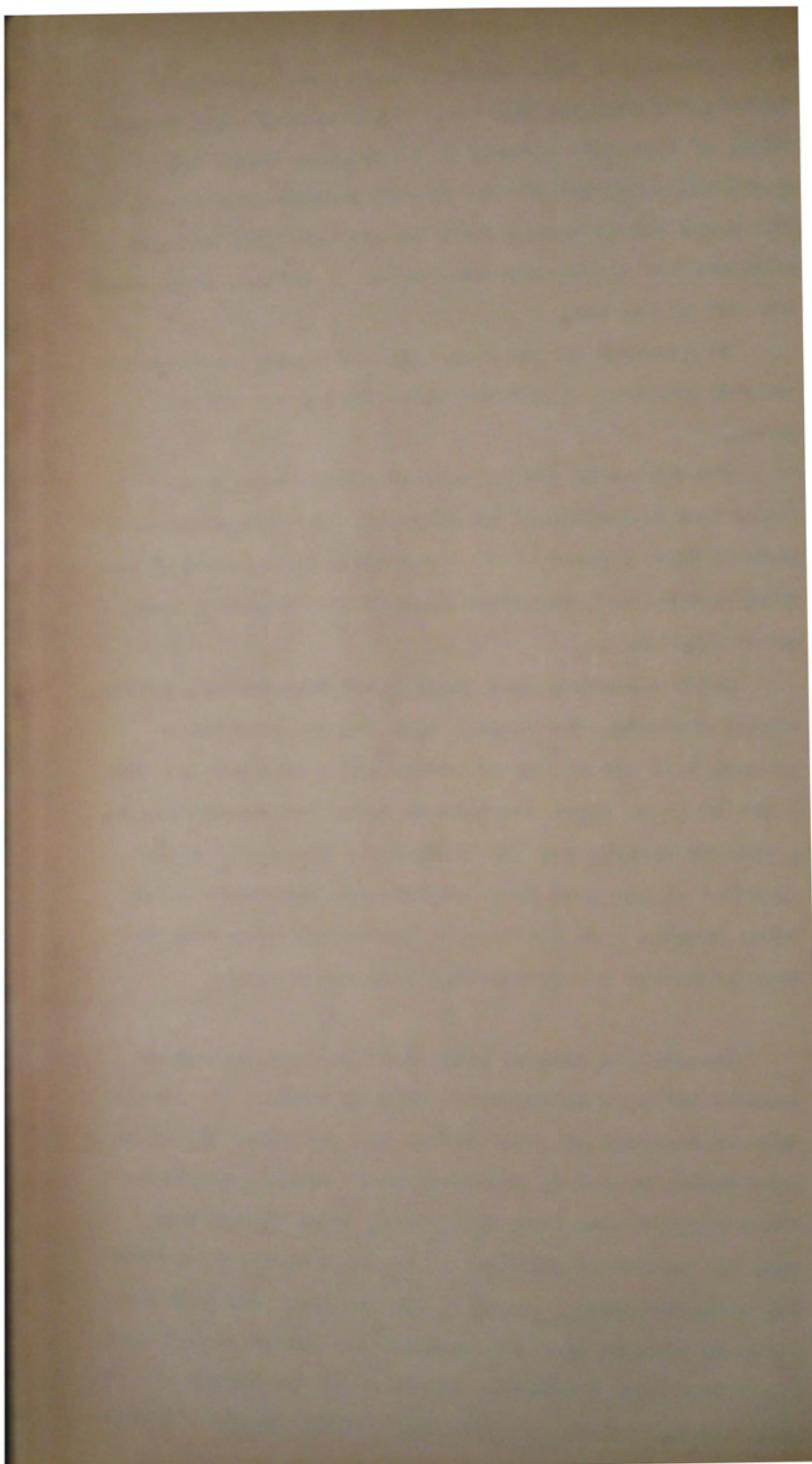
As a matter of interest, typical weekly earnings of workmen employed on defence works during the war are given.

The effect of the Department being declared an 'essential undertaking' in February, 1942, is outlined - chiefly that neither staff nor workmen could leave or be dismissed without the prior consent of a District Man-power Officer.

After recording that about 3,000 departmental workmen served overseas, the chapter sets out the privileges granted such men by way of annual leave payments and the right to leave their families in rent-free accommodation. A curious anomaly was that members of the staff had to continue to pay rent (for departmental quarters) during their absence with the Forces, notwithstanding that they were no better off financially than the workmen.

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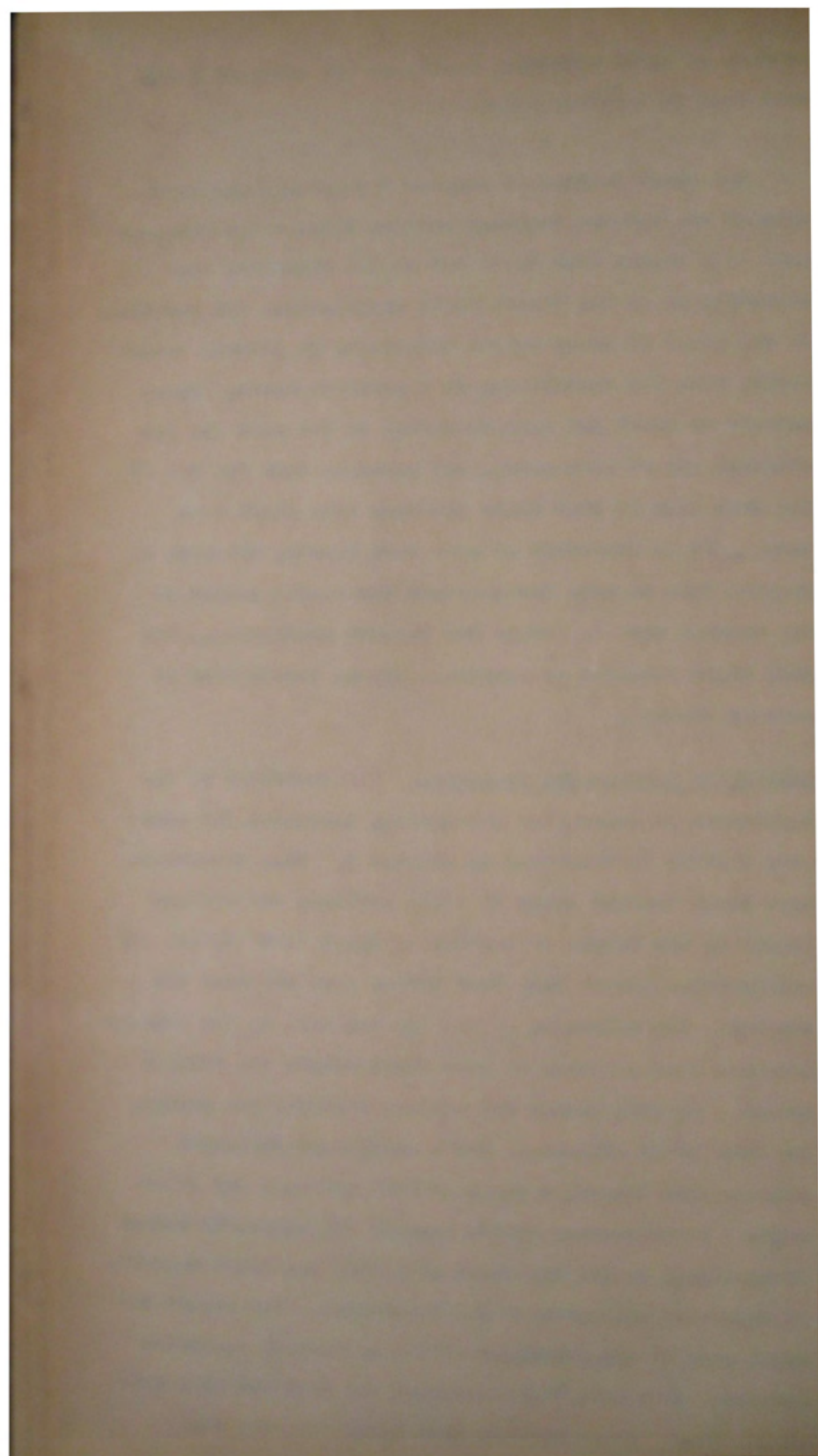
The section dealing with staff reviews allowances paid to officers stationed on defence works. The incidence of shortage of staff during the war years is thrown into strong relief by quoting figures showing how expenditure climbed from 1939-40 onwards, while at the same time the number of officers employed, instead of increasing proportionately, lessened appreciably. The significance of this is that the Department's annual expenditure has always been a reliable barometer of the amount of work being handled. The figures relating to staff enlistments in the Armed Forces disclose that at 31 March 1943



as many as 1,019 officers, or 26% of the total of 3,940, were then on military leave.

The final section of chapter 8 describes the formation of the Defence Engineer Service Corps - the development of a unique idea which had as its objective the preservation of the Department's organisation and resources in the event of enemy action disrupting or gravely interfering with its functioning on a civilian basis. Large numbers of staff and workmen served in the unit (in the evenings and at week-ends), and probably very few indeed had much idea of what their ultimate role might have been... It is therefore of more than passing interest to observe from an Army Headquarters memorandum quoted in the chapter that '...under New Zealand conditions...the DESC might function as operation troops rather than as service troops'.

Specialist Engineering Companies. The formation by the Department of specialist engineering companies for overseas service is described in chapter 9. When volunteers were first invited early in 1940, officers and workmen jumped at the chance of serving in their 'own' units, and applications poured into Head Office from all over the country. The selection of the men was made by the Department and then referred to Army Headquarters for further action. In this manner two railway construction groups, two Army troop companies, and a mechanical equipment company were formed, a total of 1594 officers and other ranks. Reinforcement drafts brought the aggregate number of personnel to not far short of 2,000, the great majority of whom were employees of the Department. The record for speed goes to the formation of the mechanical equipment company. An appeal for volunteers was launched on 4 November, 1940. Precisely one week later the roll was



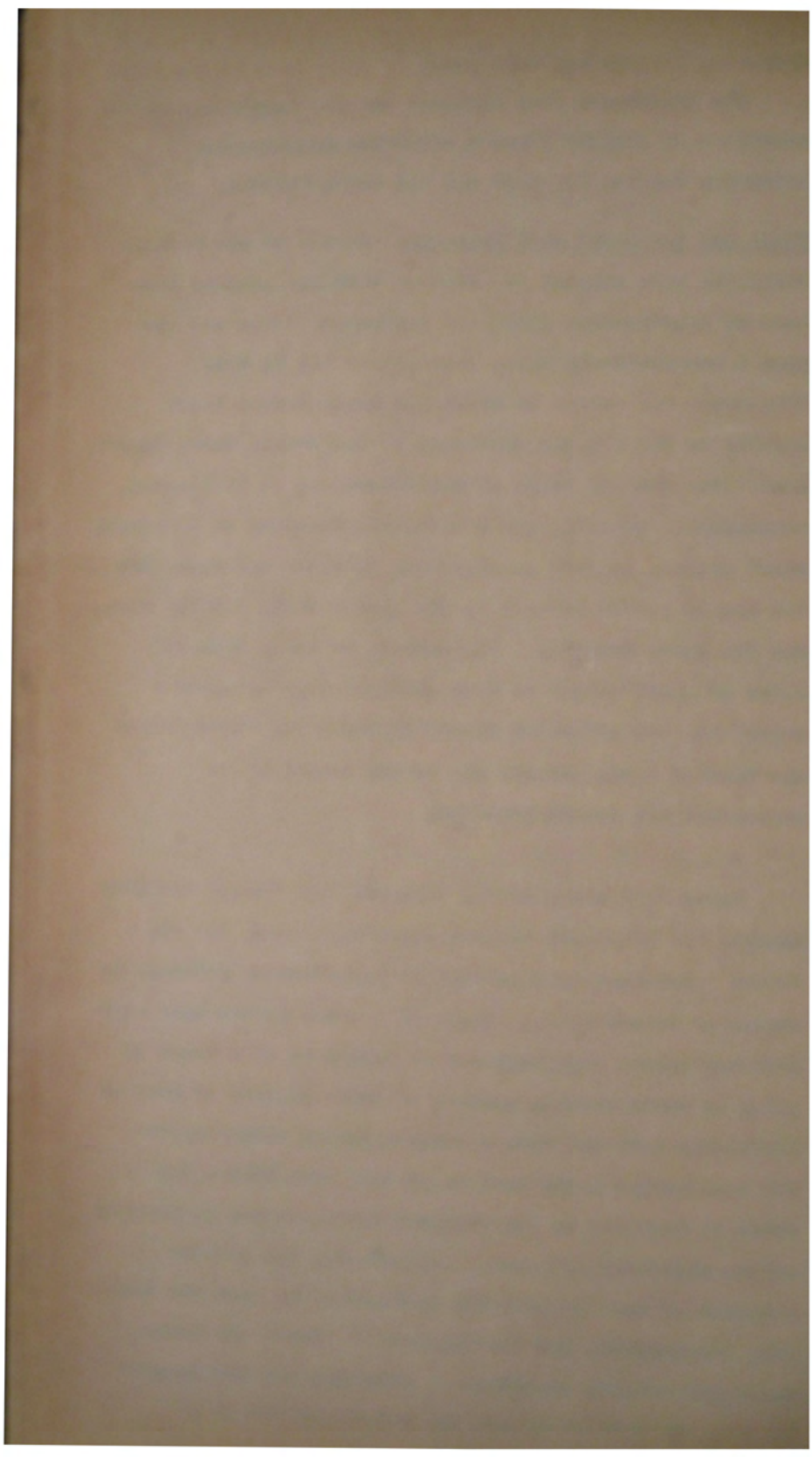
complete, and all men were ready to enter camp by the 15th.

The Department also assisted the Air Department to recruit - on similar lines - aerodrome construction squadrons for the Far East and the South Pacific.

Plant and Equipment sent Overseas. Part 1 of the History concludes with chapter 10, dealing with the sending overseas of construction plant and equipment. This was perhaps a comparatively minor achievement but it does illustrate the extent to which the Armed Forces leant heavily on the willing shoulders of the Public Works Department. The chapter tells of the assembling in Wellington, overhauling, packing, and despatching overseas at extremely short notice, several consignments of plant and machinery for use on active service in the Middle East, the Far East, and the South Pacific. Altogether, no fewer than 555 items of plant valued at over £500,000 were involved - credit for the efficient manner in which the whole matter was handled being largely due to the Department's Mechanical and Stores Branches.

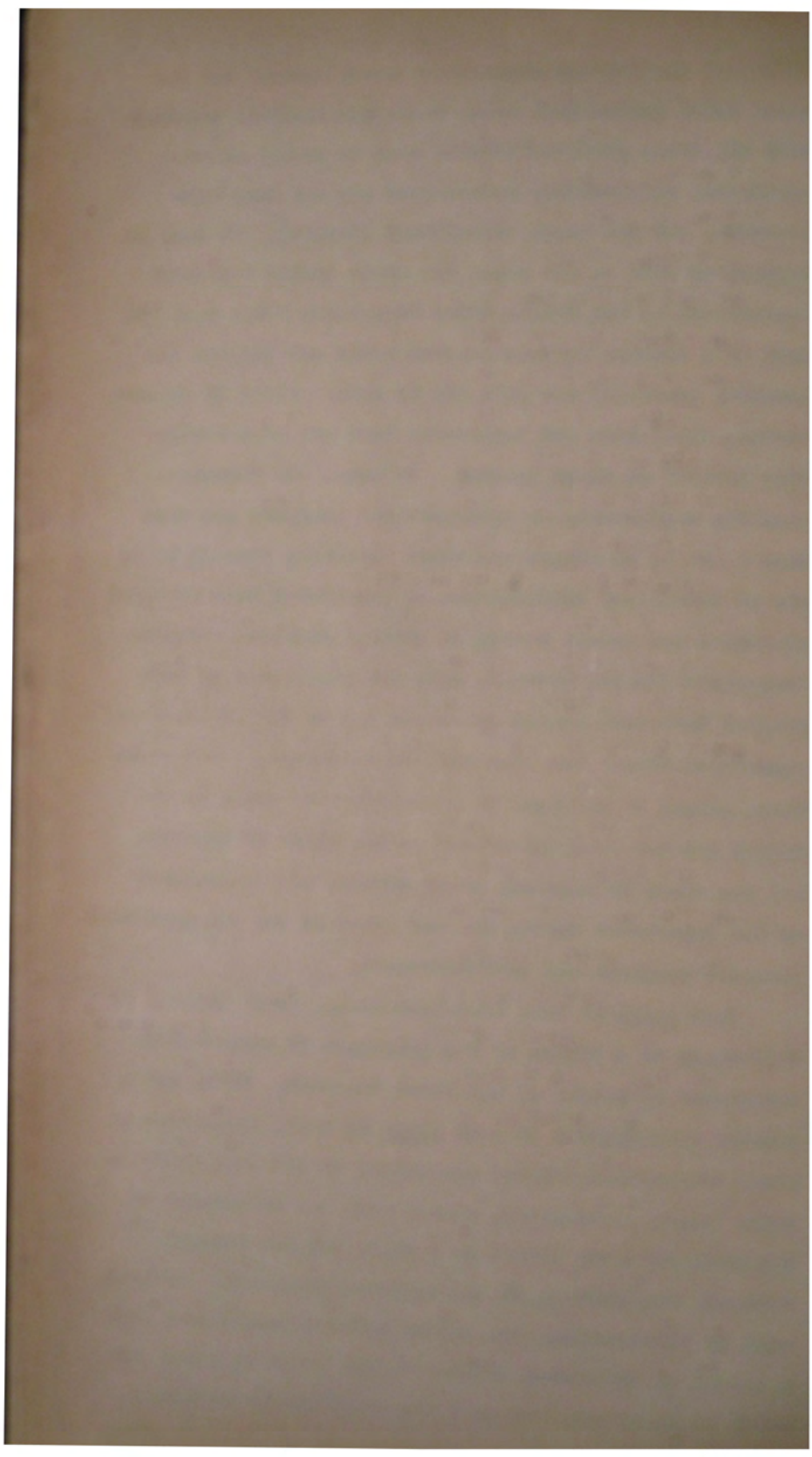
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Parts 2, 3 and 4 of the Official War History describe briefly the principal defence works undertaken for the Forces - substantially as told by departmental officers in charge of construction. Works of a minor nature have been excluded unless they happened to form part of a chain or group of works costing upwards of about £5,000, or were of particular interest from a constructional point-of-view. The description given each major work runs from a few words to from one to two thousand words, depending largely on its magnitude and cost. In general, the salient features of each project are outlined - its name and locality, its purpose, and its 'history'. Under the last-mentioned heading questions of selection and preparation of site are touched on and the nature and extent of



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buildings erected and engineering works carried out are given (with statistical data, where applicable), together with all other pertinent details such as period of construction, difficulties encountered and how they were overcome, and the total expenditure incurred. It must be emphasised that in all cases the costs quoted represent expenditure by the Public Works Department only, e.g. the cost of a coastal battery project would not include the armament purchased and paid for by Army. Works of approximately equal size and importance have not necessarily been treated at equal length. In some, for instance, specific engineering or architectural problems are discussed, while in others questions involving unusual methods of design and construction or departures from orthodox procedure are deemed worthy of special mention. Within reasonable limits, however, only the highlights of each project have been placed on record and so far as possible repetitive detail has been kept to a minimum. Nevertheless, detail which might be of interest or value in the future has not been sacrificed on the altar of brevity, and the story of each and every defence work undertaken by the Department during the war years is for all practical purposes complete and self-contained.

Each group of work histories (Army, Navy, U.S.A.) is introduced by a resumé of the programme of construction undertaken on behalf of the Force involved. This, and a similar introduction to each class of work, endeavours to place the various defence activities of the Department in their proper perspective, viewed from the background of the Dominion's war effort as a whole and the overall tactical requirements of the Services concerned. Without such an introduction, the reader would be confronted with a series of individual stories which, taken on their own, might be as meaningless as a crossword puzzle without clues. As an example: of the hundreds of military camps



built for Army all except the smaller ones are the subject of separate narratives but in the absence of a clear picture as to their necessity and an idea of how they fitted in to the mobilisation, territorial, brigade, and divisional set-up, a study of the works histories would be a fruitless task. On the other hand, it has been left to Army and the RNZ Navy to tell the full story of their activities in their own Official War Histories, and no attempt has been made herein to give more than a bare outline of such tactical and strategic considerations as are essential to an understanding of the construction programme involved.

* * *

Works for Army. Part 2 of the Department's Official War History is devoted to a description of works carried out for Army. By far the greatest expenditure was incurred on the erection of military camps. This amounted to £7,549,515. Immediately upon the outbreak of war complete new mobilisation bases were built at Papakura and Burnham for the training of the 2nd NZEF, while the existing camp at Trentham was extended. Within a few weeks sufficient accommodation was ready for the 6,000 men of the first echelon. Four months after the start of the war bare paddocks at each of the three base camps had been transformed into rows of buildings capable of accommodating a total of six battalions of troops - with all the comforts and amenities of modern townships. A third battalion area was later added to Papakura and Burnham camps. The territorial training camp at Ngarua-wahia was constructed and brought into use as an auxiliary mobilisation base. The biggest camp in the country - containing seven battalion areas - began to take shape at Waiouru in the winter of 1940.

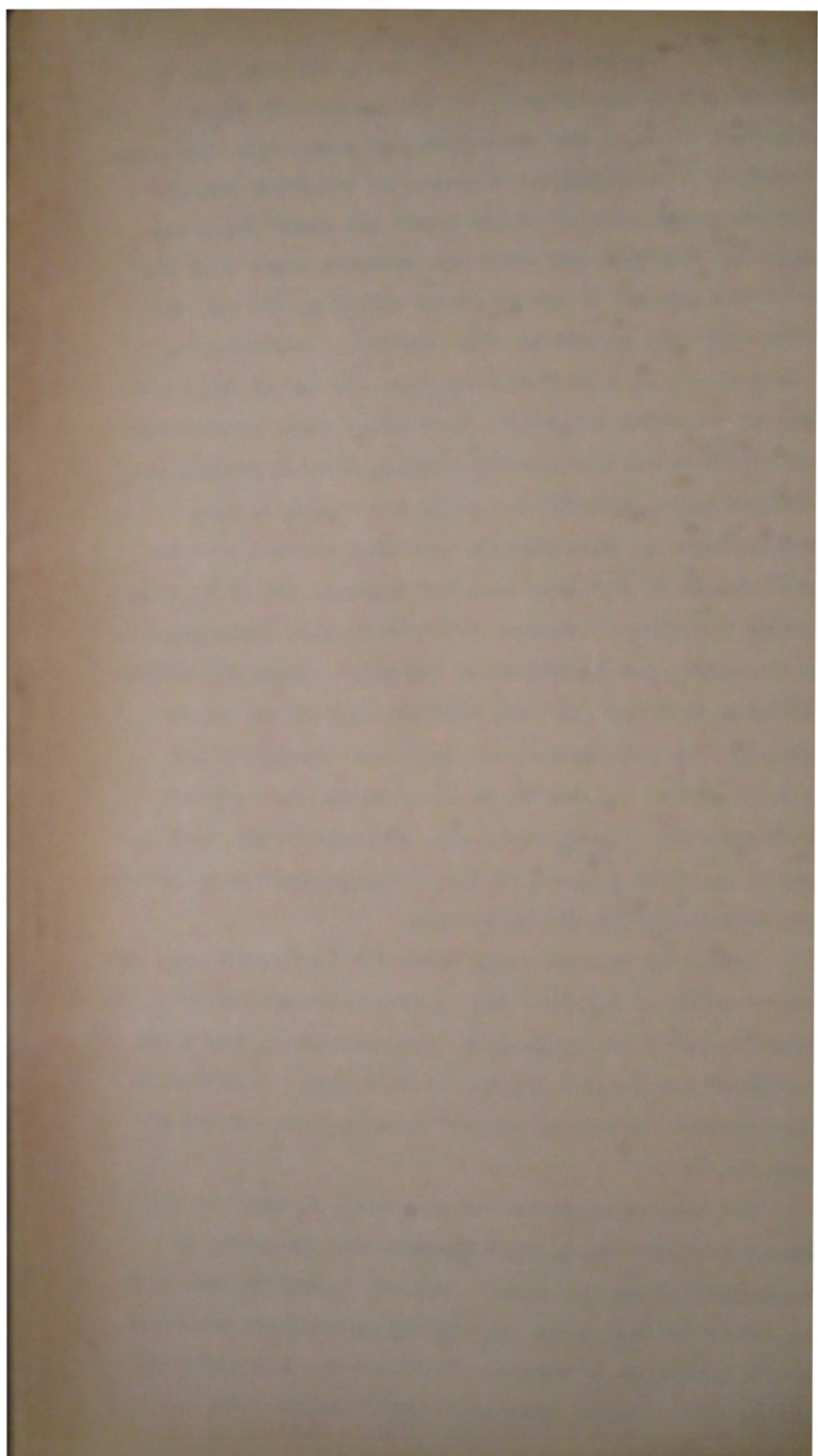
Two further large camps were authorised at the end of 1941 and rushed to completion during the following year.

THE HISTORY OF THE
CITY OF BOSTON
FROM 1630 TO 1800
BY
JOHN H. COLEMAN
IN TWO VOLUMES
VOL. I
BOSTON
PUBLISHED BY
J. B. LEECH, 15 NASSAU ST.
1858

These were located at Linton and Delta and were for the accommodation and training of the Territorial (home defence) Force. New semi-permanent camps were also commenced at Westerfield and Waiwera, in the South Island. The onrushing tide of events could not await their completion, however, nor could the existing camps hold the mounting numbers of territorials called up for service from about the middle of 1940 onwards. Consequently there sprang up like mushrooms from one end of the Dominion to the other a series of temporary camps established on race-courses, showgrounds, parks, playing fields, and similar sites suitable for ready conversion to camp accommodation. When Japan's southward advance cast the grim shadow of invasion over New Zealand, the fully mobilised Territorial Force - reconstituted as Divisions - was accommodated in dispersed 'brigade' camps, tactically deployed to throw its full strength against any enemy landing. Brigade camps were scattered throughout the North Auckland peninsula, in areas north and south of Auckland city (though these were occupied at the last minute by American forces), in the Wairarapa-Masterton district, and in Marlborough and Canterbury.

Including various camps built for fortress troops in the vicinity of the four main fortress areas (Bay of Islands, Auckland, Wellington, and Lyttelton), the total number of New Zealand troops for whom camp accommodation was provided during the fateful year of 1942 reached almost 78,000.

The immense construction programme entailed in the erection of all these camps predominates the story of works carried out for Army. Indeed, it may be said that the whole defence effort of the Dominion hinged primarily on the provision of camp accommodation for her fighting forces. The 'camps' section of part 2 of this War History sets out how this programme was accomplished.



The adoption of standards of construction (known as phases 1, 2 and 3) to meet the needs of the moment is described, and a word picture given of what was involved in the construction of each and every major camp project and associated works. Elsewhere, the system of contracting followed is reviewed in considerable detail.

* * * *

Following on the history of military camps, part 2 outlines how £2,401,736 was spent by the Department on gun emplacements and the erection of accommodation for battery personnel. In the early stages of the war activities were chiefly confined to the provision of additional accommodation for fortress troops at the coastal batteries guarding the Dominion's main ports. But even before the threat of the conflict spreading to the Pacific had developed to any great extent, some important new projects were authorised. After Pearl Harbour the completion of these was accorded top priority. New batteries of 6" guns were installed around Auckland, Wellington, Lyttelton, and Dunedin, supplementing the existing ones, while a chain of batteries (mostly 6") was established to protect secondary ports from Whangaroa to Bluff, and to keep hostile shipping out of the Marlborough Sounds. The work involved in these installations was extensive enough, but paled into insignificance beside the construction at Auckland and Wellington of batteries of 9.2" guns. Acting in conjunction with Army Headquarters, public works engineers designed underground chambers as large as railway tunnels for the magazine, engine room, and other highly vulnerable targets, thus ensuring that, among other advantages, the big guns could not easily be put out of action by bombing attack at a time when they might be required to repel the approach of enemy warships. The planning and construction of these batteries - two at Auckland and one at Wellington - is described fully in part 2. An underground lay-out



was also adopted at some of the more important 6" gun batteries. Batteries of smaller guns (4", 6-pounder and 12-pounder) were mounted around the main ports for close-defence roles, including counter-offensive against motor torpedo boats.

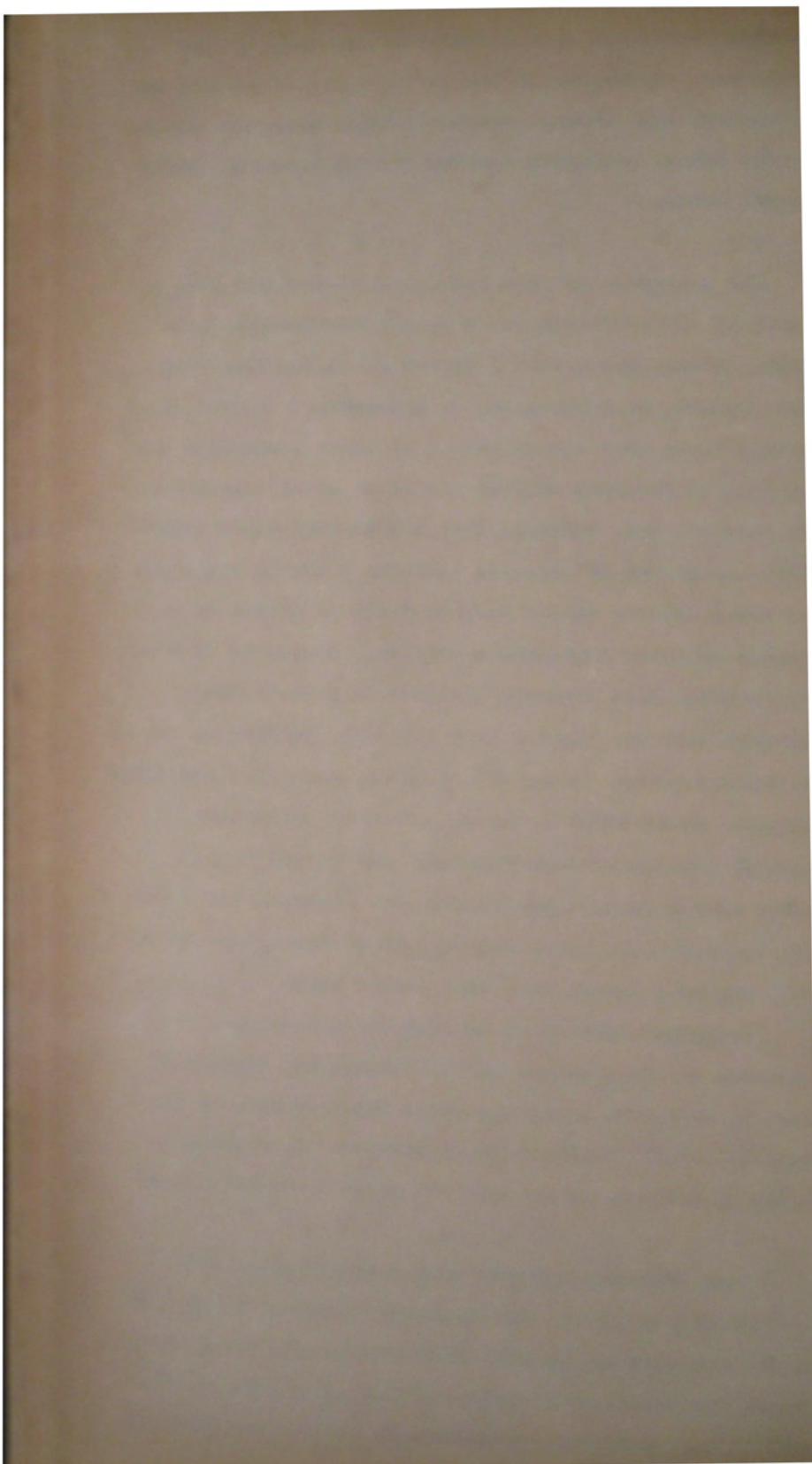
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The provision of magazine accommodation for Army at a cost of £939,189 entailed a fairly considerable programme of construction at a number of places extending from Ardmore, near Papakura, to Alexandra. Before Pearl Harbour these were simply places to store ammunition and the type of building erected was of no great consequence. All this changed, however, when New Zealand found herself liable to attack by Japanese bombers. Almost overnight the issue altered from a routine building matter to a complex military engineering problem. Magazines of brick and concrete were evolved, designed to protect their valuable contents against bomb and shell splinters, blast, or incendiaries. Sites for magazine areas were carefully selected with a view to taking advantage of as much natural protection from discovery and destruction as could be obtained. Excavation into hillsides was favoured, the buildings being camouflaged to look (from the air) like anything except what they really were.

Technical details of all the designs adopted are recorded in the preamble to the 'magazines' section of part 2, while the works histories touch on some of the constructional difficulties encountered in erecting a total of 461,000 square feet of magazine accommodation.

* * * *

Each sizeable military camp included among its amenities a hospital, and large convalescent depots (300 beds) were erected in each of the three military districts. These facilities would normally have taken care of sick soldiers. Anticipating casualties in overseas theatres,



special ward blocks were added to several civilian hospitals, notably Auckland, Palmerston North, Wellington, Wairau (Blenheim), and Cashmere and Burwood (Christchurch). A complete new convalescent hospital for servicemen was erected at Rotorua. Had a Japanese attack on New Zealand eventuated, casualties would have been incurred among the defending forces. These would have been taken care of in military hospitals built in the 'brigade' areas, especially North Auckland, where two such hospitals were established. Singularly enough, one was located in a school (Whangarei Boys' High School) while the other, at Kaikohe, eventually became a school. Smaller field hospitals (30 beds) were also erected in various parts of the North Island, while in North Auckland ward blocks for soldier T.B. patients were built alongside three civilian hospitals.

At Middlemore, near Auckland, a large new hospital intended for military use was constructed, but before it had reached completion it was taken over by the Auckland Hospital Board for civilian purposes.

The erection of hospitals and convalescent depots at a cost of £1,935,780 is dealt with in a section of part 2.

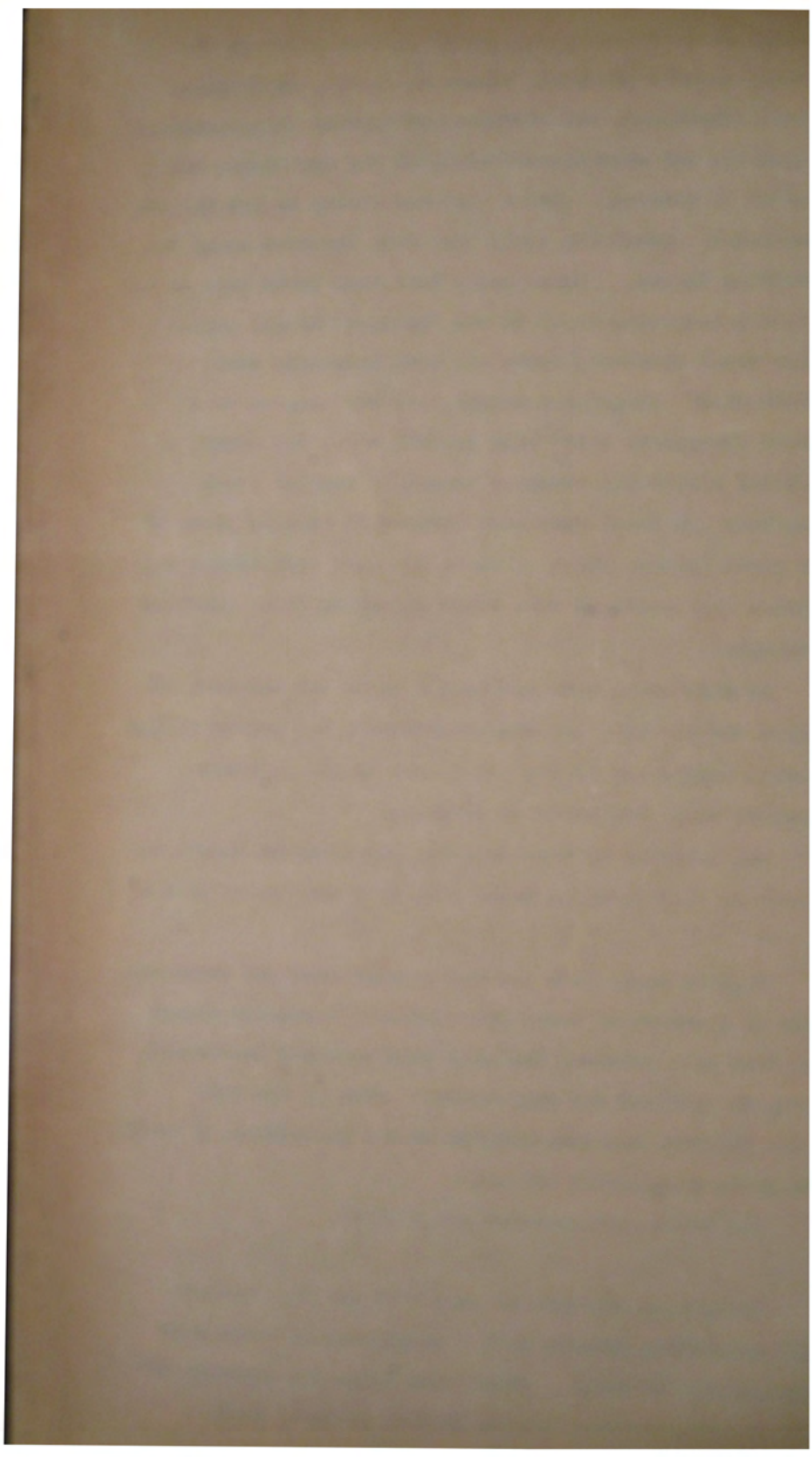
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Japan's entry into the war precipitated the construction of a series of heavy anti-aircraft batteries around the four main centres, the only ones existing previously being at Auckland and Wellington. Most of the work which followed was concentrated on the protection of these two ports from aerial attack.

The total cost amounted to £568,527.

* * * *

Succeeding sections of part 2 of the War History deal relatively briefly with a miscellany of other work carried out for Army. These came under the headings of: Bulk Petrol Reserves; Ranges (Rifle, Grenade, Mortar,

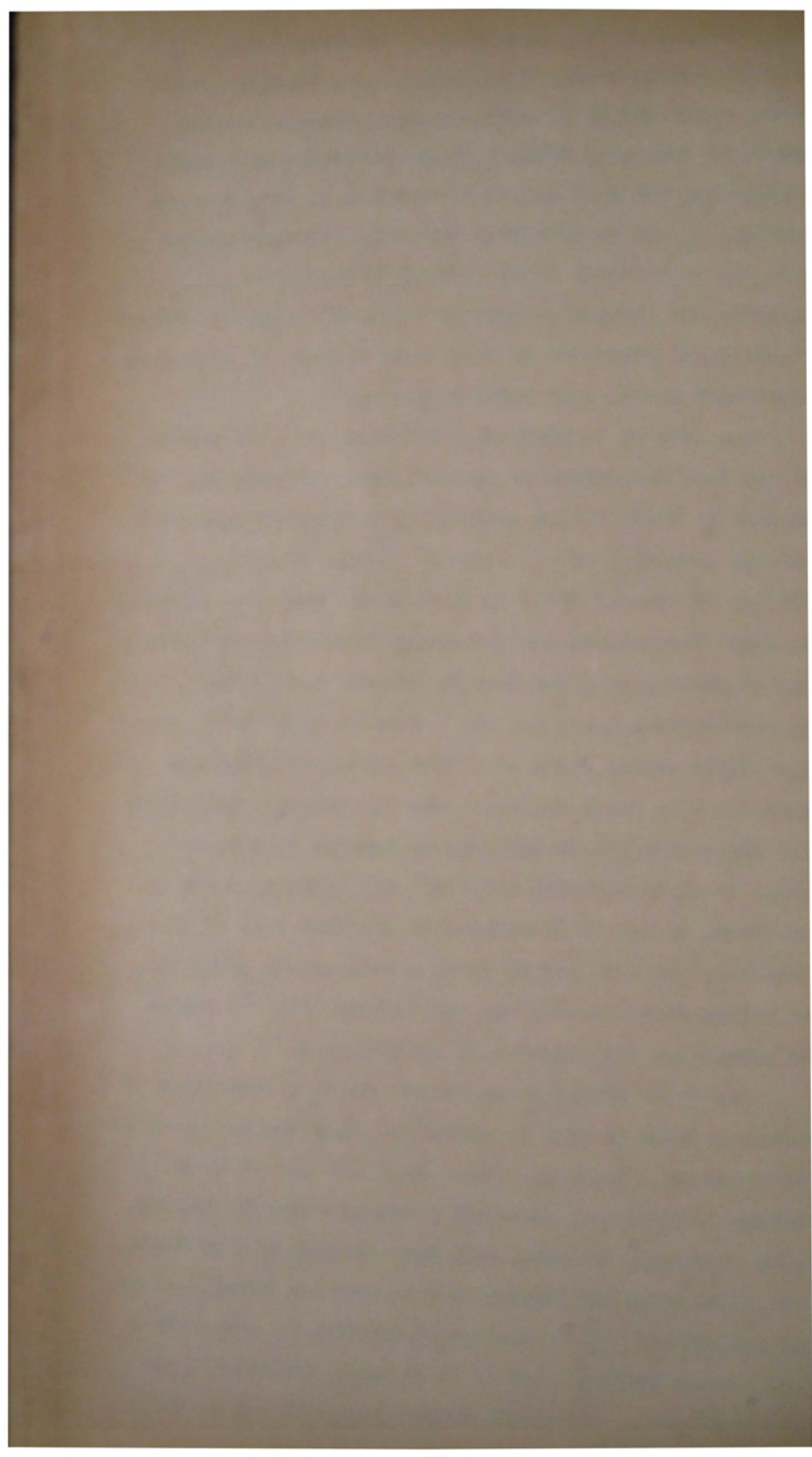


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Prisoner-of-War Camps; Army Colleges and Schools; Guard Posts, Coast Watching Stations, etc; Military Roothing; and Field Defensive Works. These are in the main self-explanatory and need little elaboration in this summary. However, it may be mentioned that bulk petrol supplies were stored in steel tanks erected at Ngaruawahia, Waiouru, and Burnham (aggregate capacity 2,050,000 gallons). In addition, compounds to hold large numbers of 44-gallon drums were provided at certain points.

The section on military roads describes the extent of the work undertaken to improve communications for the purpose of facilitating movement of troops and equipment and for general tactical reasons. This covers roads in the Bay of Islands fortress area; a new road from Onehunga to Kumeu (by-passing the congested through routes traversing Auckland city); the Waiouru-Tokaanu Road; the Waiouru-Taihape Road; and the Napier-Taihape Road. These last three gained their strategic importance from the presence of a large military camp at Waiouru. Concluding the story of military roading, an account is given of steps taken to classify all roads and bridges in the Dominion, to enable comprehensive military maps to be prepared. Arising out of this, a substantial programme of bridge strengthening was put in hand with the object of permitting the movement of 16-ton tanks.

The field defensive works section is a compendium of measures taken in 1942 to repel the enemy had he succeeded in effecting a landing. These took the form of road blocks, pill-boxes, anti-tank ditches, beach wiring, gun pits, trenches, dugouts, etc. also preparations to destroy strategic roads and bridges and to deny the enemy the use of aerodromes. At this stage of the war, in early 1942, New Zealand was believed to be in grave danger, and the field defensive works were required as a matter of the

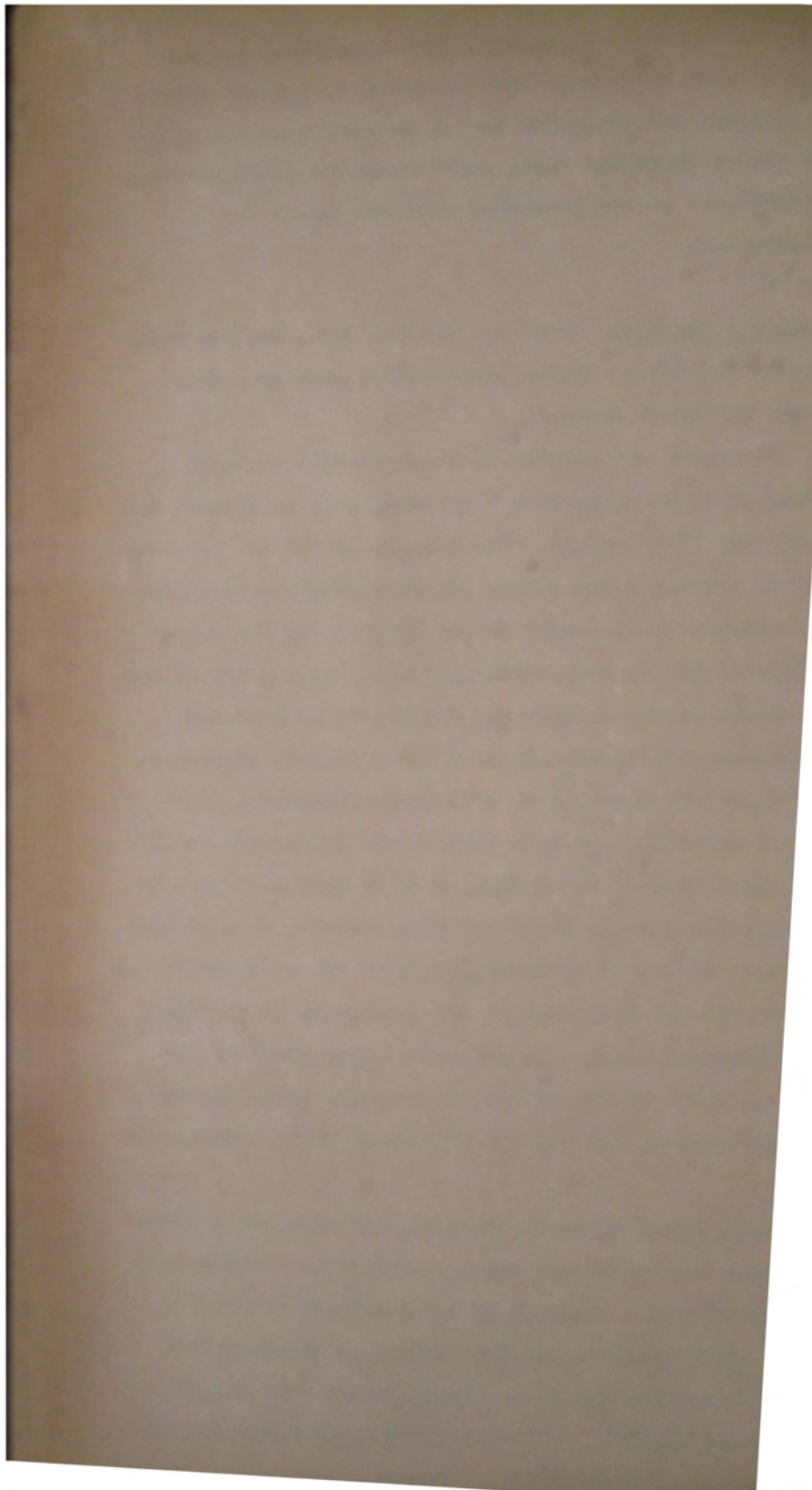


greatest urgency. By special arrangement Army and the Public Works Department co-operated in an all-out effort to complete the programme in the shortest possible time - the 'usual channels' being short-circuited and everything subordinated to the paramount need for speedy construction.

Works for the Navy. Part 3, 'Defence Works for the Navy' divides the Naval defence construction programme into twelve different sections.

The first and largest of these relates to Naval bases, of which there were two: Devonport (Auckland) and Shelly Bay (Wellington). The development of the existing base at Devonport was easily the most comprehensive project undertaken on behalf of the Navy during the war. It started off as a moderate expansion scheme, but as the war spread to the Pacific and the shadow of invasion lengthened, Devonport assumed a new strategic importance and became the scene of an extensive programme of work which eventually cost more than $1\frac{1}{2}$ million pounds. The full story of what was accomplished at Devonport is told in narrative form in the Naval Base section, complemented elsewhere in part 3 by descriptions of the construction of underground oil fuel tunnels and expansions to the Kauri Point armament depot. An account is also given of the new base built at Shelly Bay, Wellington, primarily for the servicing of the lighter classes of Naval vessels.

The section on Naval barracks, schools, etc (excluding those located within Naval bases) covers construction work (principally erection of buildings) at a training school established on Motuihi Island; at an electrical school at Petone; and at a composite auxiliary patrol service headquarters, anti-submarine maintenance base, and mine sweeping store at Wellington. A new barracks



was built at Lyttelton and an RNVR headquarters building at Dunedin. The total accommodation made available for personnel in the four principal barracks (Philomel, Tamaki, Cook, and Tasman) was just over 2,000.

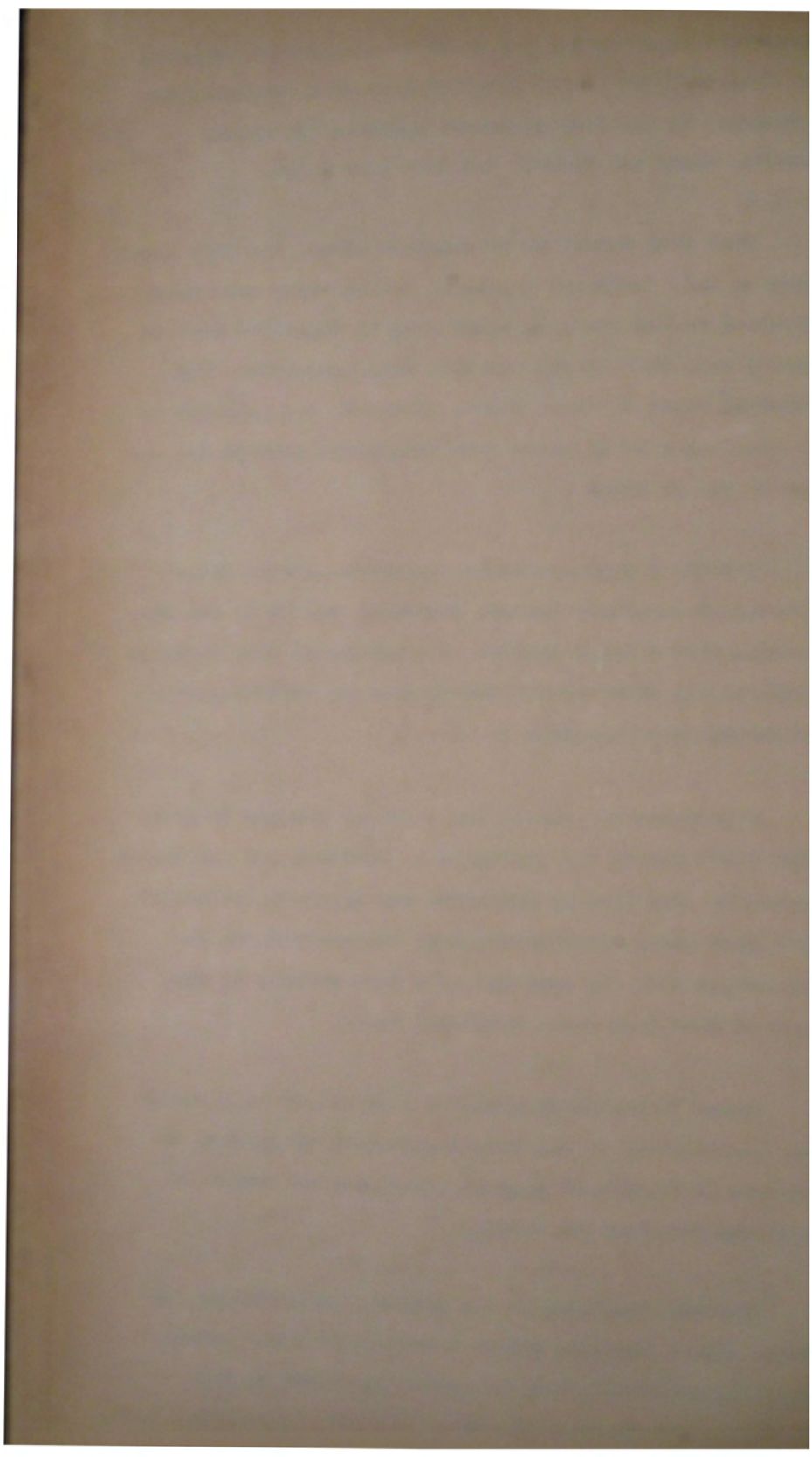
What Army refers to as magazine areas, the Navy prefers to call 'armament depots'. Two of these were constructed during the war, comprising 10 magazines each at Shelly Bay, Wellington, and Cass Bay, Lyttelton. The existing depot at Kauri Point, Auckland, was expanded to 26 magazines, 15 of which were originally erected for the use of the US Navy.

Section 4 contains works histories of mine bases erected on Rangitoto Island, Auckland, and at Te Kao Bay, Akaroa, also a brief outline of a series of mine stations (control and observation) established at various points extending from Whangaroa to Akaroa.

Pile booms to prevent the entry of hostile shipping were built across the entrances to Auckland and Wellington harbours. The port of Lyttelton was similarly protected by a gate boom. Preliminary work was carried out in connection with the erection of a boom defence at the head of West Bay, Queen Charlotte Sound.

Under 'Wireless Stations' a description is given of the construction of the Navy's principal WT station at Waiouru (a 'combined' project undertaken on behalf of both the Navy and the RNZAF).

The work involved in the erection of buildings for Naval signal stations was of a relatively minor nature. The only projects given individual treatment in the narrative are stations set up on Tiritiri Island (Auckland),



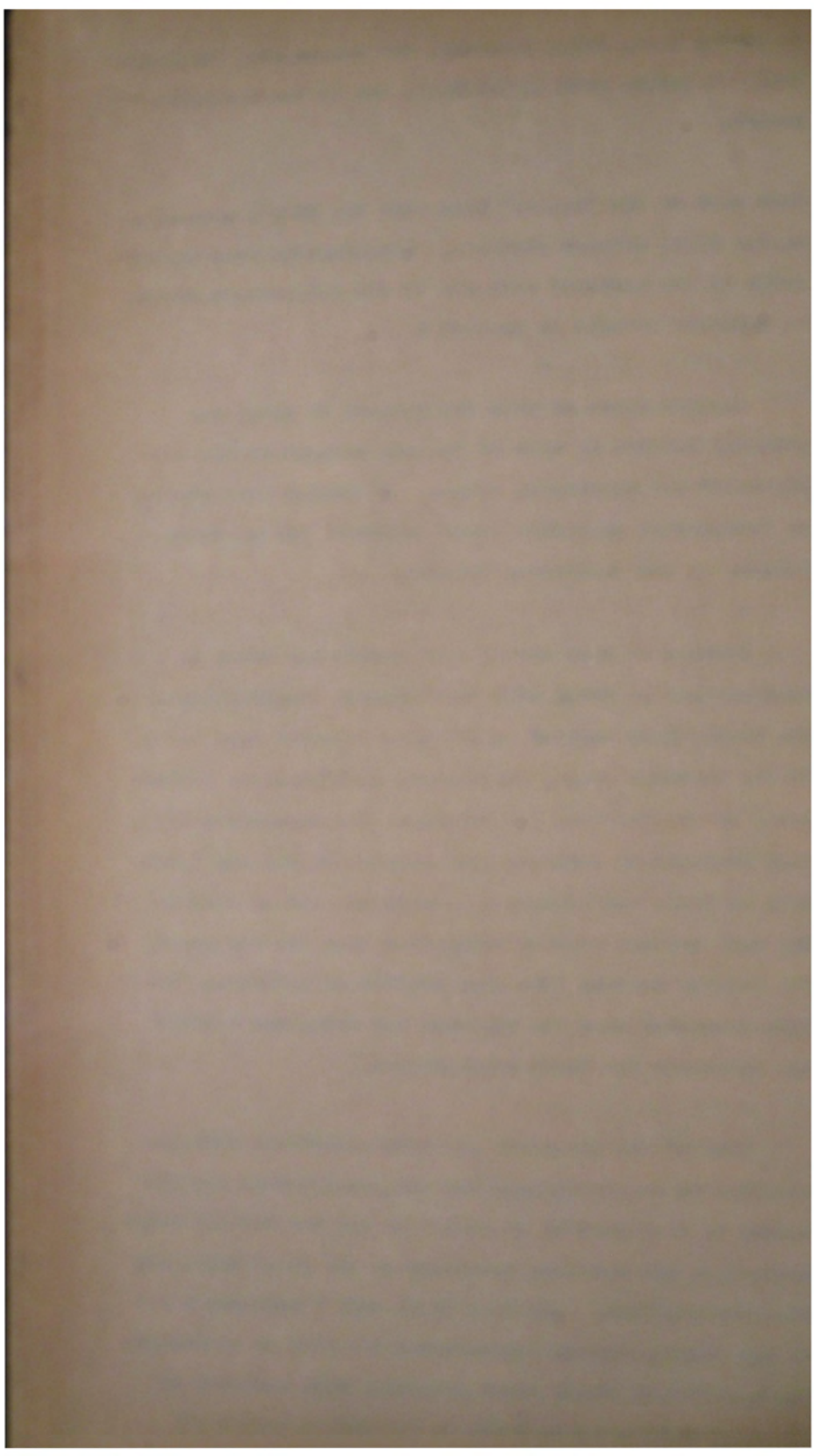
at Baring Head, Point Halswell, and Beacon Hill (Wellington), at Godley Head (Lyttelton), and in the Marlborough Sounds.

Very much on the 'secret' list were the Navy's anti-submarine fixed defence stations. Construction work undertaken in the Auckland area and in the Marlborough Sounds is outlined briefly in section 8.

Another class of work the purpose of which was probably unknown to most of the men engaged on its construction was degaussing ranges. Buildings were erected on Whangaparoa peninsula (near Auckland) and on Somes Island, in the Wellington harbour.

Section 10 sets out in fair detail the story of the construction of Naval bulk fuel storage installations. Two steel tanks each of 12,000 tons capacity were built in the Kaiwarra Gorge, Wellington, with pipeline connections to the wharves. At Devonport the excavation of four underground tunnels, each capable of holding 6,000 tons of fuel, was commenced towards the end of 1943 but the work had not reached completion when the war ended. Two storage tunnels were also started at Lyttelton, but were abandoned when the improved war situation removed the necessity for their construction.

Some of the technical problems associated with the erection of radar stations for the Armed Forces are discussed in that section of part 1 of the War History which deals with the war-time functions of the Chief Designing Engineer's office. Section 11 of part 3 mentions a few of the constructional vicissitudes met with in establishing a series of Naval radar stations, with emphasis on the difficulties encountered in delivering building



materials to such inaccessible sites. Typical of these were islands in the Hauraki Gulf.

Part 3 ends with a short reference to a little-known activity of the Department. This was assistance rendered the Navy in arranging for the manufacture in New Zealand of plastic armour, to a formula invented by the British Admiralty.

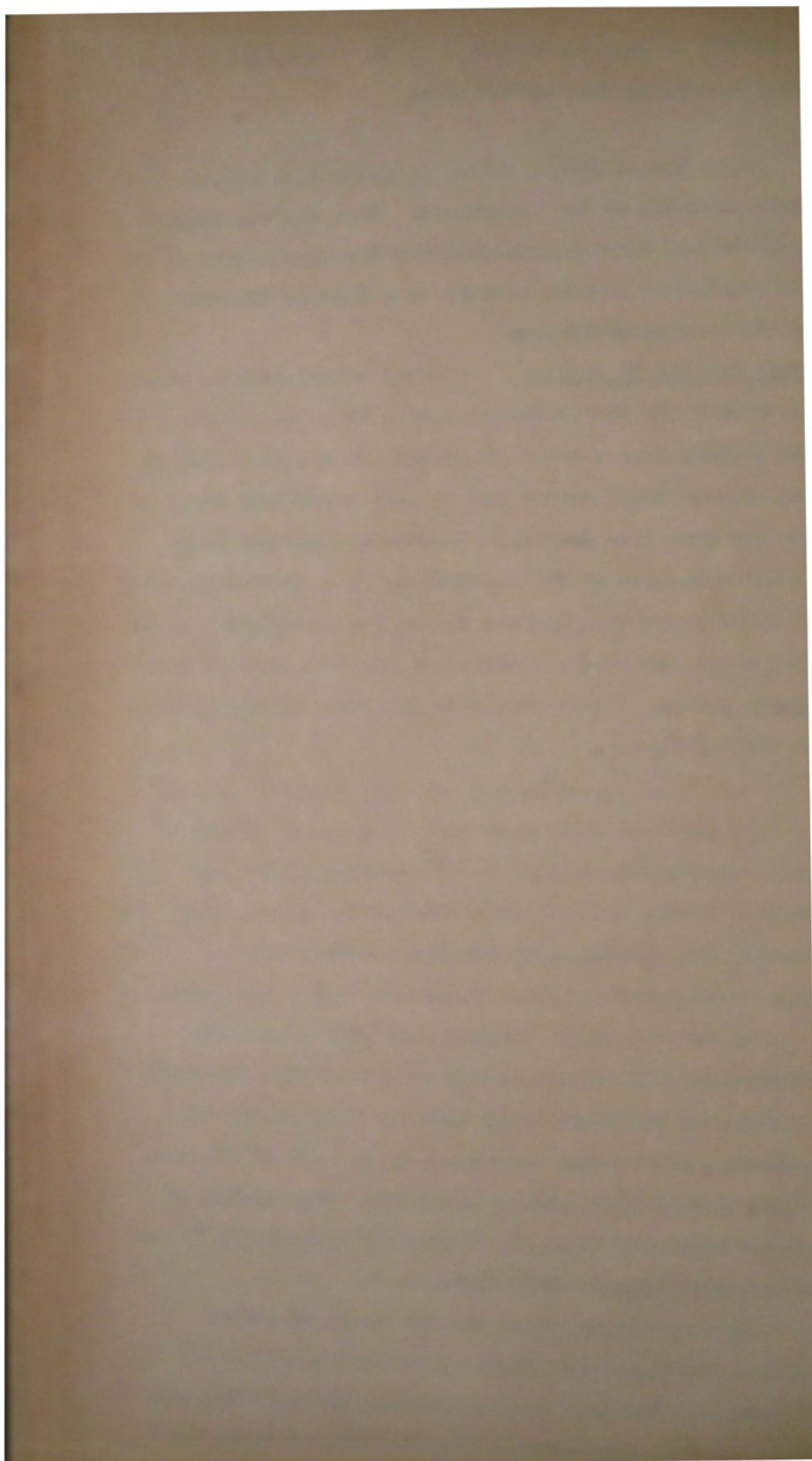
Works for the US Forces. The works constructed by the Department for the US Forces during their sojourn in New Zealand cost a total of £5,838,131 and were carried out at such short notice and at such a critical stage of the war that they severely strained the already overloaded resources of the Department. Yet the works, owing to their repetitive nature, do not lend themselves to so long or so detailed a description as their overall magnitude perhaps really merits in the Official War History of the Department.

Part 4 is accordingly a relatively short section.

Twenty-four works narratives record the extent of the programme undertaken in the Auckland area - the biggest centre of activity. These cover camps, hospitals, stores, and several miscellaneous projects such as a fuel tank farm, radio stations, magazines, and a rest home.

In the Wellington district the most noteworthy achievement was the erection within less than six weeks of camps in the Paekakariki area for over 20,000 US Marines. Other camps were built in and around the city, in the Hutt Valley, and at Masterton. Huge blocks of stores sprang up along the Wellington waterfront, in the Hutt Valley, and at Paekakariki.

In addition to these, the provision of rented accommodation for the Americans in both Auckland and Wellington - office, storage, garage, residential, etc. - was a task of considerable proportions, and forms the



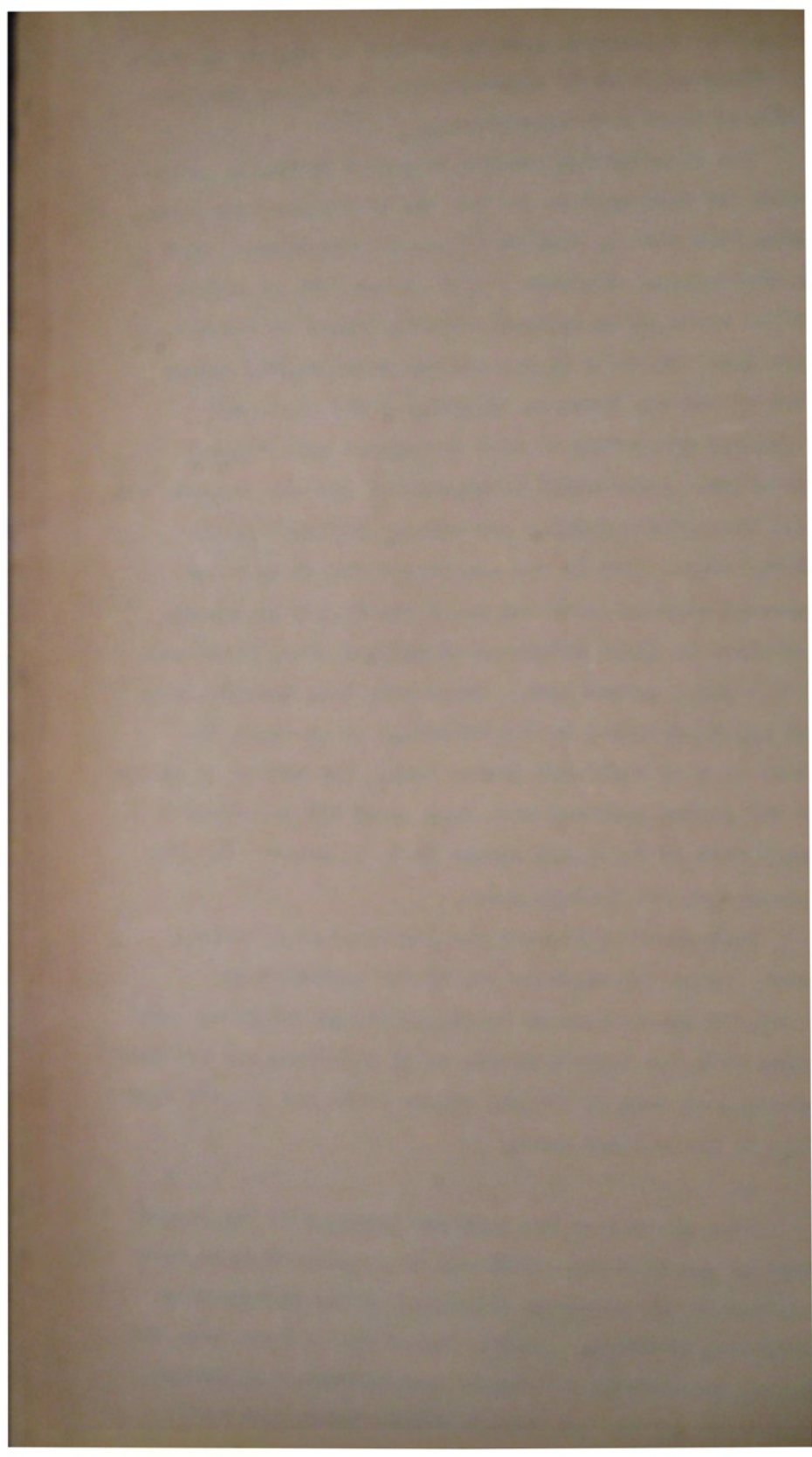
subject of a separate section in part 5, chapter 1, where the whole question of accommodation in all its ramifications is dealt with exhaustively.

The introductory remarks to part 4 review in general terms the work carried out for the US Forces. Statistics taken from part 5, chapter 1, are quoted, showing that in the Auckland district 71,937 square feet of rented office space at an aggregate annual rental of £12,576.5.6 were made available to our Allies, also 454,843 square feet of storage space at £43,221.6.6 per annum and 2,792,542 cubic feet of cool storage at £215,239.9.8 per annum. Residential accommodation (hotels, houses, etc) cost another £65,579.8.5 per annum. Further figures quoted reveal that in the Auckland district camp and barracks accommodation was built for 29,510 personnel, contained in 4,421 buildings covering a total floor area of 1,113,316 square feet. Three hospitals provided beds for 4,500 patients, in 251 buildings of an aggregate floor area of 1,005,000 square feet. New blocks of stores in and around Auckland were made up of 174 buildings of a total area of 1,733,467 square feet, of which 1,624,760 square feet was storage space.

Corresponding figures for the Wellington district were: camps and barracks for 26,542 personnel in 2,505,925 square feet of tents, buildings and huts; hospital beds for 2,340 patients in 59 buildings and 115 huts covering an area of 191,341 square feet; and 752,480 square feet of new storage space.

* * * *

This summary of the services rendered by the Department to the US Forces would not be complete without some mention of the gratitude expressed by the Americans on countless occasions. In the United States there was, and is, no nation-wide Government construction organisation equivalent to the New Zealand Public Works Department.



own construction projects, and, in fact, they took construction battalions with them wherever they went. Whatever the Americans may have expected from the New Zealand authorities - and it is doubtful whether they hoped for much more than a free hand and co-operation in attending to their own needs - it is no exaggeration to say they were delighted to find an organisation such as the Public Works Department ready and willing to fulfil their requirements. Typical of the written expressions of appreciation received is a letter sent on 12 July 1944 to the Government Architect by Commodore Jupp, Officer Commanding, US Naval Operating Base, Auckland. This reads as follows:

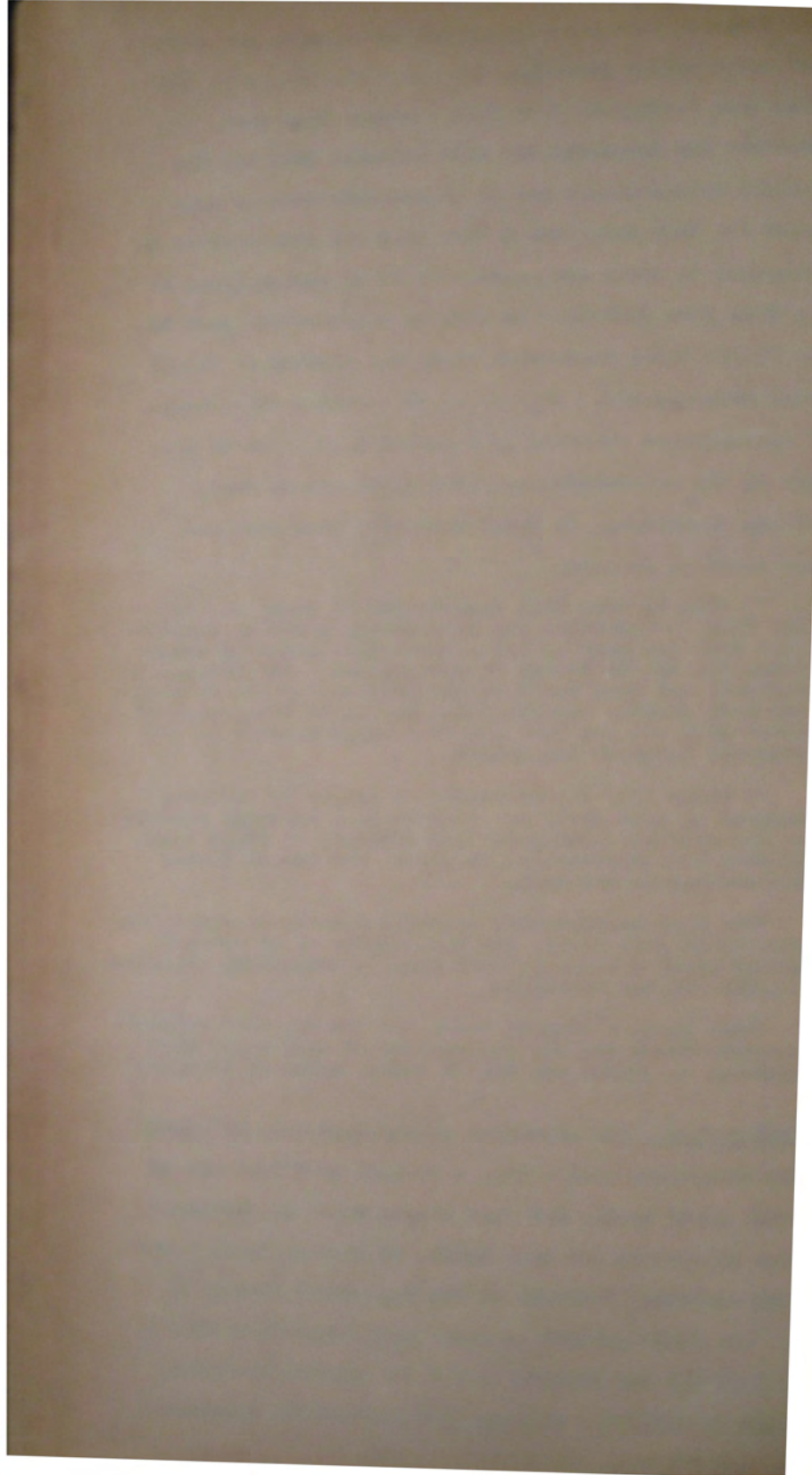
'I wish to take this opportunity to thank you for the fine co-operation you have always given in connection with the many varied construction projects undertaken for the US Forces in New Zealand. The placing of yourself and your staff at the disposal of the US Forces has been greatly appreciated. The rapid completion of these projects has been due in a large measure to your personal interest and effort.

'I would like you to convey my thanks to the many members of your staff who have taken a personal interest in the work and have given unstintingly of their time to make the construction programme for the US Forces the success it has been.

'The fine co-operation existing between yourself, the members of your staff, and the members of my command should prove a very valuable asset in cementing relations between our two countries.

'Once again I wish to thank you for the many valuable services which you and the members of your staff have rendered to myself and the US Forces under my command.'

Accommodation. The provision of accommodation of almost every imaginable kind - from a 10 feet by 8 feet hut to a first class hotel, and from single rooms to elaborate suites of offices and huge blocks of storage space - was a most important function of the Department during the war. The whole subject is dealt with comprehensively in part 5 of the War History, under two general headings, namely: (1) office, storage, and residential accommodation, and (2) camp accommodation, etc.



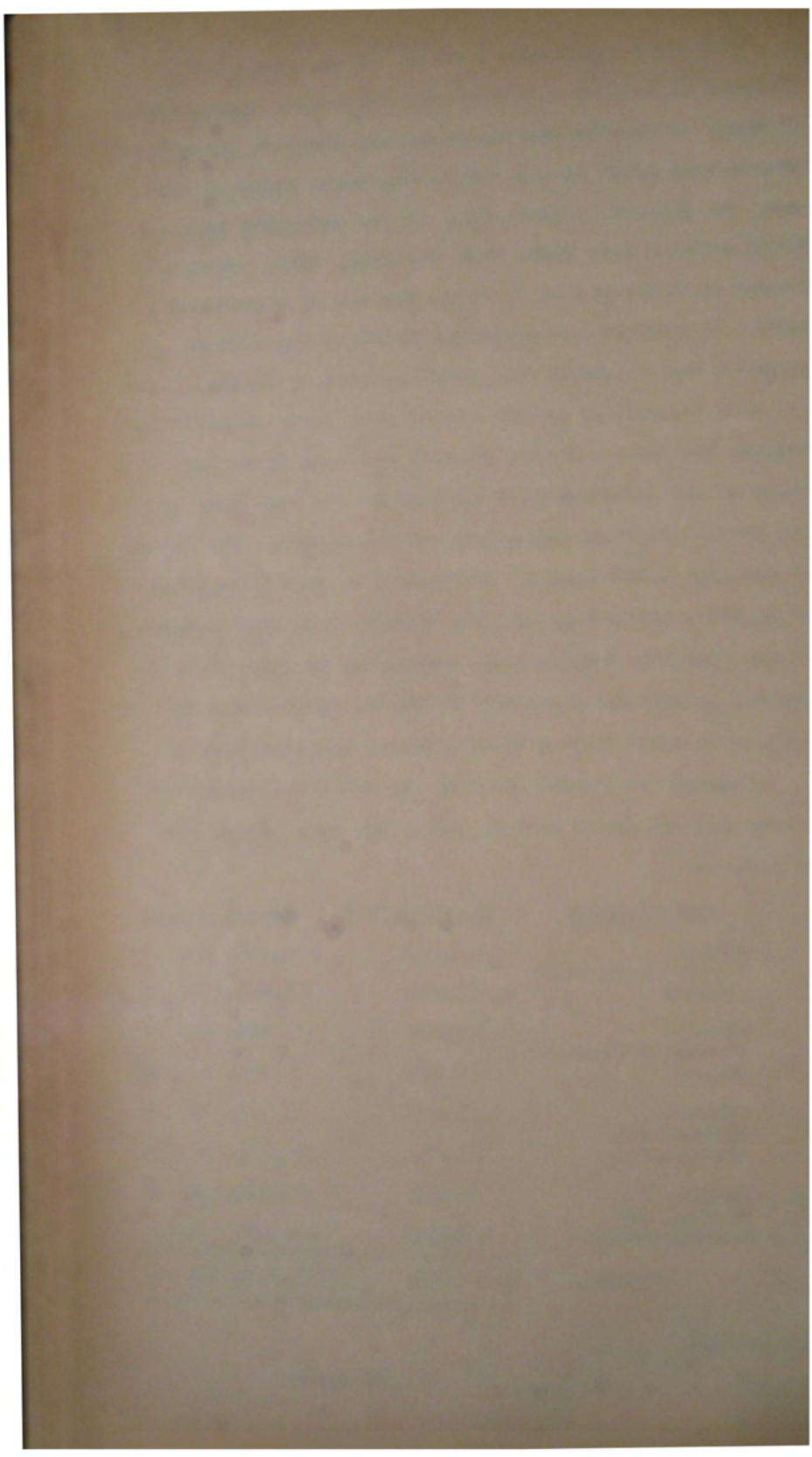
Chapter 1 opens with a review of the procedure followed in meeting a requisition for rented space, and sketches in briefly the accommodation position generally immediately prior to and during the early years of the war. An outline is then given of the emergency regulations brought into force from December, 1941, onwards, having as their object firstly, the use of compulsory powers to possess accommodation required for defence purposes and secondly, the stabilisation of rents. Without such compulsory powers (these were later extended to include the United States Forces) the task which lay ahead of the Accommodation Officer in the next year or two would have been impossible of fulfilment. The threat of compulsion was usually sufficient to gain possession of premises under requisition, though it is fair comment to say that the regulations, containing as they did provisions peculiarly repugnant to the democratic way of life, were administered tactfully and sympathetically.

Figures are quoted showing the total accommodation rented for the Armed Forces during the war. These are as follows:

| <u>Service</u> | <u>Type of Accom:</u> | <u>Area(sq.ft.)</u> | <u>Annual Rental</u> |
|----------------|---------------------------|---------------------|----------------------|
| <u>Army:</u> | Office | 241,639 | £31,396. 12. 4 |
| | Storage & Miscellaneous | 1,443,093 | 77,887. 1. 2 |
| <u>Navy:</u> | Office | 11,121 | 1,290. 11. 0 |
| | Storage & Miscellaneous | 161,823 | 9,393. 16. 0 |
| <u>Air:</u> | Office | 67,422 | 8,733. 4. 7 |
| | Storage and Miscellaneous | 565,023 | 30,735. 1. 9 |
| <u>Forces:</u> | Office | 71,739 | 12,576. 5. 6 |
| | Storage and Miscellaneous | 454,843 | 43,221. 6. 6 |
| Totals: | | 3,016,703 | £215,233. 18. 10 |

Residential:

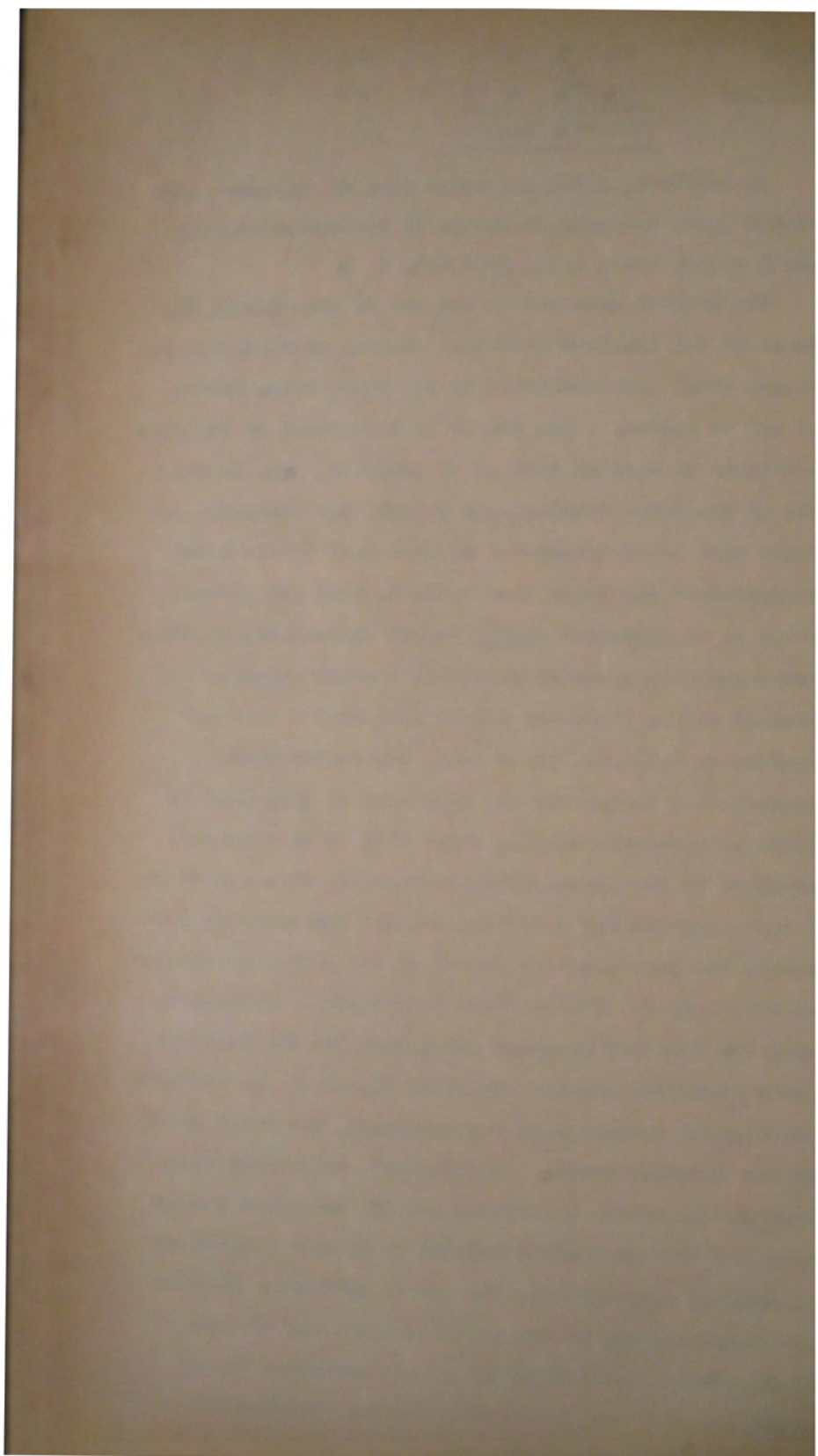
| | | | | |
|----------------|---------|----|---|-----------|
| <u>NZ Army</u> | £8,593. | 9. | 0 | per annum |
| <u>NZ Navy</u> | 941. | 4. | 0 | " " |



| | | | | |
|------------------|------------------|------------|-----------|-----------|
| <u>NZ Air</u> | 56,769. | 11. | 6 | per annum |
| <u>US Forces</u> | 65,579. | 8. | 5 | " " |
| | <u>£131,883.</u> | <u>12.</u> | <u>11</u> | |

In addition, 2,792,542 cubic feet of expensive cool storage space was made available to the Americans, the annual rental value being £215,238. 9. 8.

The chapter proceeds to set out in some detail the extent of the premises (offices, stores, garages, hotels, houses, etc.) made available to the Army, Navy, RNZAF, and the US Forces. The review is restricted to the main centres or to special centres of activity, e.g. in the case of the RNZAF Hamilton and Rotorua are included, the latter town being noteworthy in that most of its hotel accommodation was taken over early in 1942 (14 private hotels at an aggregate weekly rental approaching £1,000). Particulars are given of practically every property occupied in the towns and cities concerned - name and locality of building, floor area, and rental paid. Accommodation rented for the Americans is gone into in fairly considerable detail, since this is an essential corollary to the story, told elsewhere in this narrative, of works carried out for them, and the two sections constitute the only complete record of the services rendered our Allies by the Public Works Department. Conspicuous among the Auckland premises taken over for the Americans (under emergency powers) were five floors of the Dilworth Building (65 tenants were dispossessed), the Grand Hotel, and the Waverley Hotel. Wellington's well-known Hotel Cecil became suites of offices for the US Marine Corps, while the 86-room Windsor Private Hotel was occupied as residential accommodation for Marine officers. Passing references is made to the numerous parks and playing fields placed at the disposal of the Americans in and around Auckland and Wellington, for use as sites for camps, barracks, hospitals, etc.



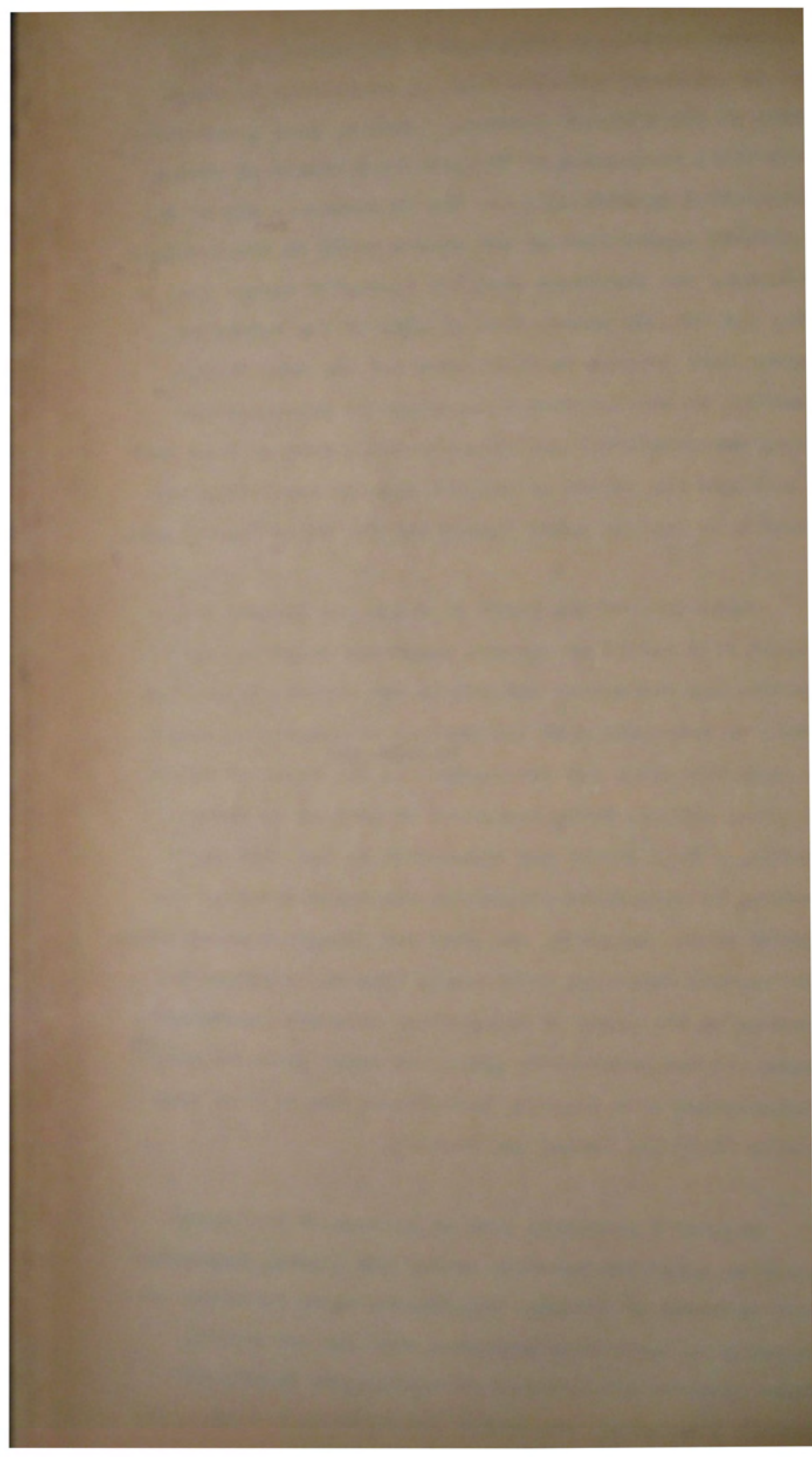
The erection of new stores buildings during the war is a subject belonging more appropriately to other parts of the Official History. Indeed, part 4 incorporates works narratives of the principal blocks of stores constructed specifically for the US Forces... And of the 2,078,080 square feet of new stores built in the Auckland district, the Americans occupied 1,624,760 square feet or 78%, and 752,480 square feet or 48%, of the 1,560,316 square feet erected in Wellington and the Hutt Valley. However, in the interest of keeping the accommodation story self-contained and all-embracing, chapter 1 of part 5 outlines the extent of the new storage facilities provided both for the Armed Forces and for other Departments.

* * * *

Indicative of the peril in which New Zealand was placed as a result of Japan's southward drive in the Pacific was the survey ordered by War Cabinet in January, 1942, to determine what alternative accommodation could be made available for Government ^{Departments} in the event of their existing offices being destroyed or damaged by enemy action. This survey was undertaken in the four main centres by committees comprising representatives of the Public Works, Railways, and Post and Telegraph Departments, the reports submitted prominently figuring colleges and schools in the lists of alternative premises recommended. Later, it was proposed to place the whole question under ^{the} jurisdiction of a Property Controller, but by that time (early 1943) the danger had receded.

* * * *

Chapter 1 continues with an account of the steps taken to solve the war-time office and storage accommodation problems of civilian Departments whose functions were directly or indirectly connected with the war effort. These included the Ministry of Supply, the Waterfront Control Commission, the Marine Shipbuilding Division, the



Defence Services Provision Office, the National Service Department, the Price Investigation Tribunal, and the Patriotic Purposes Branch (Department of Internal Affairs). The first four shared substantially in the new storage space erected. Typical instances are given of the mushroom growth of some of these Departments, particularly the Ministry of Supply and the Price Investigation Tribunal, whose appetite for additional office space seemed insatiable. The Ministry of Supply at one time occupied the whole or portions of eight floors in the Government Life Building and overflowed into two floors in the Huddart Parker Building. Tenants in the Prudential Assurance Building had reason to be uneasy during the war, for the Price Tribunal, starting with the seventh and a part of the eighth floors, took over in stages the whole of two other floors by the simple medium of orders for possession issued under the Accommodation Emergency Regulations.

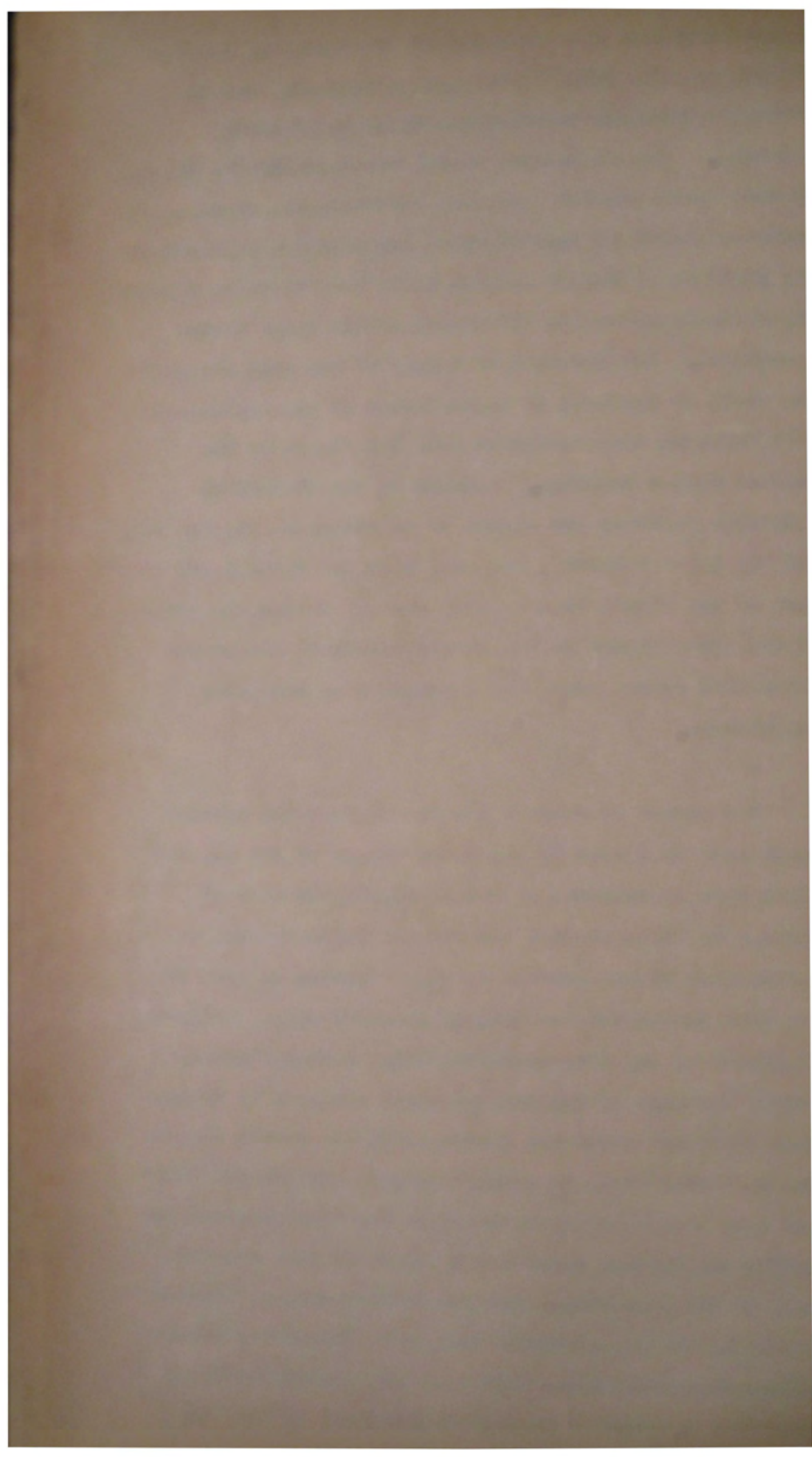
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The manner in which a peculiarly pressing problem which came to a head in the later stages of the war was dealt with is recorded in the concluding section of Chapter 1. This relates how 600,000 bales of wool had accumulated in the country by 1944, leaving no room in the wool stores for the ensuing season's clip. Following an appeal to the Government for help, a comprehensive survey was made of all storage space occupied by Government Departments and the Forces, with the result that by the following March accommodation for over 300,000 bales had been placed at the disposal of the wool industry and sufficient further space was in sight to take care of most of the remainder. But the problem quickly reasserted itself as the new season's wool again filled the brokers' stores to overflowing. Once more all possibilities of releasing Government space were gone over with a fine



tooth comb, and somehow more than 400,000 bales of wool were provided for - in all sorts of premises, from military camps and aerodromes to showgrounds and race-courses and including even a disused gaol.

Camp Accommodation. Chapter 2 of part 5 is chiefly concerned with a different kind of accommodation - namely, the provision of huts for various types of workers.

In mid-1940 farmers received copies of a Government pamphlet inviting them to solve their staff accommodation problems by hiring 'temporary' married or single men's quarters at extremely low rates of rental. The object was, of course, to enable farmers to maintain and where possible increase production during the war. Married quarters, consisting of a living-room, two bedrooms, and a bathroom-washhouse, were offered at 5/- weekly, and single men's huts at 2/- weekly. The latter could be purchased outright, if desired, in cash or by instalments. Applications were to be submitted to branch offices of the State Advances Corporation and then passed on to the Public Works Department for action. The Department's responsibility was to supply and deliver the huts, leaving it to the Corporation to collect rents and attend to other details of administration.

An outline of how the scheme worked and how the Department fulfilled the orders placed (over 1,000 married quarters and 250 single) is given in the opening section of chapter 2.

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A year later, when it was decided to promote increased cheese production for export to Britain, and numbers of dairy factories were in process of changing over from butter to cheese, similar facilities for obtaining temporary accommodation for cheese workers were made available. The same arrangements applied - applications



to be made to the State Advances Corporation, which would refer approved orders to the Public Works Department. By the time dairy factories had reverted to normal butter production early in 1942, 414 married and 39 single quarters had been supplied.

The ultimate disposal of the huts, both on farms and at dairy factories, was a long and complicated procedure.

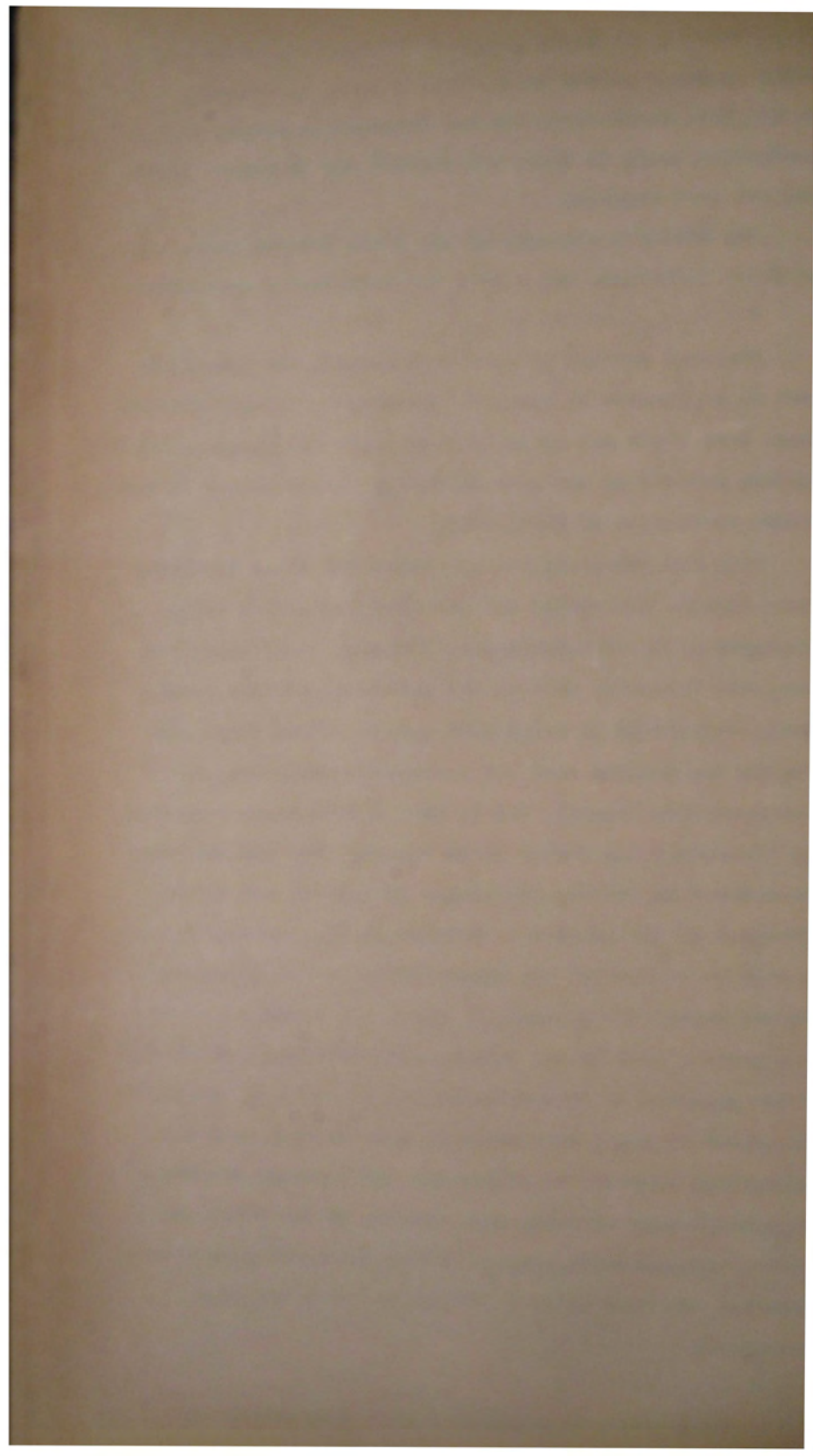
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The next section of chapter 2 reviews the establishment at Wellington of camps to accommodate defence workers. These were first set up to provide board and lodgings for workmen brought to the city to repair damage caused in the severe earthquake of June, 1942.

From one point-of-view the camps all along fulfilled their purpose admirably: the men were reasonably well accommodated and the meals supplied were excellent. However, the financial side of the matter occasioned considerable misgivings in Government quarters (the State was finding the capital cost and would ultimately have to bear operating losses), and it was in this connection that the Department was called in to assist. The vicissitudes encountered in the various stages of control and administration of the camps are detailed in the chapter, together with an account of the manner in which the Department met and solved the problem of spiralling costs. Included is a tribute paid to the departmental officers concerned by the director of defence works camps (Mr. R.H. Nimmo), who stated it was a revelation to him 'to find such a really high standard of efficiency and business acumen...' The significance of this, and, indeed, of the whole subject of defence works camps, is that non-Government administration had been fully tried and had been far from successful.

* * * *

There follows an outline of the establishment at



hundreds of two similar workers' camps, one of which was exclusively for Maori workmen. Board and lodgings in the northern city were as scarce as in the Capital, and accommodation had to be provided urgently for large numbers of men - chiefly those compulsorily directed to freezing works, but with a fair sprinkling of other essential industries represented. Both camps had previously been occupied by the Armed Forces, though extensive alterations and improvements were necessary.

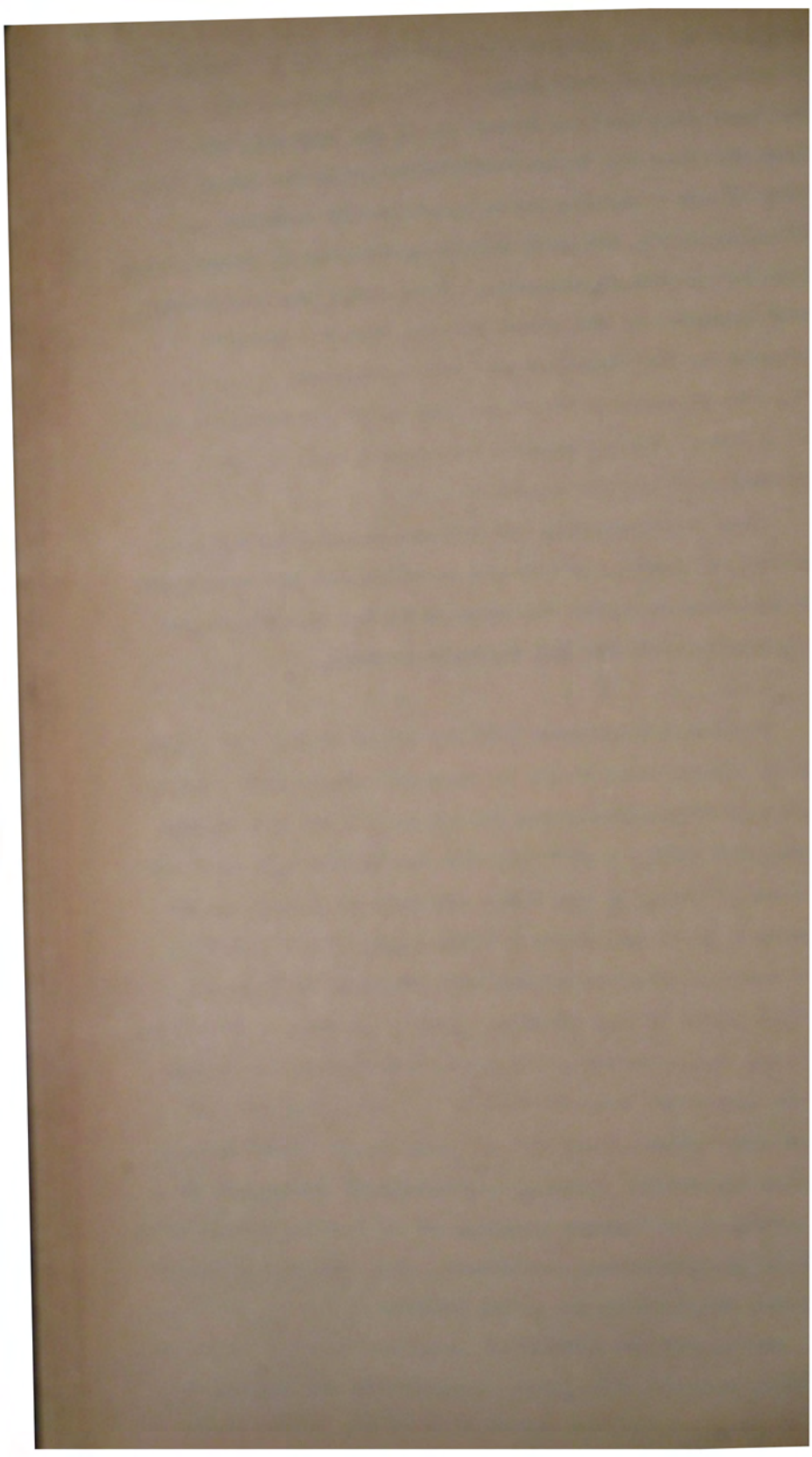
The Department built the new camps and operated them for a time. Later, control was passed over to the National Service Department.

Camp accommodation for workers engaged in the production of vegetables for the Services and for mine workers was also supplied and erected by the Department, as a charge against the War Expenses Account.

* * * *

Chapter 2 continues with the story of how the shortage of canvas which began to make its effect felt from the middle of 1941 onwards was surmounted by the use of pre-fabricated huts. A contract for the manufacture of large numbers of huts, in two sizes (15 feet by 8 feet and 10 feet by 8 feet) was awarded a Wellington firm, which in turn sub-let portions of the work to other builders in various parts of the country. Later, in 1942, a committee on which the Department was represented evolved a design for an eight-men hut, 20 feet by 8 feet. Thousands of these were manufactured for delivery to the Armed Forces. Another Department (Housing Construction) supervised the construction of further supplies of 10 feet by 8 feet huts, also of pre-fabricated warehouses, etc. required principally for shipment to the South Pacific.

Sufficient pre-fabricated buildings for the erection of three complete camps were manufactured and shipped to New Caledonia under the supervision of the Public Works



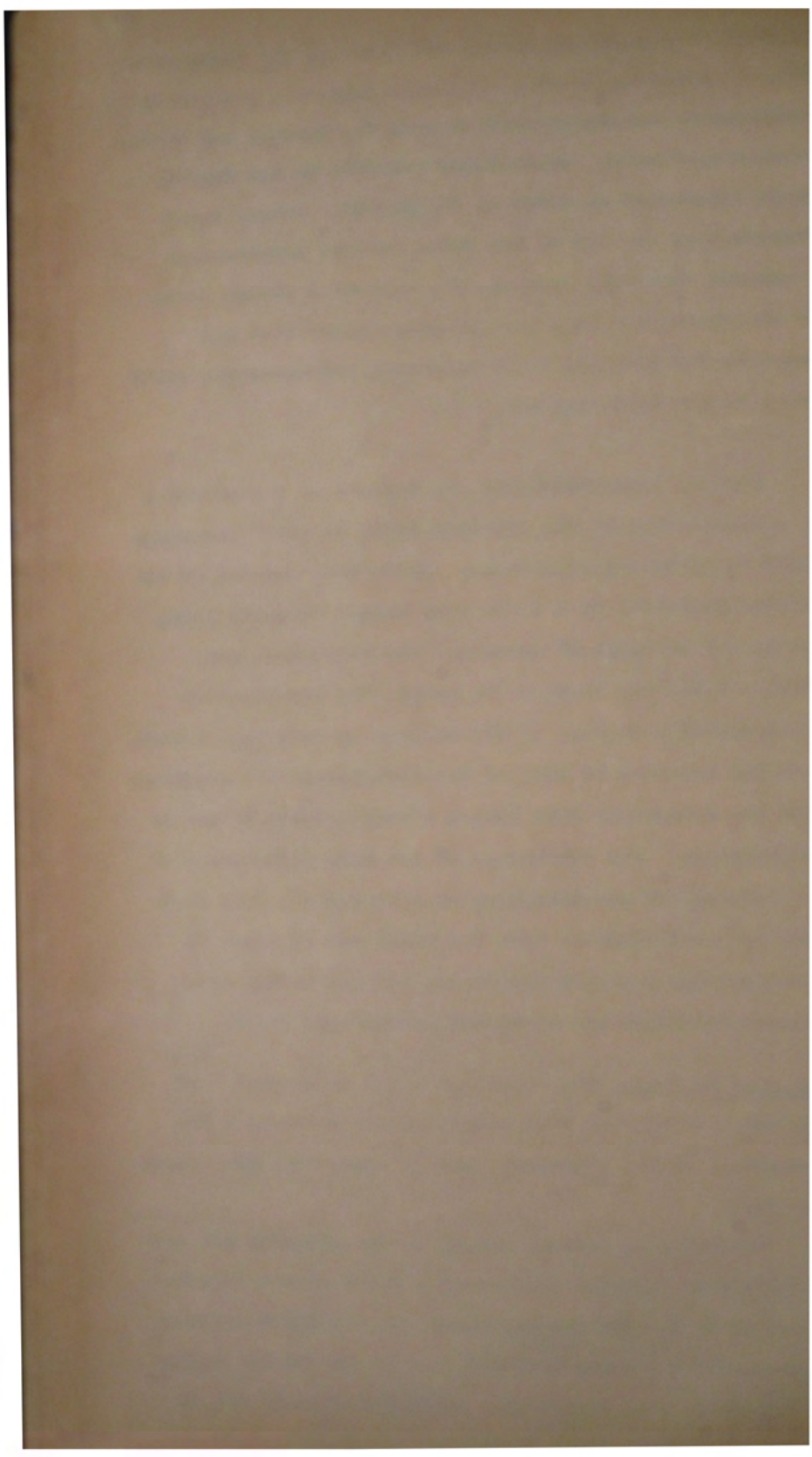
Department. Excluding these, and omitting the 'warehouse' type of building, a total of 28,468 huts was pre-fabricated under the supervision of both the Housing and Public Works Departments. Expenditure recorded by the Public Works Department amounted to £1,356,038. Behind these figures lies the key to the whole defence construction programme from 1942 onwards, for without a steady stream of pre-fabricated huts the pressing demand from all quarters for more and still more camp accommodation could not possibly have been met.

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Part 5, 'Accommodation', is brought to a conclusion by a description of the measures taken to erect detention camps for military defaulters. These were located in the Rotorua district, in a block area beyond National Park, and in the vicinity of Shannon. The Strathmore camp (Rotorua) was the first to be built, its construction being accorded urgency at all stages, so much so, in fact, that the services of some of the defaulters were recruited when the contractor fell behind schedule owing to labour difficulties. The remoteness of the camp sites added to the troubles of construction, as also did the fact that they differed somewhat from the usual run of camps by incorporating security provisions such as barbed wire fences, detention barracks, and prison-type cells.

Air Raid Shelters. The first two chapters of part 6 of the War History deal with inter-related subjects - the protection of (1) personnel, and (2) property, from enemy attack.

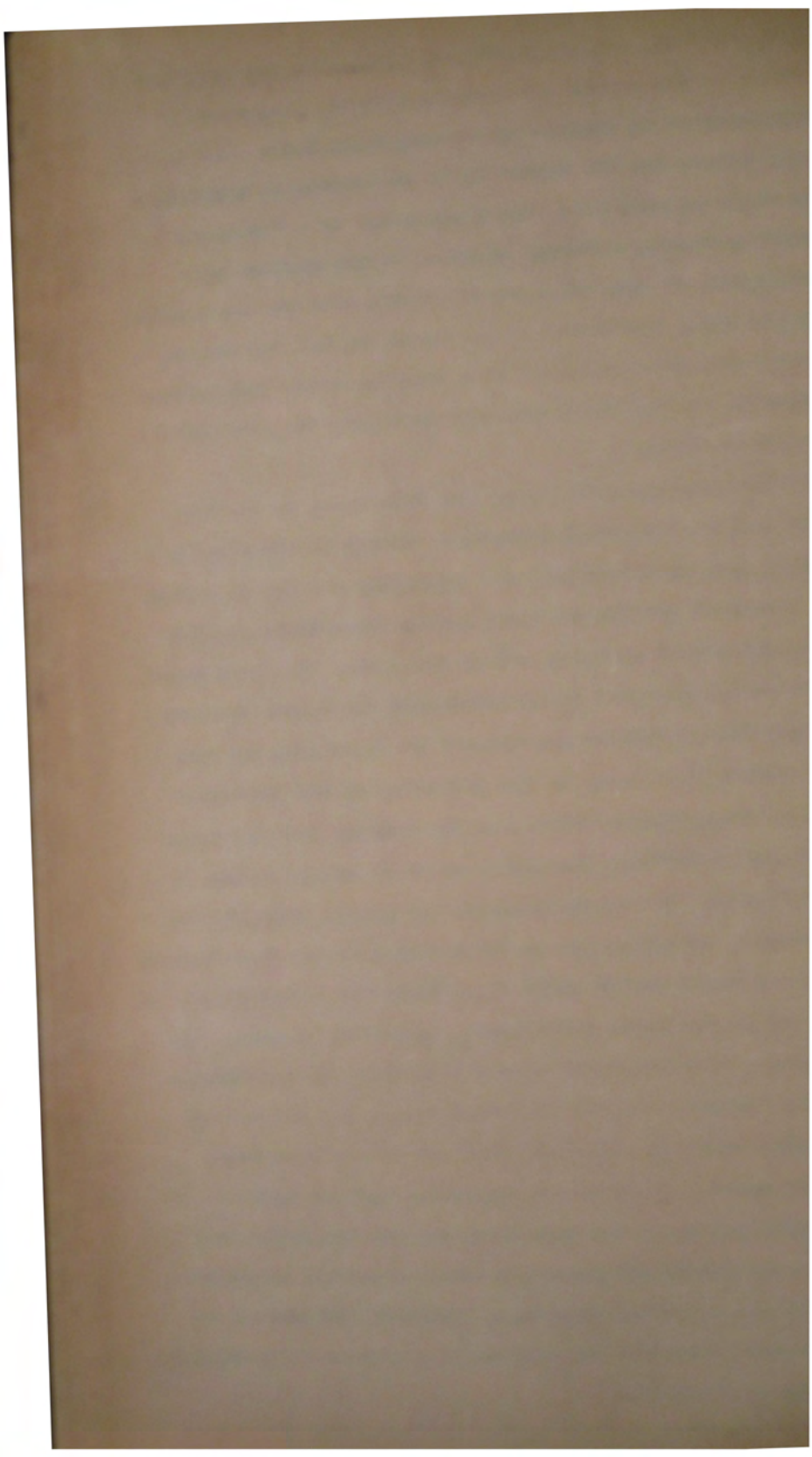
Chapter 1 is devoted mainly to the planning and construction of air-raid shelters - a story of co-ordinated activity by the EPS organisations and various Government Departments - notably National Service and Public Works. It discloses that even before hostilities broke out in Europe the Public Works Department had begun assembling



in its library all available literature dealing with the effect of war on the civilian population. This was supplemented by studies of reports which later came to hand concerning the German blitz on Britain in 1940-41. As early as May, 1941, the formulation of a 'standard code' governing air-raid shelters in New Zealand was commenced, so that when Japan's entry into the war brought in its train the threat of an attack on our own shores, sufficient groundwork had been done to enable the authorities to prepare for a possible emergency without confusion or delay.

The responsibilities of the Department in the air raid shelter programme generally, though of inestimable importance, were limited, and consisted chiefly of acting as technical advisor to local bodies and others charged with the actual carrying out of the work. To place these responsibilities and their associated functions in clear perspective it has been necessary to trace step by step the events leading up to the gazetting of the Emergency Shelter Regulations, 1942, and the issuing to EPS organisations of definite instructions as to the procedure to be followed. So far as business and public shelters were concerned, proposals had to be approved by the Department's District Engineers in order to qualify for a Government subsidy on the scale authorised. And to be eligible for approval, such proposals must comply with the provisions of the 'standard code.' In other words, the Government insisted on being satisfied that its moneys were being wisely spent. At first the subsidies applied only to shelters put up in the main centres, but the scheme was soon extended to all principal towns along the coast-line. As well as approving proposals, district officers of the Department inspected the work as it progressed and arranged payment of subsidies.

If the whole shelter policy and procedure appears to



have been set out in chapter 1 in perhaps greater detail than the Department's share in the programme seemed to warrant - particularly so far as it relates to public and business shelters erected by local bodies and by the owners of business premises - the reason becomes clearer as the chapter proceeds. But before coming on to Government shelters - the primary concern of the Department - the overall picture is completed by an account of some of the difficulties encountered in construction (notably on account of shortage of labour) and an outline is given of the action taken, when the danger had receded, to demolish shelters.

The provision of shelters for occupants of buildings owned or occupied by employees of the State was, of course, a direct Government responsibility, and was carried out by the Department. A review of what was done in Wellington serves as a cross-section of the Dominion-wide programme under this heading. Complementary to this, the erection of the major public shelters in the capital is touched on, with passing reference also to business shelters. There is thus recorded a self-contained story of the precautions taken in Wellington to minimise death or injury through enemy action - by the Government, by local bodies, and by private enterprise.

There follows particulars of the measures adopted to provide raid shelter protection for two specially vulnerable sections of the community - school children and hospital staff and patients. In both these cases the Department acted in an advisory capacity and as approving authority, the work being initiated, with certain exceptions, by education and hospital boards. Raid shelters at schools alone cost no less than £161,339. A small portion of this accomplished some good out of the evil of war, for certain types of shelters were designed for ultimate use as swimming pools and dressing sheds. Similarly, adroit



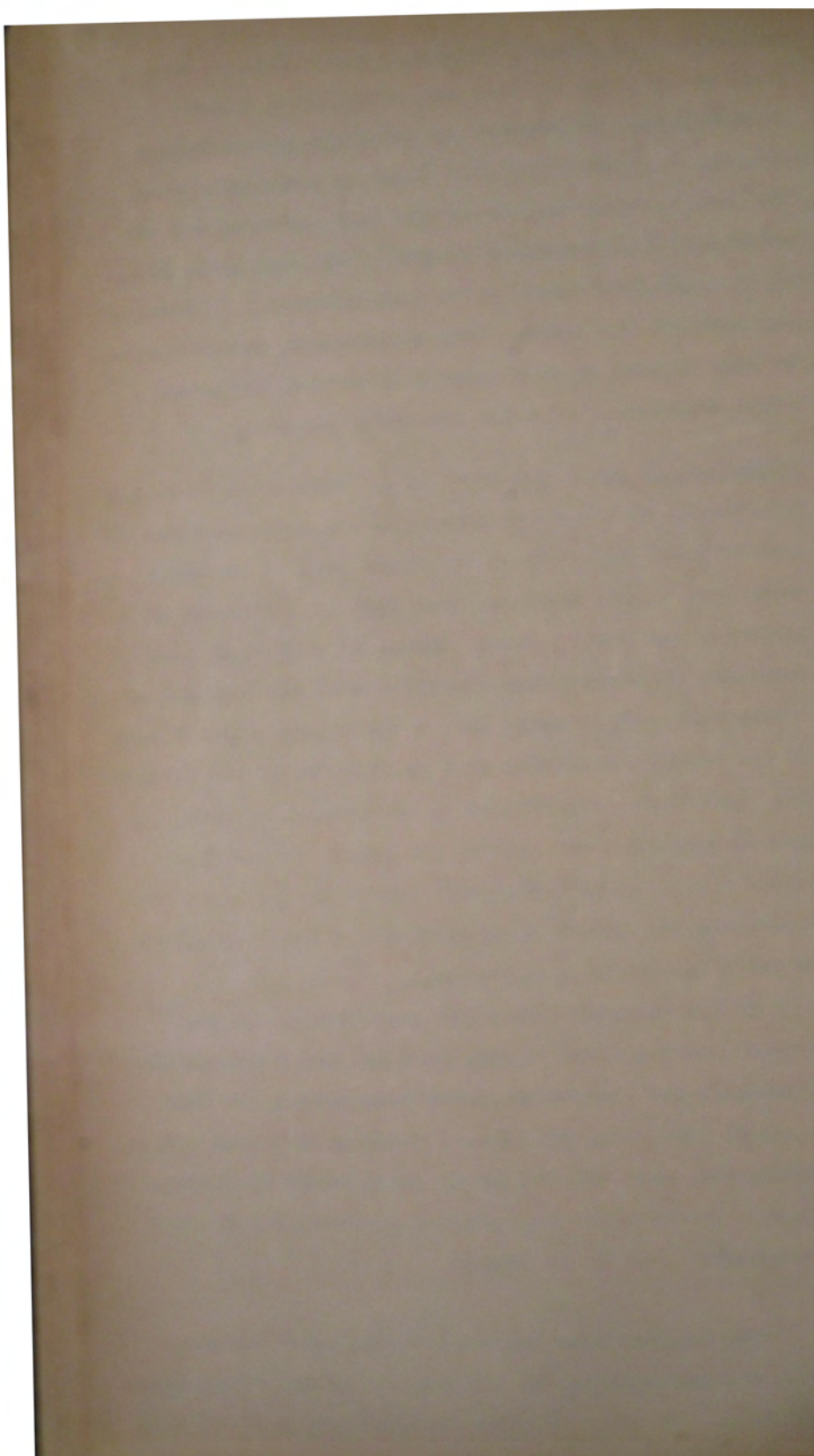
hospital board architects planned their shelters with a view to end - use as permanent additions to their institutions. Expenditure by hospitals on reservoirs, etc. to store water for fire fighting purposes enjoyed the same generous subsidy as did raid shelters, but the Government looked askance at one or two such proposals which would have rewarded the hospital with a fine swimming pool for its staff. 'The subsidisable expenditure to be only so much as is necessary to provide emergency water supplies...' was War Cabinet's decision.

Protection of Property. Chapter 2, 'Protection of property', starts with a short account of the measures taken to protect vital equipment in buildings such as telephone exchanges, police stations, post offices, broadcasting stations, and power houses. Damage to this might have seriously interfered with the defence of the Dominion at a time when - in January, 1942 - the Chiefs of Staff were of the considered opinion that an invasion of New Zealand was 'probable'. In addition to bricking up windows, etc. special attention was paid to the possibility of post office clock towers collapsing, and to the necessity for minimising the effect of blast on the delicate mechanism of radio transmitting apparatus.

Privately-owned industries essential to the war effort were inspected by engineers and architects of the Department and reports submitted recommending the best means of protecting the factory premises from bomb damage. Owners were then called upon by the Director of National Service to undertake the measures recommended - the cost being subsidised by the State.

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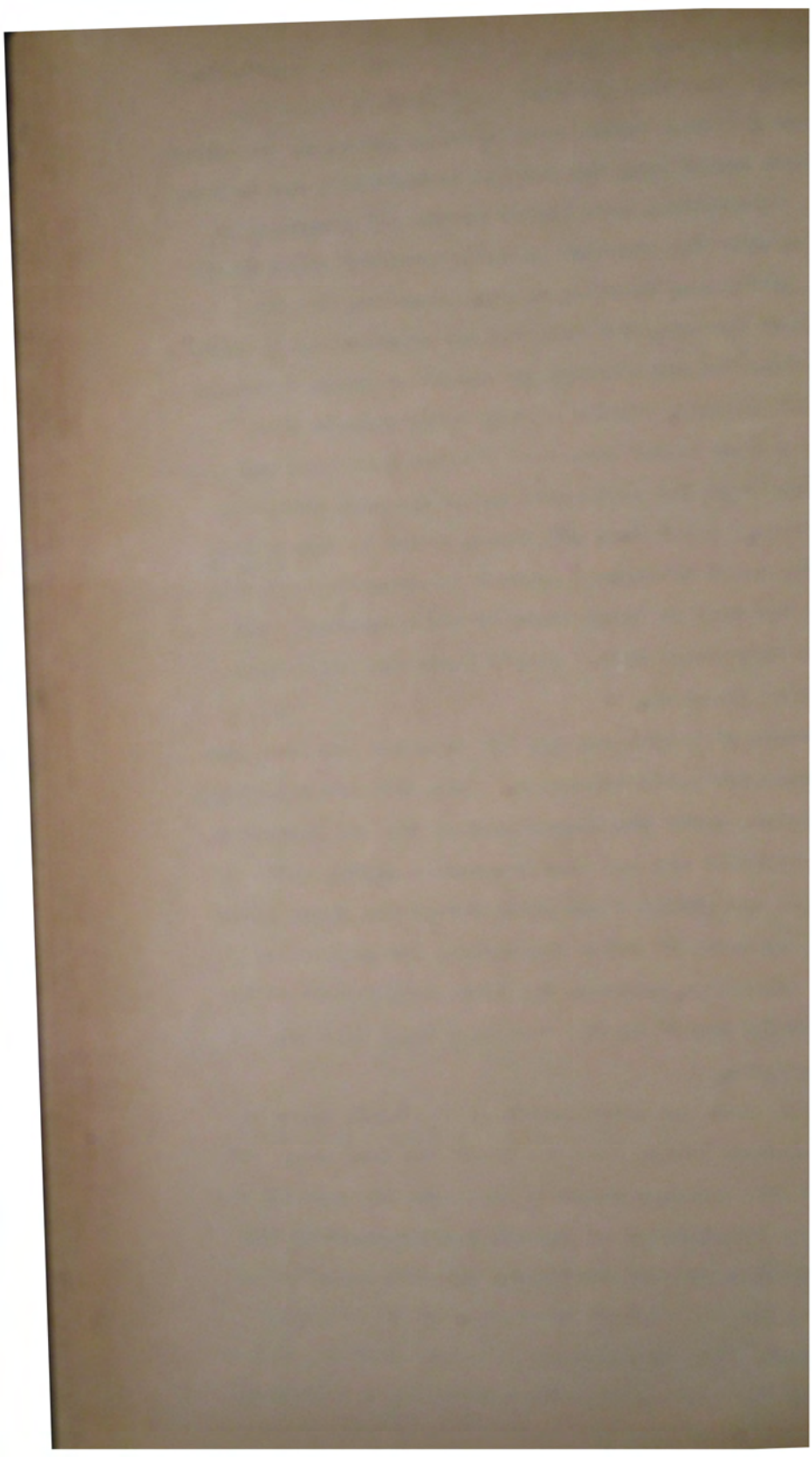
New Zealand, like Britain, was dependent entirely upon overseas sources for her supplies of petrol and other oil fuels. Consequently, the protection of bulk oil fuel



installations was regarded as a matter of the utmost importance. How this was done is described fully in chapter 2. Even before Pearl Harbour advice in the matter had been sought from the British authorities, and in June, 1941, instructions were issued to the oil companies to proceed with the erection of splinter-proof walls around tanks containing aviation spirit. However, for one reason or another, the work did not commence until Japan's entry into the war removed any shadow of doubt as to the need for urgency. Tanks holding RNZAF reserve fuel supplies then became scenes of fevered activity, and within a few weeks the protective walls had been rushed to completion. Naval fuel oil tanks, fewer in number and directly under Government control (whereas the aviation spirit was held in tanks owned by oil companies), had already been dealt with. Army's three oil tanks were left until later on.

Stocks of petrol and oil for civilian use were also given splinter-proof treatment. This work was undertaken by contract, under the supervision of the oil companies. All expenditure was met from Government funds, while an assurance was sought - and given - that the State would pay the expenses of later demolishing the protective walls. Actually, however, the costs were passed on to the motoring public in the form of a small increase in retail prices.

Apart from the small number of oil tanks owned by the Government (these were the Naval and Army ones) the whole of the splinter-proofing programme was carried out under the jurisdiction of the oil companies, which invited tenders, awarded contracts, and were responsible initially for the cost of the work. As stated, this expenditure, plus an allowance to cover overhead, was re-funded by the Crown. But before accepting a tender, it was a stipulation that the approval of the Public Works



Department must first be obtained. The Department's engineers had made a close study of the problem, and were, moreover, able to - and did - get in touch immediately with British experts when any point required elucidation.

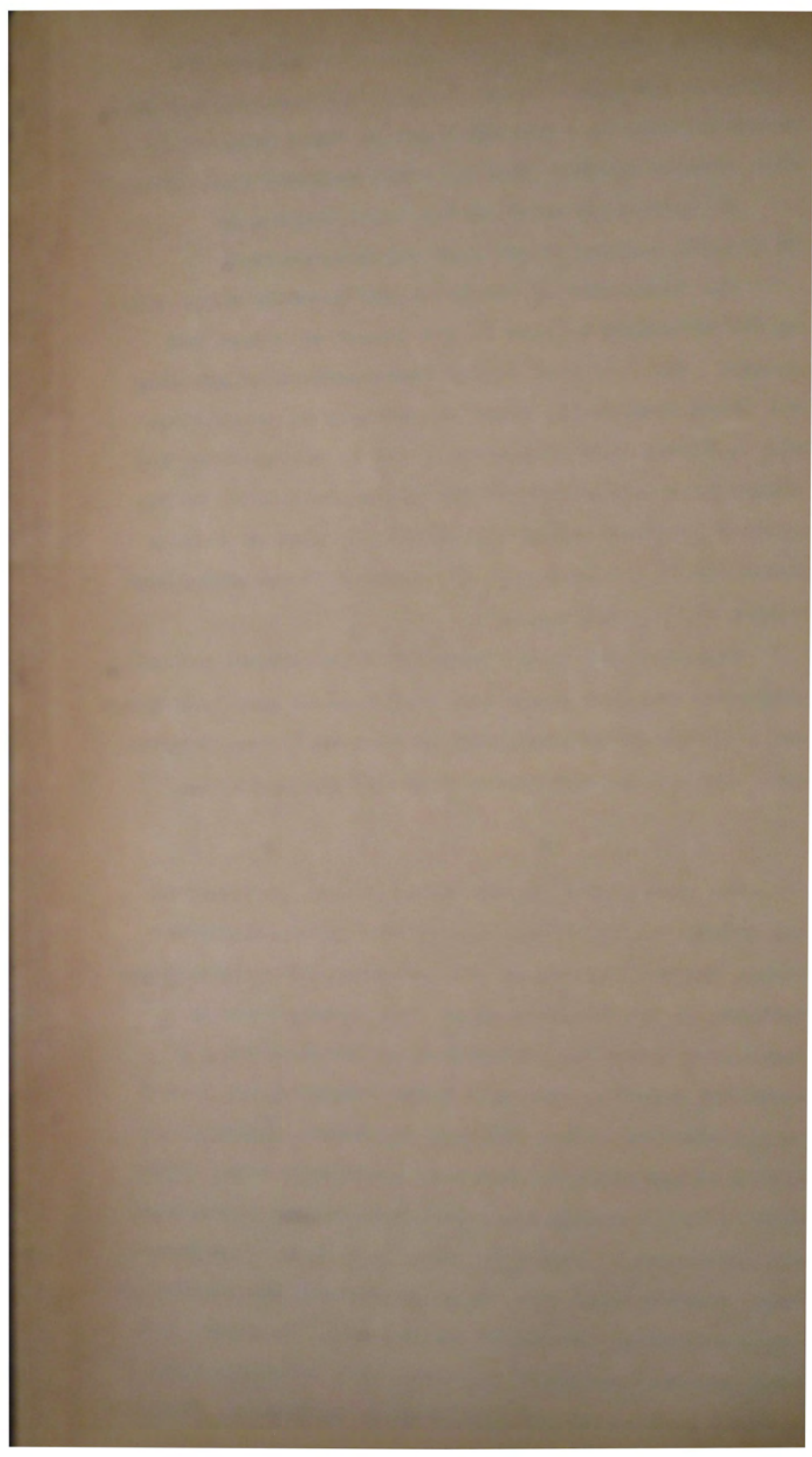
Altogether, a total of 149 tanks containing 92,712,000 gallons of oil was splinter-proofed.

The demolition of the brick and concrete walls came up for attention as soon as the danger of attack had passed. The fear that behind their protective covering the steel tank shells might be starting to deteriorate was confirmed upon examination, and it was realised the longer restoration was delayed the greater would be the cost of re-conditioning the tanks. In view of this, a commencement was made with the removal of the walls even before the war had ended.

Supplementary to the erection of splinter-proof walls, emergency transfer pumps were installed at some tank farms and a system of inter-connection adopted. These measures were designed to save the contents of damaged tanks.

* * * *

The part played by the Department in implementing the supply and distribution of fire fighting equipment during the war follows on the story of splinter-proofing. Hundreds of trailer fire pumps were manufactured in Wellington under the supervision of the Department's technical experts, each unit being inspected and passed as satisfactory before delivery was taken. Large quantities of equipment to deal with incendiary bombs ('sand units', bucket pumps, etc.) were ordered and distributed. When shortages of materials threatened to hold up production, special steps were taken to overcome the problem by improvisation or the use of substitutes. In common with other business premises, all Government buildings were supplied with emergency fire fighting equipment. Previous



to this, a departmental engineer had made a comprehensive study of the whole question of protection of Government buildings in Wellington from the effects of enemy action, and his report served as a valuable guide to officers in other districts.

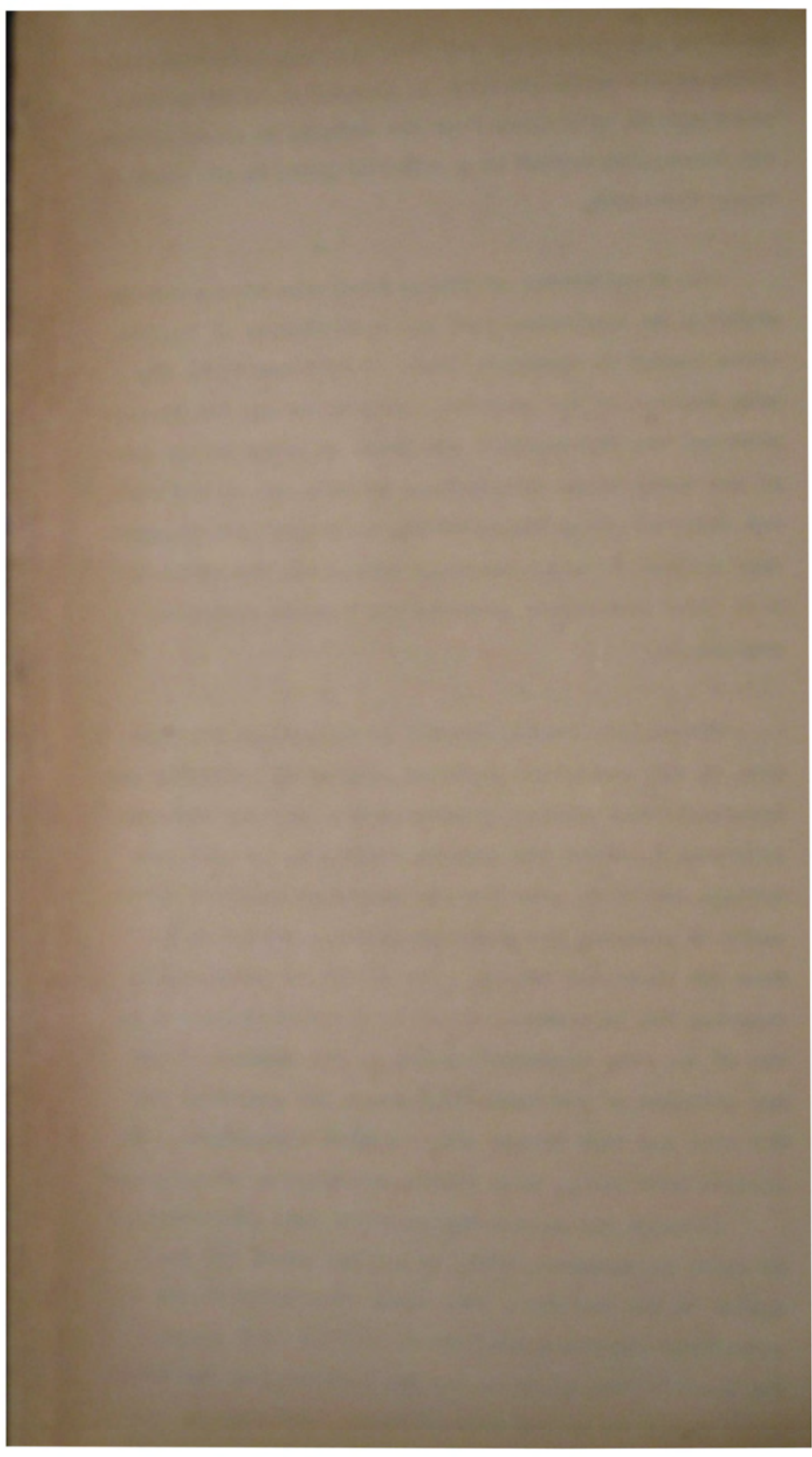
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The blacking-out of public buildings throughout the country, in compliance with the requirements of regulations issued in February, 1941, is referred to in the next section of the chapter. This shows how the Department set the Government's own house in order before one of the early minor restrictions arising out of the war was enforced among the community at large. The Department's fleet of motor vehicles were among the first to have their headlights prepared for dimming during an emergency.

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The rather complex subject of camouflage is dealt with in the concluding pages of chapter 2. Although the Department was officially responsible only for the construction involved (to designs evolved by an Army camouflage unit), in practice its engineers assisted materially in planning the whole programme - particularly from the technical aspect. 'It should be remembered', remarked the Engineer-in-Chief to District Engineers in one of the many circulars quoted in the chapter, 'that the officers of the Camouflage Corps are generally men who have had some little scenic artist experience... in private life and... have little knowledge of structures.'

Although the matter had received some consideration as early as December, 1940, it was not until the war spread to the Pacific a year later that instructions to camouflage important military objectives were issued. Top priority was given to coastal batteries at the principal ports, to petrol storage tanks, bomb stores, and



magazines, aerodromes, and to oil tanks. Other probable targets of enemy attack followed, notably hangars and other strategic buildings on RNZAF stations. Much of the technical advice tendered District Engineers to assist them in carrying out the work is recorded in the narrative or appended thereto. Of passing interest, perhaps, was an instruction that dummy targets should not be camouflaged 'as perfectly' as the main target itself!

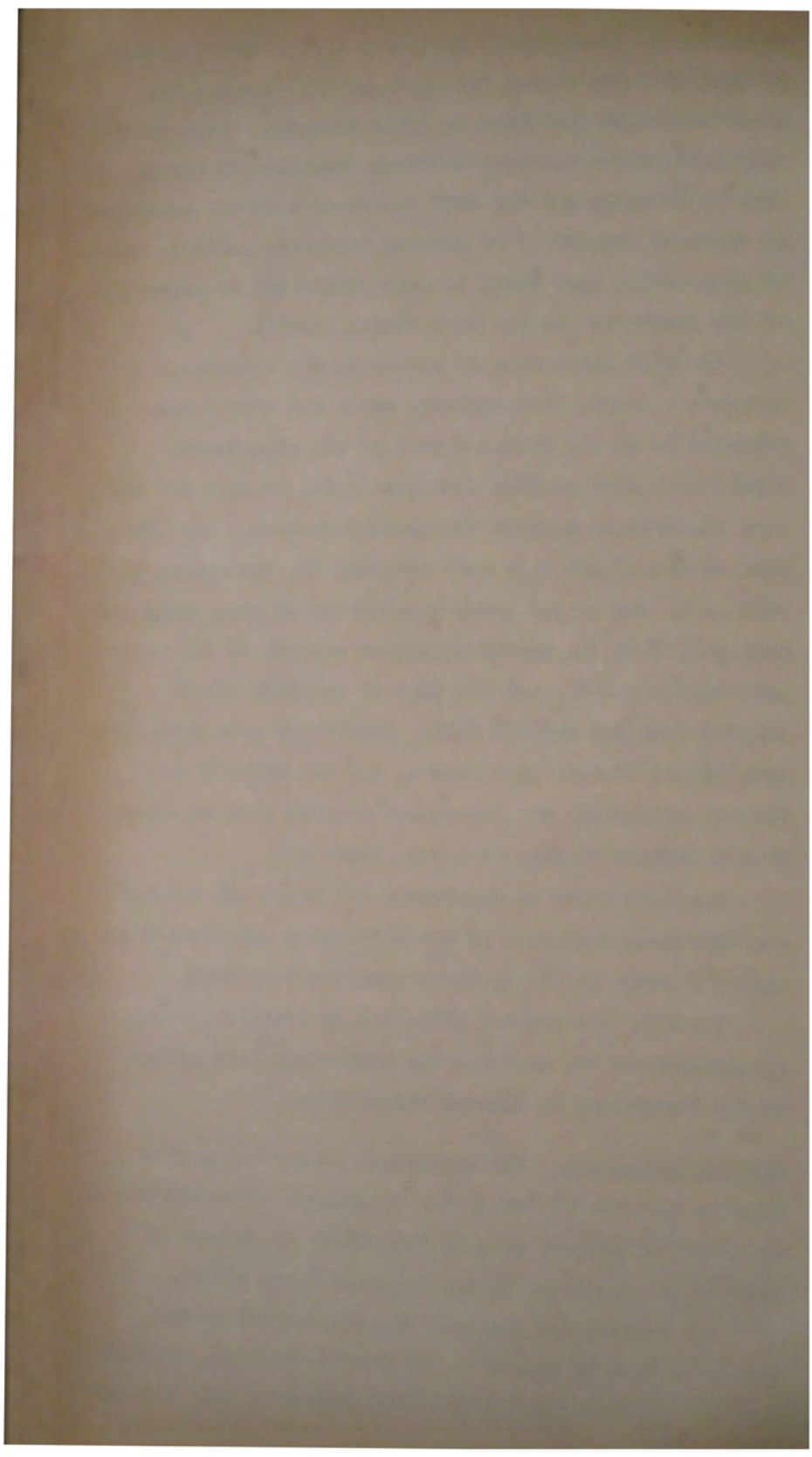
The bulk purchasing of materials for camouflage purposes - paint, wire netting, rope, and cord - was attended to by the Stores Branch of the Department. Supplies of wire netting soon ran short, as also did the rope required to garrison the camouflage nets. All available stocks of old rope were procured for the making of rope nets, and as the local manufacture of rope could not keep pace with the demand (overseas sources of raw materials were cut off), use was made of phormium fibre, derived from New Zealand flax. Camouflage nets were being made by boy scouts, girl guides, and the Women's War Service Auxiliary, the Department keeping them supplied with materials as long as stocks lasted.

Measures taken to camouflage oil tanks are touched on, including a mention of the difficulty experienced in applying paint to the splinter-proofing brickwork.

Finally, the chapter tells how in February, 1942, responsibility for carrying out camouflage work passed to the Department of Housing Construction.

Special Industries. The concluding chapter of part 6 relates the role played by the Department in establishing or extending several special industries which were of particular importance to the Dominion's war effort.

New Zealand had accepted the responsibility for supplying food to troops in the Pacific theatre, and with this end in view three dehydration factories were erected



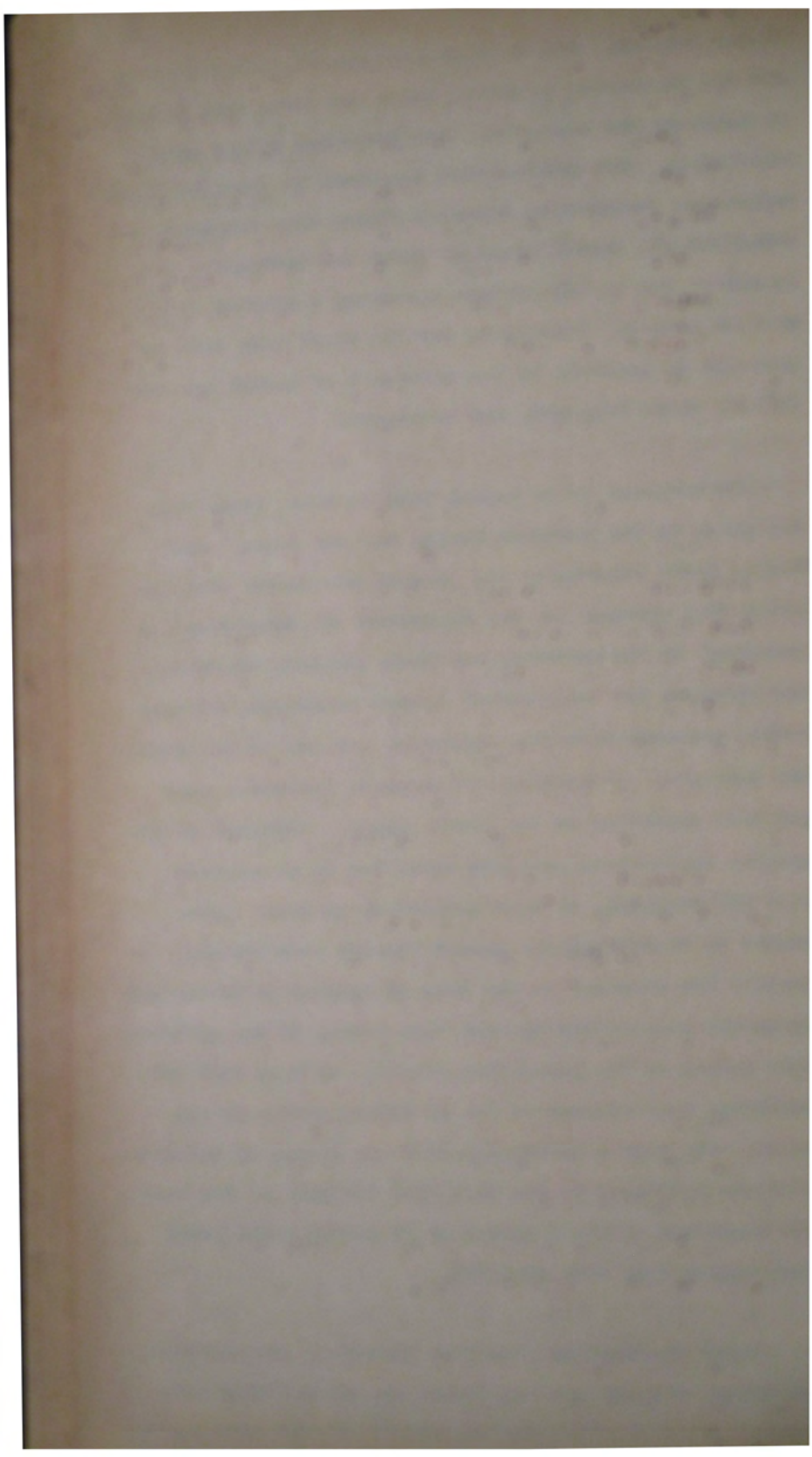
during 1943-44. One of these, at Motueka, was primarily for the processing of fruit, while the other two, located at Pukekohe and Riscarton, were concerned mainly with vegetables. The construction programme at Pukekohe alone - buildings, engineering services (these were extensive and complicated), installation of plant and machinery, etc. accounted for an expenditure exceeding a quarter of a million pounds. Conditions for the staff were made as pleasant as possible by the provision of hostel accommodation, where required, and cafeterias.

* * *

In response to an appeal from Britain, linen flax was grown in the Dominion during the war years. The Public Works Department was closely associated with the Linen Flax Section (of the Department of Industries and Commerce) in implementing the whole project, especially the planning and erection of factory buildings, retting tanks, accommodation for employees, and ancilliary works and services. Altogether, 16 complete factories were put into operation in the South Island. Included in the special engineering problems which had to be overcome were the supplying of huge quantities of water (some 50,000 to 80,000 gallons passed through each factory daily); its disposal in the form of odorous effluent; and elaborate precautions against fire (owing to the inflammable nature of the linen flax fibre). No less than 602 buildings were erected on the 16 sites, mostly by contract. The high priority accorded all stages of construction was reflected in the fact that the bulk of the work was completed within a period of 20 months - the total cost aggregating over £440,000.

* * *

Under the heading 'Munition Factories' are described two works in which the Department was not directly concerned, since it came into the matter chiefly from the



financial aspect. Plans were designed by private architects, who also supervised the construction contracts. The existing munition factory at Auckland was extended early in the war, while in 1942 a complete new small arms ammunition factory was established at Hamilton. The latter was a project of considerable magnitude, the expenditure which passed through the hands of the Department running to upwards of £200,000.

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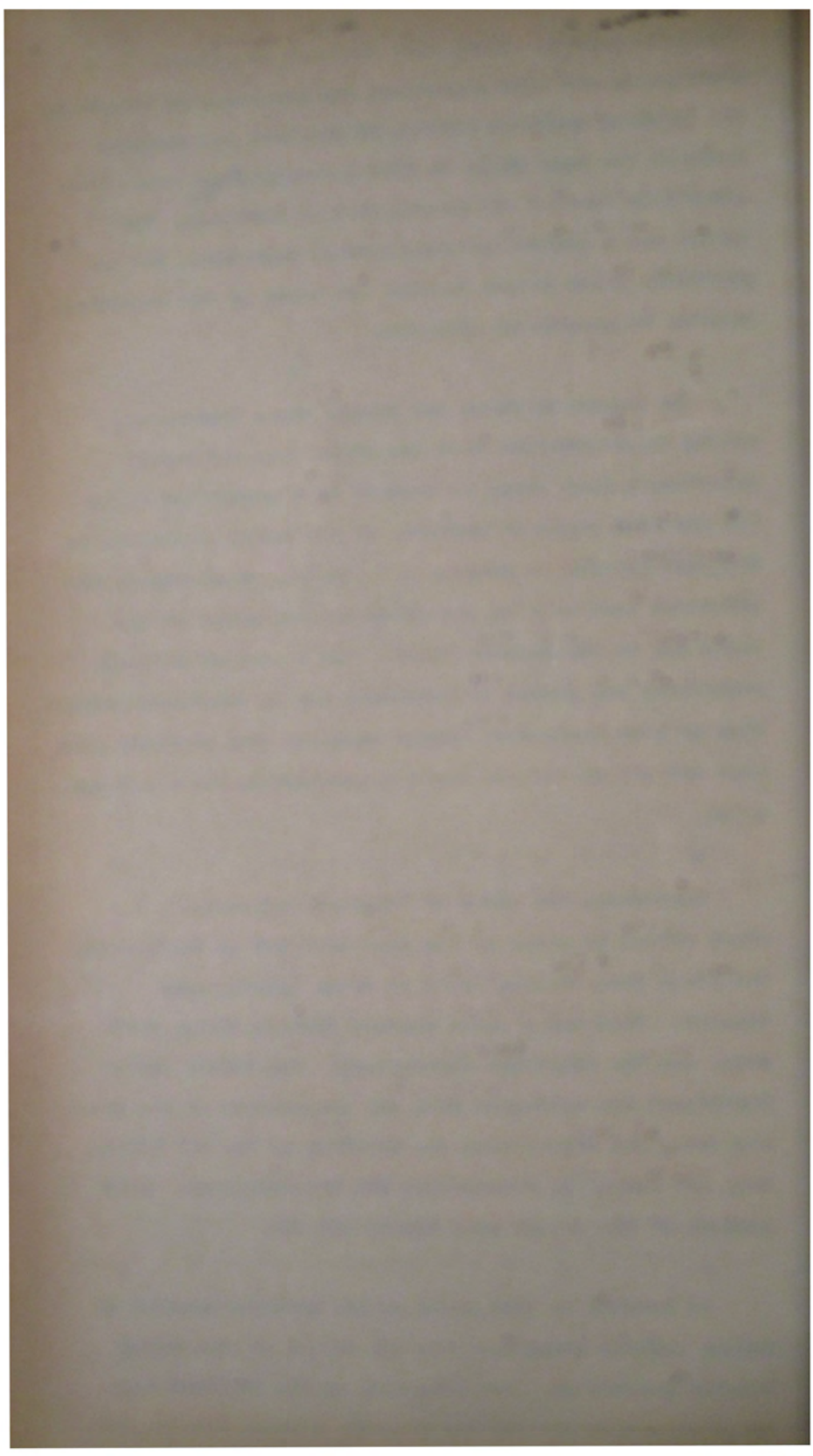
The extent to which the Public Works Department, acting in conjunction with the State Iron and Steel Department, took steps to restore to a productive basis the old iron works at Onekaka, in the Nelson district, is outlined briefly in chapter 3. Repairs, renovations, and additions were made to the plant and buildings at the works and to the Onekaka wharf. At a cost of £67,100, everything was placed in readiness for an immediate resumption of iron production should supplies from overseas have been cut off during the war - a contingency which did not arise.

* * *

Continuing the story of 'Special Industries', a short review is given of the work entailed in duplicating the Otago iron rolling mills at Green Island, near Dunedin. This was a joint venture (Public Works, Railways, and the Munitions Controller). The Public Works Department was entrusted with the preparation of the site, designing and supervising the erection of the new building, and providing foundations for the machinery. This portion of the scheme cost nearly £29,000.

* * *

An account is next given of the measures adopted to extend certain tanneries with the object of increasing leather production. Two tanneries in the Auckland district were enlarged (by the owners), payment for the work



done being made on the certificate of the Public Works Department. Extensive additions were also carried out to tanneries at Dunedin and Christchurch.

Finally, the chapter concludes with a description of the ship construction building erected at Auckland for the Ship-building Division of the Marine Department. This structure, which cost over £100,000, provided facilities for the construction of small ships and tug boats for the US Forces.

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Each section of chapter 3 deals with projects completed under typical war-time conditions. The dominant factor throughout was urgency. In every case the Public Works Department was only one of the two or more Departments involved - and this purely from the constructional point-of-view. Beyond a brief introductory note, to put the matter in its correct perspective, no attempt has been made herein to set out details which were of no particular concern to the Public Works Department and which rightly belong to the Official War Histories of the Departments primarily responsible - namely: Internal Marketing Division (dehydration factories), Linen Flax Section (linen flax factories); the Ministry of Supply (munition factories, duplication of the Otago iron rolling mills, the restoration of the Onckaka iron works, and extensions to tanneries); and the Marine Department (ship construction).

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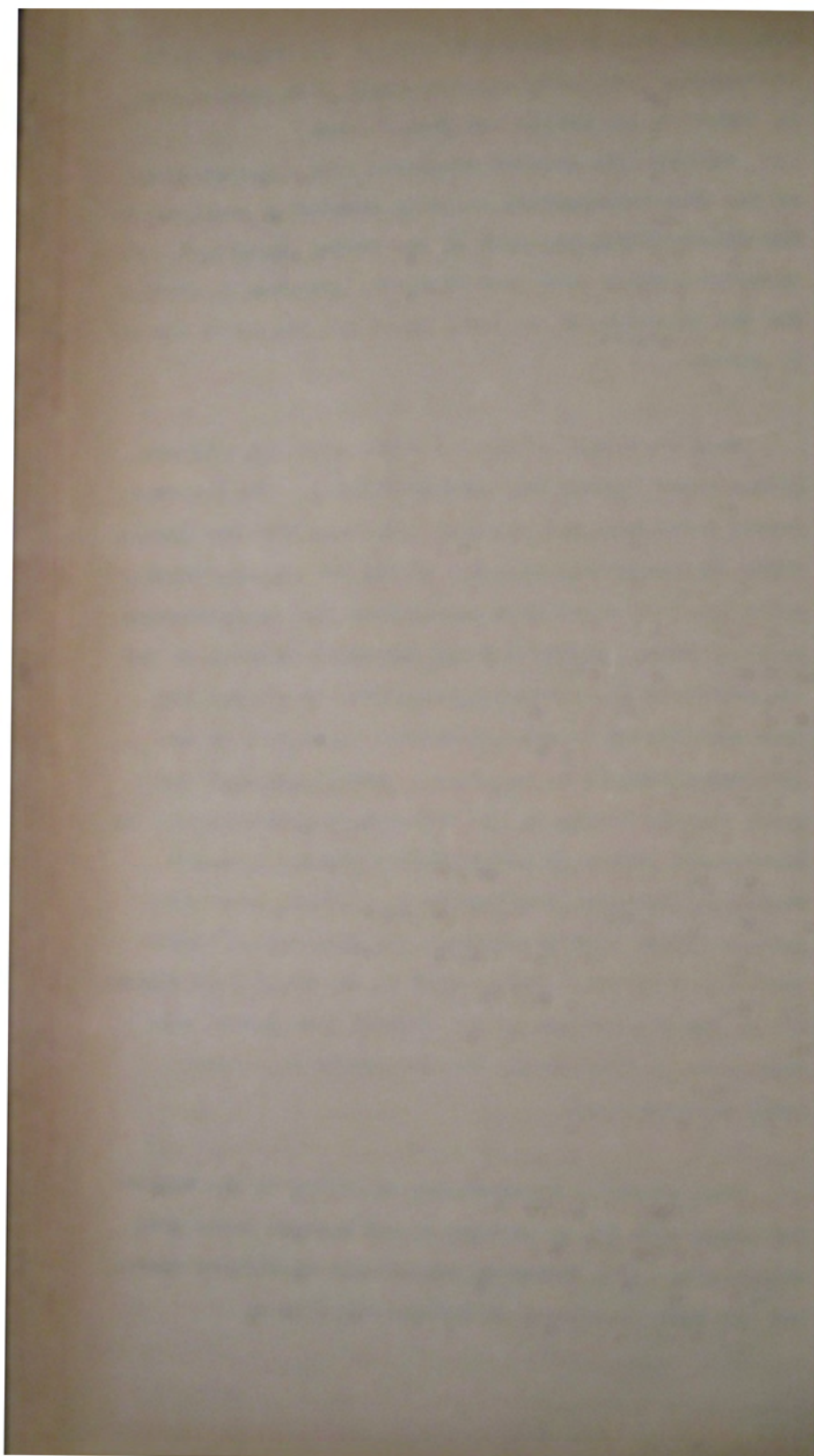
This chapter (Introductory) continues on the following pages with (2) an outline of how defence works were authorised, (3) a review of expenditure on defence works, and (4) some statistics of defence activities.

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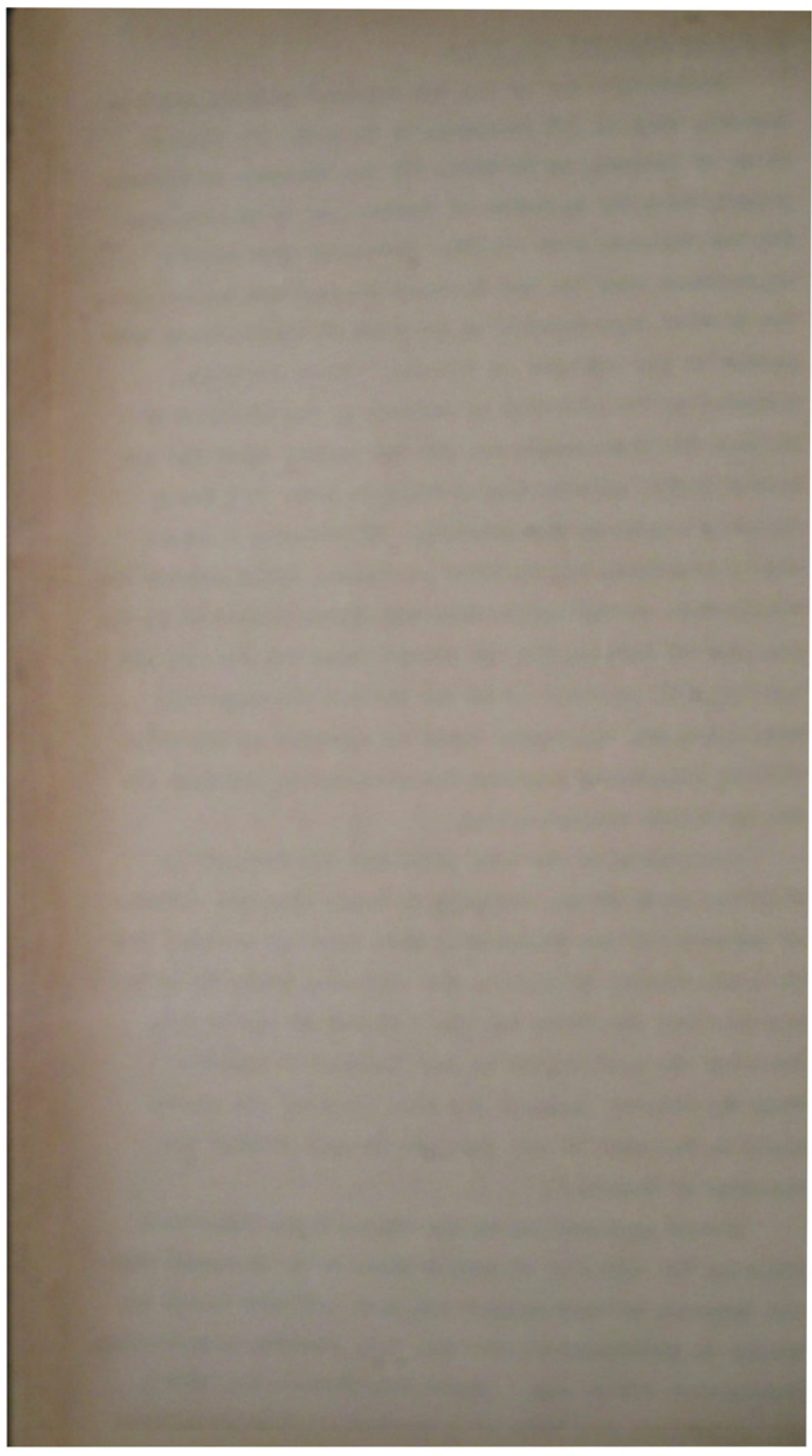
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Expenditure out of the War Expenses Account could be approved only by (1) Treasury, up to £100, (2) the Minister of Defence, up to £500, (3) the Minister of Defence jointly with the Minister of Finance, up to £2,500, and (4) War Cabinet, over £2,500. Naturally most of the expenditure from the War Expenses Account was initiated by the Service Departments, in the form of applications submitted to the Minister of Defence. These would be referred by the Minister of Defence to the Minister of Finance for his concurrence (if the amount asked for exceeded £500), and the latter would in turn call for a Treasury report on the proposal. If Treasury's report were favourable, the Minister of Finance would endorse his concurrence on the application and either return it to the Minister of Defence (if the amount asked for did not exceed £2,500) or refer it to War Cabinet for approval. When approved, the papers would be returned to the originating Department (through the Minister of Defence) for the requisite further action.

Substantially the same procedure was followed by civilian Departments, although in their case the Minister of Defence did not necessarily come into the matter. The Director-General of Health, for instance, would apply to his Minister for funds and the Minister of Health then referred the application to the Minister of Finance. When War Cabinet approval had been obtained the papers would be returned to the Director-General through the Minister of Health.

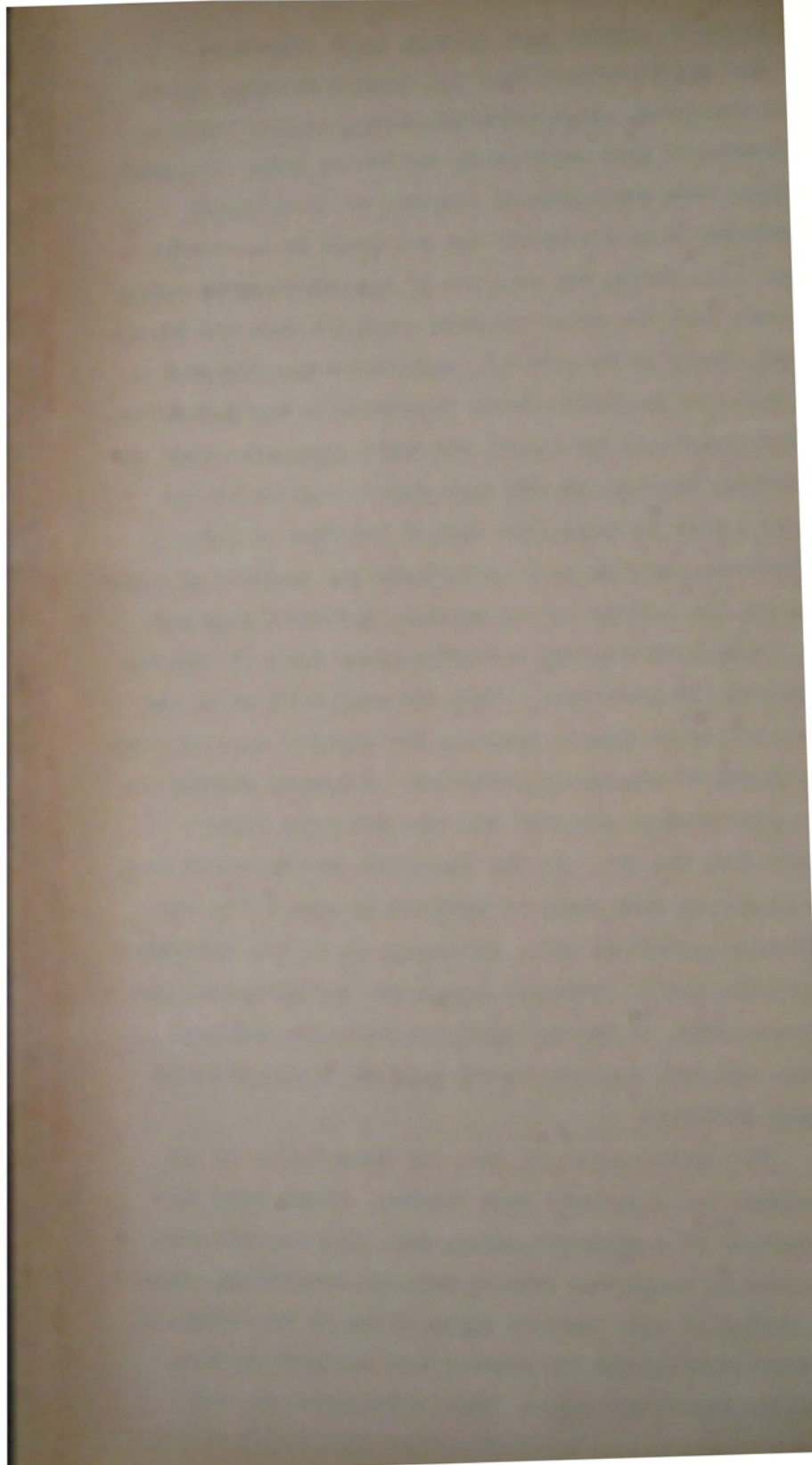
Direct applications by the Public Works Department (through the Minister of Public Works or to Treasury) for War Expenses Account authorities were confined almost entirely to accommodation matters, i.e. rentals, compensation, restoration costs, etc. Apart from these - and with a few exceptions they were of a comparatively minor nature,



authority to proceed with defence works invariably reached the Department from the Service or other Department concerned. Such authorities were usually based on estimates of cost supplied by the Public Works Department - ranging from small jobs to projects of considerable magnitude, e.g. a complete new aerodrome or a military camp. If, during the progress of construction, it became evident that the authority held would not meet the expenditure likely to be incurred, application was supposed to be made (by the Public Works Department to the Service or other Department concerned) for additional authority. In practice, however, it was customary during the war to carry a work to completion once it had been formally authorised, leaving until afterwards the question of applying for the balance of the monetary authority required.

Sometimes the only authority given was a War Cabinet approval 'in principle'. This was especially so in the case of urgent defence measures the ultimate cost of which could not be accurately estimated. A typical example was the provision of air raid shelters following Japan's entry into the war. It was impossible at the outset even to guess how much would be involved in such a huge and varied programme of work, embracing, as it did, Government shelters, public shelters, commercial shelters, etc. etc. Consequently, it was not until the programme had been completed that application was made for a specific monetary authority.

The authorisation of Navy and RNZAF works did not occasion the Department much trouble. Naval works were generally of a clear-cut nature and, once started, were carried to completion without material alteration. Firm estimates of cost could be prepared and if the authority proved insufficient the reasons were not hard to seek. The Air Department issued 'bulk' authorities for all major undertakings, and difficulties with regard to over-



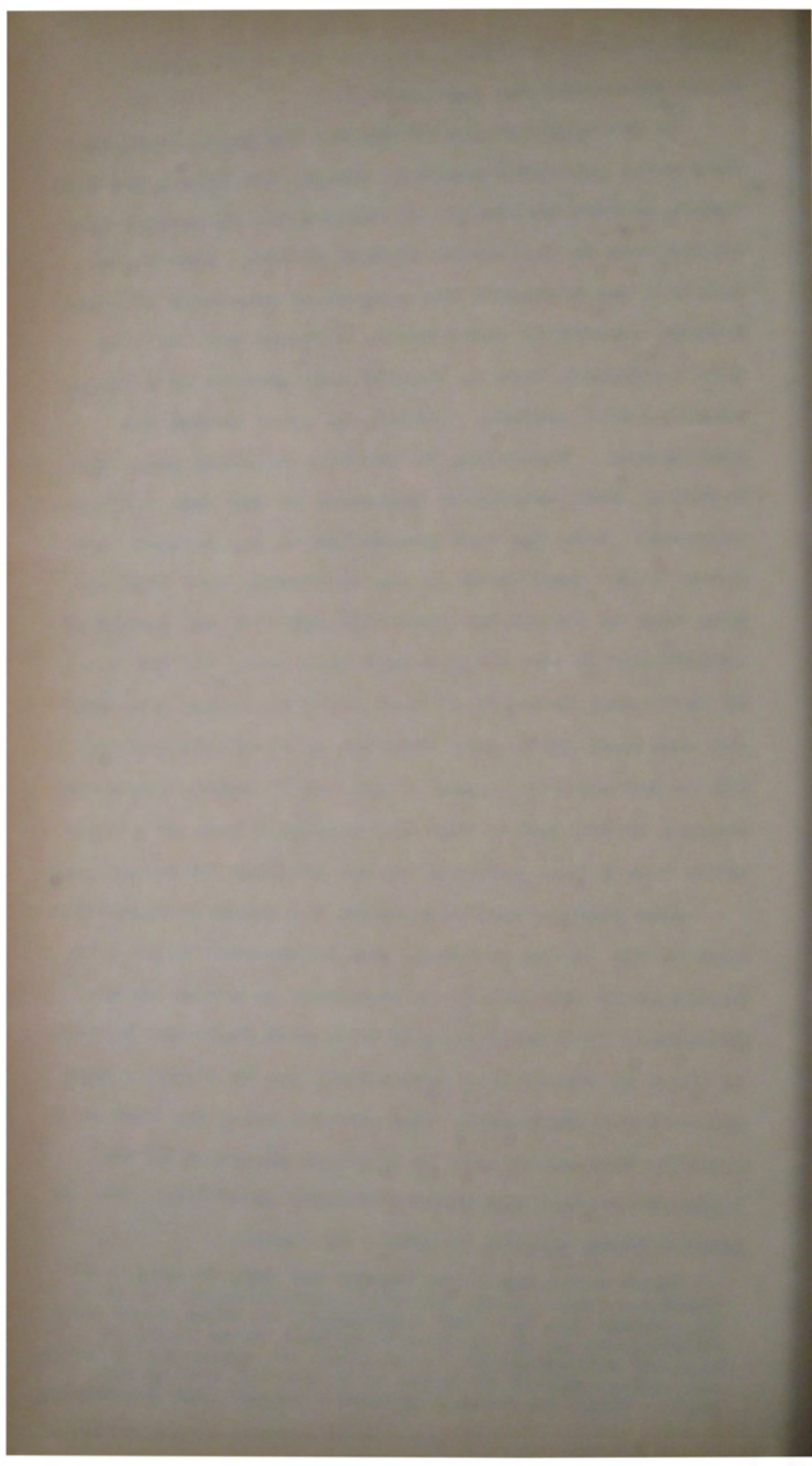
drawn authorities seldom arose so far as the Public Works Department was concerned.

In the early stages of the war the authorisation of Army works proceeded smoothly enough, but it was not long before serious overdrawal of authorities in various districts came to the notice of Head Office. Army Headquarters had continued the peace-time procedure of authorising separately works which, although more or less self-contained, were in reality only portion of a large, comprehensive project. Indeed, no other course was practicable. Extensions to Trentham Military Camp, for instance, were authorised piecemeal as and when they were required. With the work proceeding at top pressure and under 'rush' conditions it was inevitable that when the time came to review the financial position any excess of expenditure on the project as a whole over the sum total of individual authorities held could be broken down into its component parts only with the greatest difficulty. And in the earlier stages of the war at least, plans were changed so frequently that the completed cost of a work often bore little relation to the original estimated cost.

Army Headquarters recognised the inherent disadvantages of the system followed, and co-operated fully with departmental officers in an endeavour to effect an improvement. Concerted efforts were made from time to time to clean up outstanding authorities and to evolve a more stream-lined procedure. Indicative of this, the text of a circular memorandum sent to District Engineers by the Engineer-in-Chief and Under-Secretary on 25 July 1941 is perhaps worth quoting in full. It reads:

'Some weeks ago a conference was held at Army Headquarters, Wellington, between representatives of this Department and the Army Department, at which there were discussions as to the best procedure which might be adopted for arranging, on a sound and satisfactory basis, the authorisation of works to be carried out by the Public Works Department on behalf of the Army Department.

As a result of the conference certain proposals were



submitted to the Hon. Minister of Defence and he has now approved in principle the following outline of procedure.

These matters are being notified for the information of yourself and your officers. It is desired that particular attention be paid to the procedure laid down so that in future the preparation and submission of estimates for Army works, the authorisation of approved items, and the execution of works at a cost not exceeding the amounts authorised can be arranged on a definite basis with a minimum of inconvenience to both Departments.

1. When Army requests Public Works Department for plans and estimates of cost of works, as full information as possible will be supplied in the first instance, and Public Works Department will then supply detailed estimates of cost based on such information.

2. When plans and estimates are asked for Army will give an indication as far as possible as to the date by which the work is to be completed. (PW Head Office comment: In all cases where estimates are supplied by the District Engineer to Army Officers, a copy of the estimate is to be sent simultaneously to PW Head Office for record.)

3. When financial authority is received Army will advise the Engineer-in-Chief, Public Works Department, copies of such advice being sent to the District Engineer, Public Works Department, and Military District concerned. The District Engineer will take action on receipt of this advice.

(PW Head Office comment: If within a few days the District Engineer does not receive appropriate formal monetary authority, the matter should be taken up by him with this office. If there appears to be any reason why the District Engineer should not act upon receipt of the Army Headquarters advice of approval, PW Head Office should be advised immediately.)

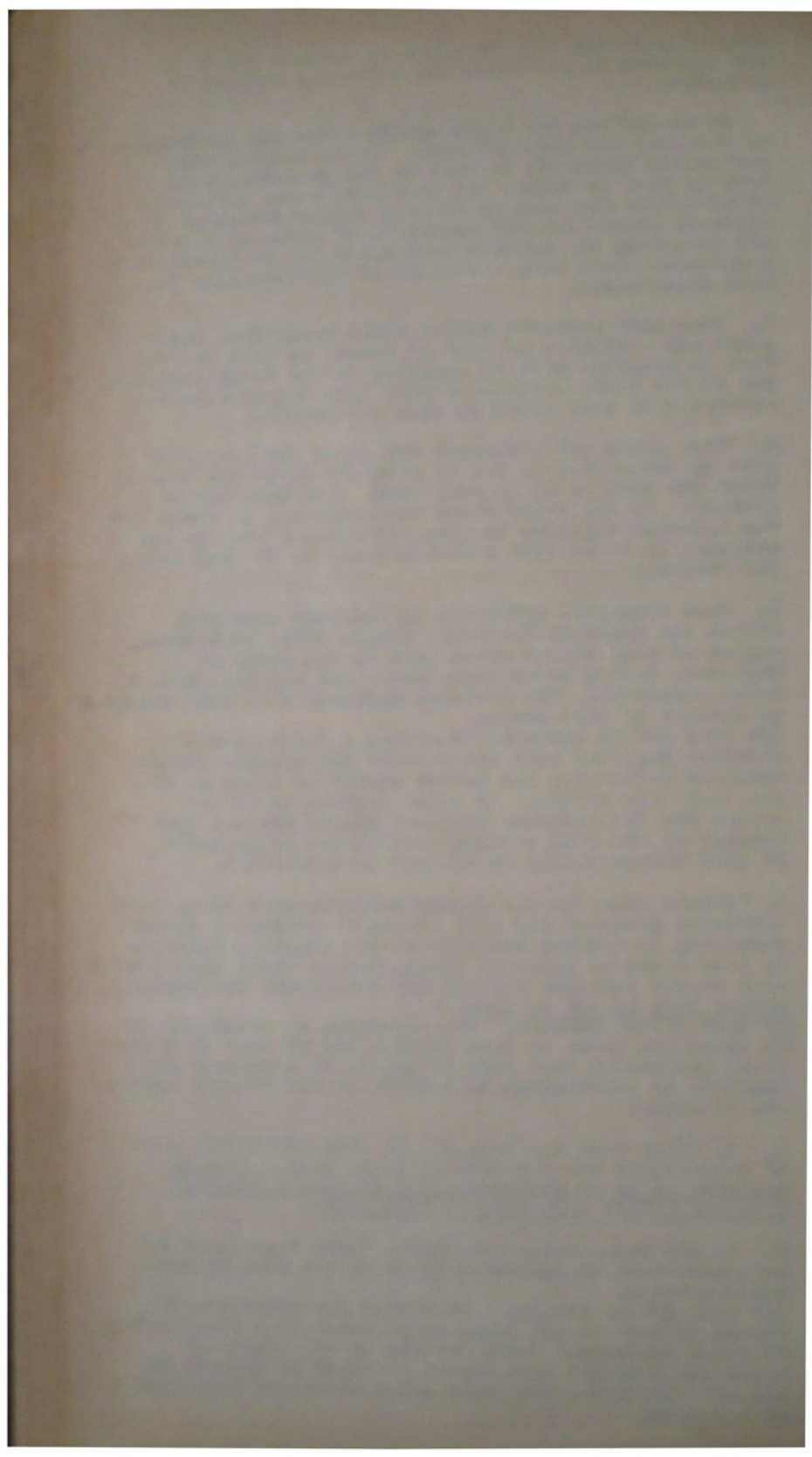
4. Should there be any considerable delay between date estimates prepared and date financial authority granted resulting in altered conditions; for example, increase in labour and/or material costs, Public Works Department will report position and ask for additional sum required before work is put in hand.

(PW Head Office comment: The attention of every officer is specially drawn to this proviso and it must be definitely understood that work is not to be commenced until approval is forthcoming in respect of the amended estimate of cost.)

5. If after work has been put in hand additional work or alterations are required by Army, then a further estimate is to be provided and financial authority obtained before such work is commenced.

6. In all major works the Public Works Department to make provision in estimates up to 10 per cent to meet contingencies.

(PW Head Office comment: Provision for contingencies should be made in all cases where there is a possibility of minor contingent items arising in the course of executing a work. Care should be taken to include in estimate schedules all items which obviously form part of a proposal.)



7. Army to allot a serial number to every financial authority, such number to be communicated to the Public Works Department. These serial numbers to be quoted by Public Works Department on all statements of expenditure.

8. Army to indicate from time to time the order of priority of all works authorised.

9. Army to issue instructions to all concerned that there must be no alterations to approved works involving cost except through the recognised channels. In this connection Officers Commanding Districts will delegate authority to named officers to deal with the Public Works Department.

(PW Head Office comment: This clause originated from a request by PW Department that District Engineers, or their control officers in charge of Army works, be enabled to look to certain responsible Army Officers for advice, in preference to several officers, who, in the past without delegated authority, have exercised direct-
ional powers.

It is hoped that the instructions now being issued under this clause will restrict contacts between local officers of both departments to those who are authorised to act, thus obviating the confusion hitherto existing when conflicting instructions, etc., were common. However, the underlined portion of Clause 5 above must be observed.)

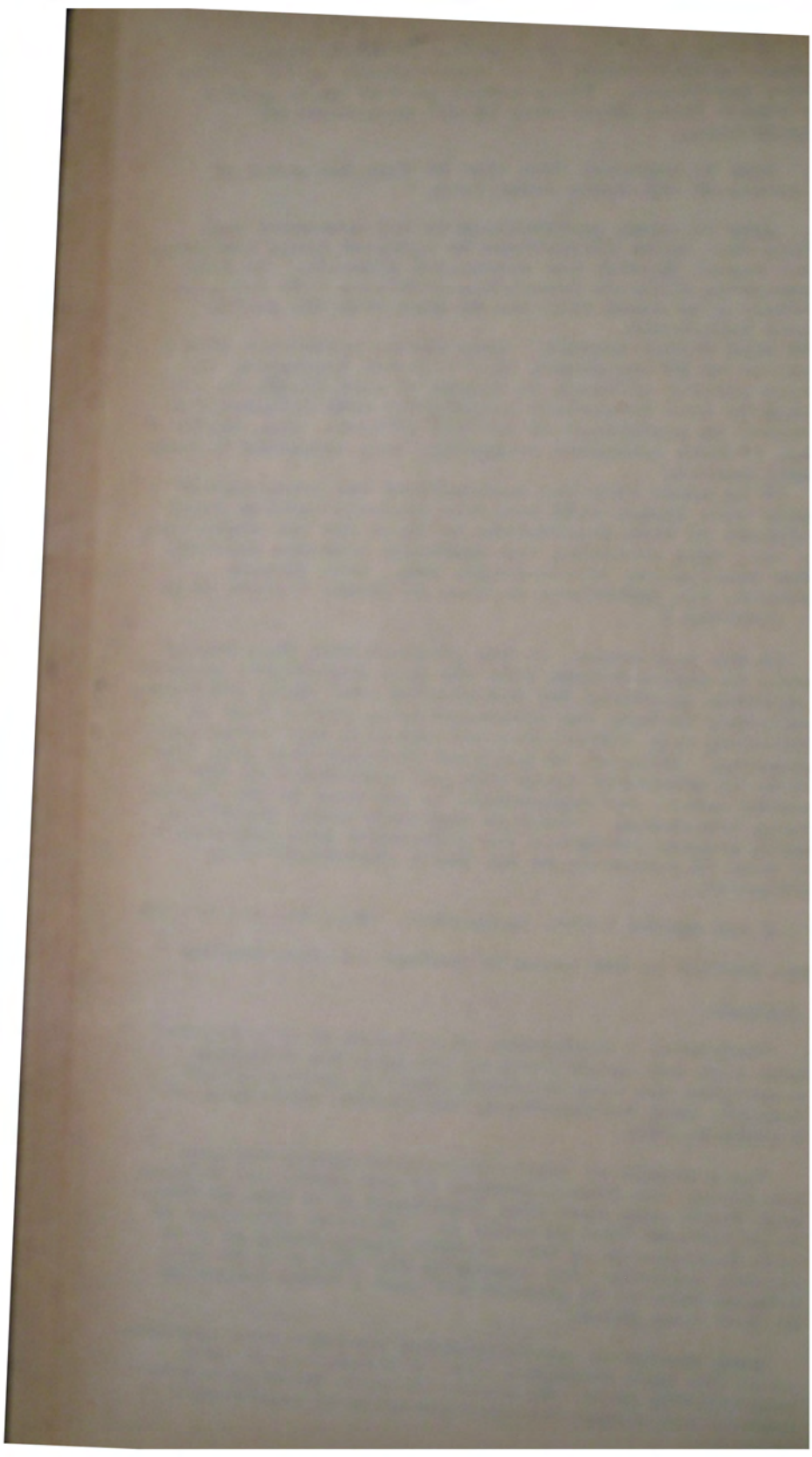
At the conference, it was proposed that this Department, in collaboration with the Army Department, prepare estimates quarterly for anticipated Army works programmes, including surveys and investigations, with a view to obtaining bulk authorities and ensuring more economical planning. However, it has been directed that each case is to be submitted separately and considered on its merits before any expenditure is incurred by the Public Works Department. District Engineers will, therefore, still prepare estimates for particular jobs from time to time as requested by the local responsible Army Officers'.

A few months later, in October, 1941, the matter was taken further by the issue of another circular reading as follows:

'Following a conference by officers of this Department with representatives of the Army the following memorandum has been received from the Quartermaster-General, Army Headquarters, Wellington, under date of 9 October, 1941:

"As a result of experience gained during the past two years, and from a perusal of statements and returns that reach Army from your Department from time to time, it is obvious that it would be a distinct advantage to both Departments to have certain requirements of Army clearly defined. The necessity for this will be more obvious when it is pointed out that a heavy programme of work lies ahead.

Much confusion and unnecessary work has been occasioned in the past through a lack of definition of Army requirements as to the manner in which works should be costed, and claims for reimbursements of expenditure presented.



all major works should be costed:

- (1) Land - purchase of.
- (2) Preparation of site, including sub-surface and storm-water drainage.
- (3) Sewerage.
- (4) Electric power reticulation.
- (5) Water supply.
- (6) Roading, paths, parade grounds - building surrounds -
 - (a) formation
 - (b) scaling
- (7) Buildings
 - (a) Timber or iron
 - (b) Concrete or brick
- (8) Fencing, gates, hedges, tree-planting, etc.
- (9) Miscellaneous.

Additional for fortresses:

- (10) Gun emplacements.
- (11) Underground work for guns.
- (12) Searchlight emplacements, tunnels, engine rooms, etc.

It should be understood that all services within the buildings are a charge against 'Buildings'. Items 3, 4 and 5 refer only to the provision of the services up to the building.

It is hoped that this condensed system of costing will greatly facilitate the work of your Department and will lessen the confusion that has existed hitherto.

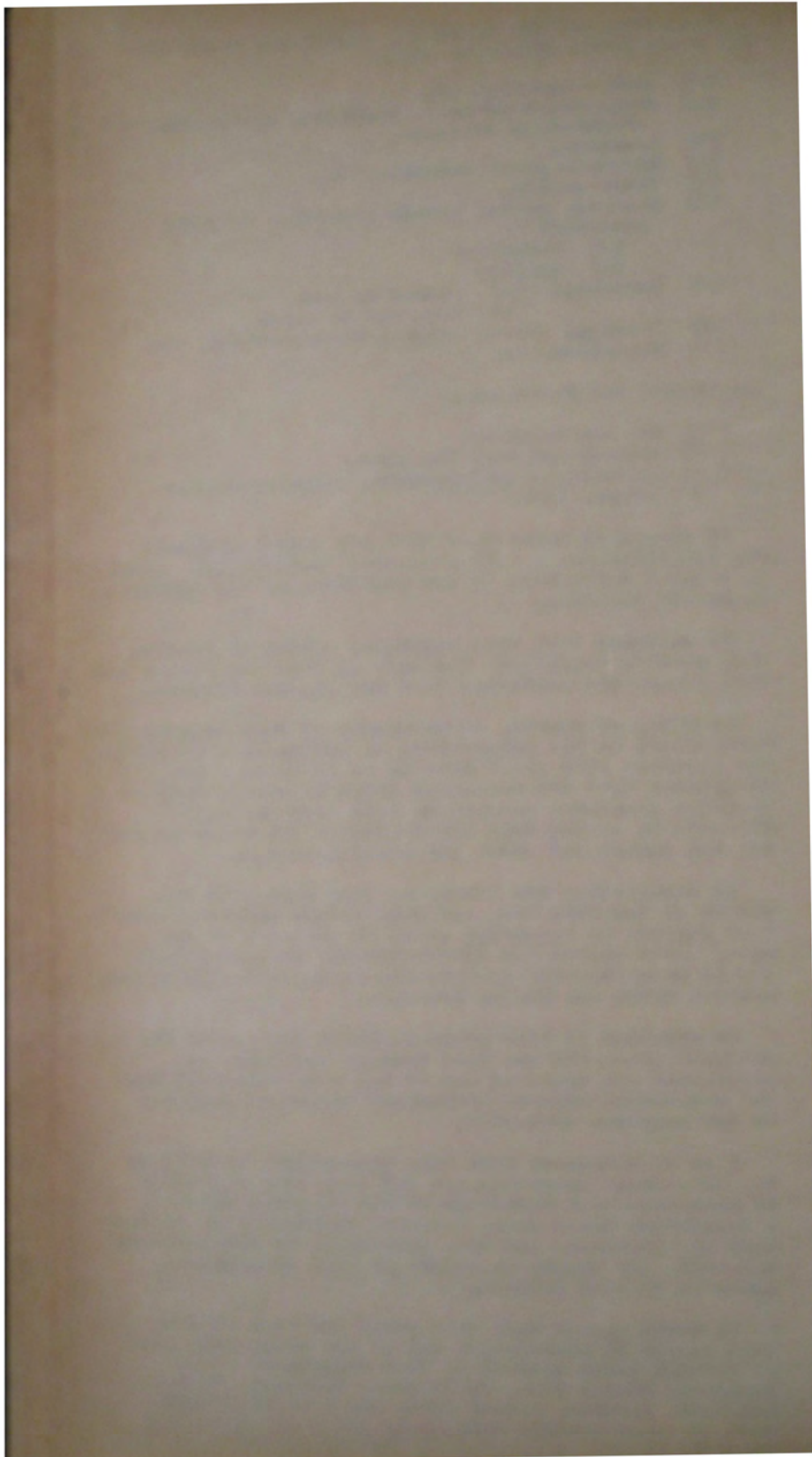
It will, of course, be necessary to show considerably more detail in the preparation of estimates - buildings for instance will still have to be itemised - but will you please take the necessary steps to ensure that your District Engineers co-operate with Army District Officers in seeing that all estimates submitted in future are summarised under the above headings.

As authorities are issued by Army they will sub-divide in the same way, and your ledger accounts should then provide an automatic check on the cost of the work. Your claims for re-imbursement of expenditure should also indicate clearly the particular authorities against which the claims are made.

In practice it will often be found that after the original authority has been issued, additions or extensions are approved and it has been suggested that the additional amounts authorised should be credited to the original authority.

I am in agreement with this suggestion, so long as the subsequent approvals are for work that can truly be described as a variation of the original proposal. A saturation point must, however, eventually be reached when any approvals can more accurately be described as new work, and should therefore be kept in separate accounts in your ledgers.

It would appear that this stage has been reached with regard to practically all of the major camp jobs at present being handled by your Department - viz. Papakura, Narrow Neck, North Head, Motutapu, Waiouru, Trentham, Burnham, Godley Head, and I am of opinion that it would greatly facilitate the task of keeping track of future expenditure if any new authorities that

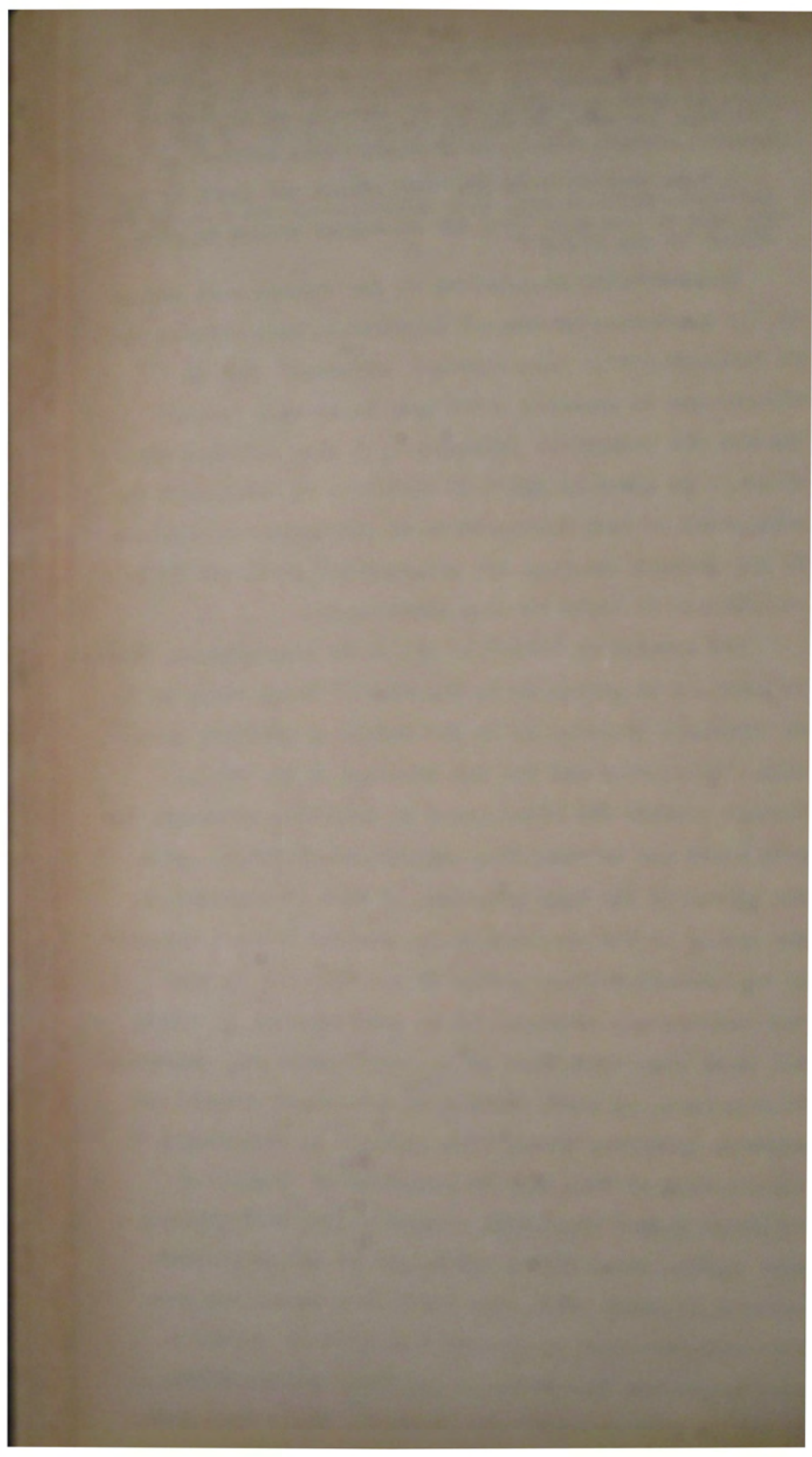


may be issued for additional work at these places were kept separate in your ledgers. In any case, I think it should be a matter for direction by Army from time to time as further authorities are issued, as to whether separate accounts should be opened or not. If you concur, action will be taken along these lines."

I have concurred in the suggestions put forth by the Quartermaster-General, Army Headquarters and I shall be pleased if you will take the necessary action to give effect to the change.'

Complimentary instruction on the subject were issued by the Quartermaster-General to district Army offices on 25 November 1941. This circular emphasised that no alterations to approved works were to be made 'except through the recognised channels.' It also outlined the steps to be taken by military districts to facilitate the submission by Army Headquarters of quarterly requisitions to War Cabinet covering all proposed new works and over-expenditure on works already authorised.

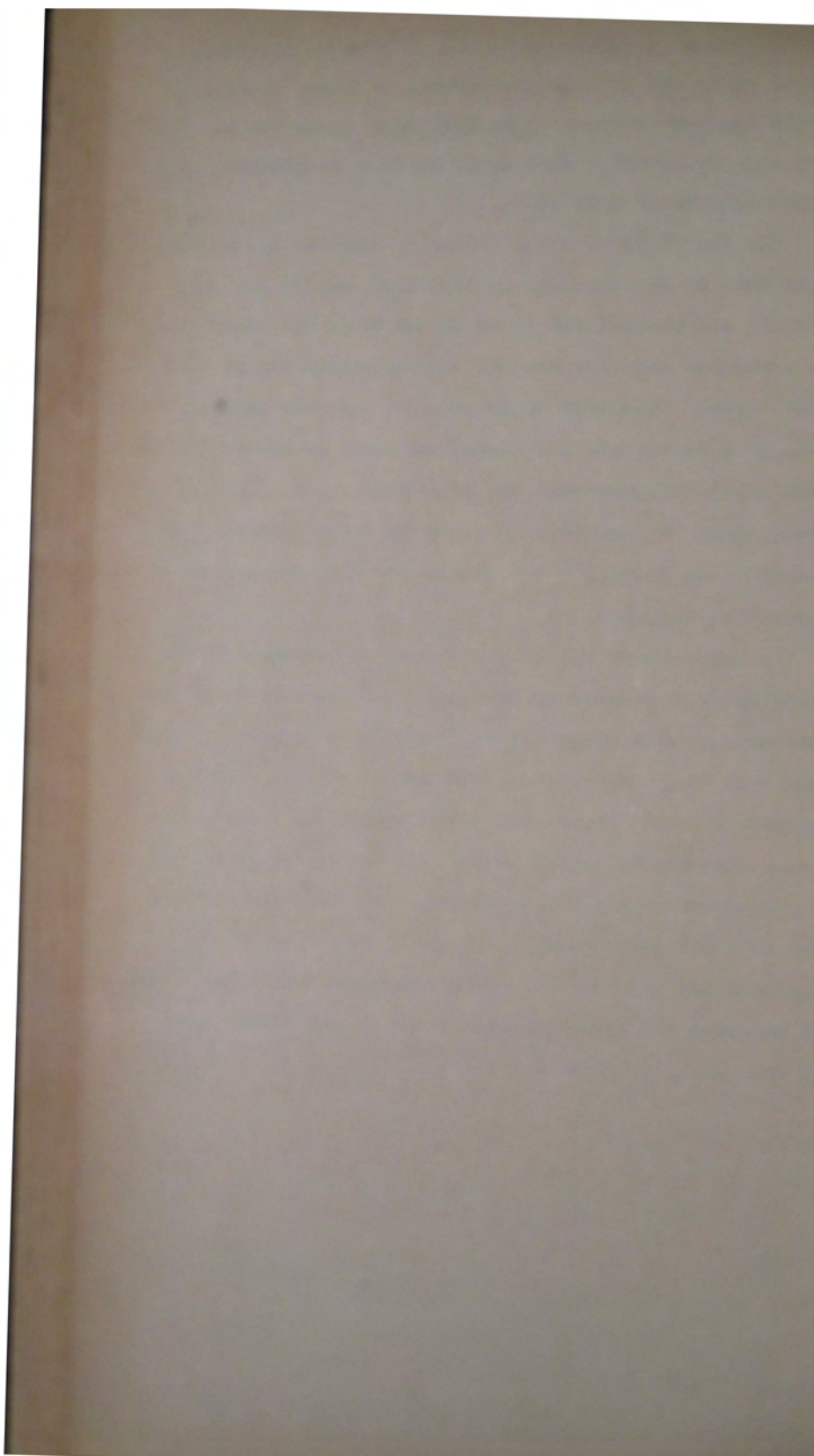
The cumulative effect of all these instructions, both to Army and to public works district offices, resulted in an immediate improvement in the authority position generally. Thereafter and for the duration of the war no further trouble was experienced in obtaining authority for Army works nor in recording expenditure properly. Even the impact of the huge programme of work precipitated by the spread of the conflict to the Pacific did not seriously over-strain the new system of control. It is true that authorities continued to be over-expanded at times, but these were taken care of in Army's quarterly estimates. On occasions, in fact, works were undertaken without any monetary authority having been issued. An outstanding illustration of this was the programme of 'essential defensive works' (trenches, gun-pits, anti-tank ditches, road blocks, etc.) during the height of the threatened invasion in early 1942, when local unit commanders were expressly empowered to proceed with whatever measures were necessary, regardless of any other consideration. It was at this juncture - in February, 1942 - that Army



headquarters was given authority to approve expenditure up to £100, and officers commanding military districts could likewise approve up to £50 (with authority to delegate up to £5) - thus still further simplifying the authorisation of Army works.

In the field of civil defences, mention has already been made of the air-raid shelter work and of the fact that it was carried out under an approval 'in principle'. In a similar category was the splinter-proofing of bulk fuel tanks. This also could not, by its very nature, be estimated accurately and formal monetary authority had to wait until the programme had been completed. In both these cases the approval of a sum in round figures, say £50,000, 'on account', was sufficient for preliminary accounting purposes.

A supervision fee of 5 per cent was charged by the Department in respect of all works carried out under War Expenses Account authorities. That is to say, if an Army work cost the Department a nett sum of £5,000, the debit against the Army Department would amount to £5,250. The usual supervision charge was 10 per cent. So great was the turnover during the war years that even the reduced fee of 5 per cent provided an ample margin to cover salaries and allowances, office expenses, and other items of overhead not directly chargeable to the actual cost of the work.



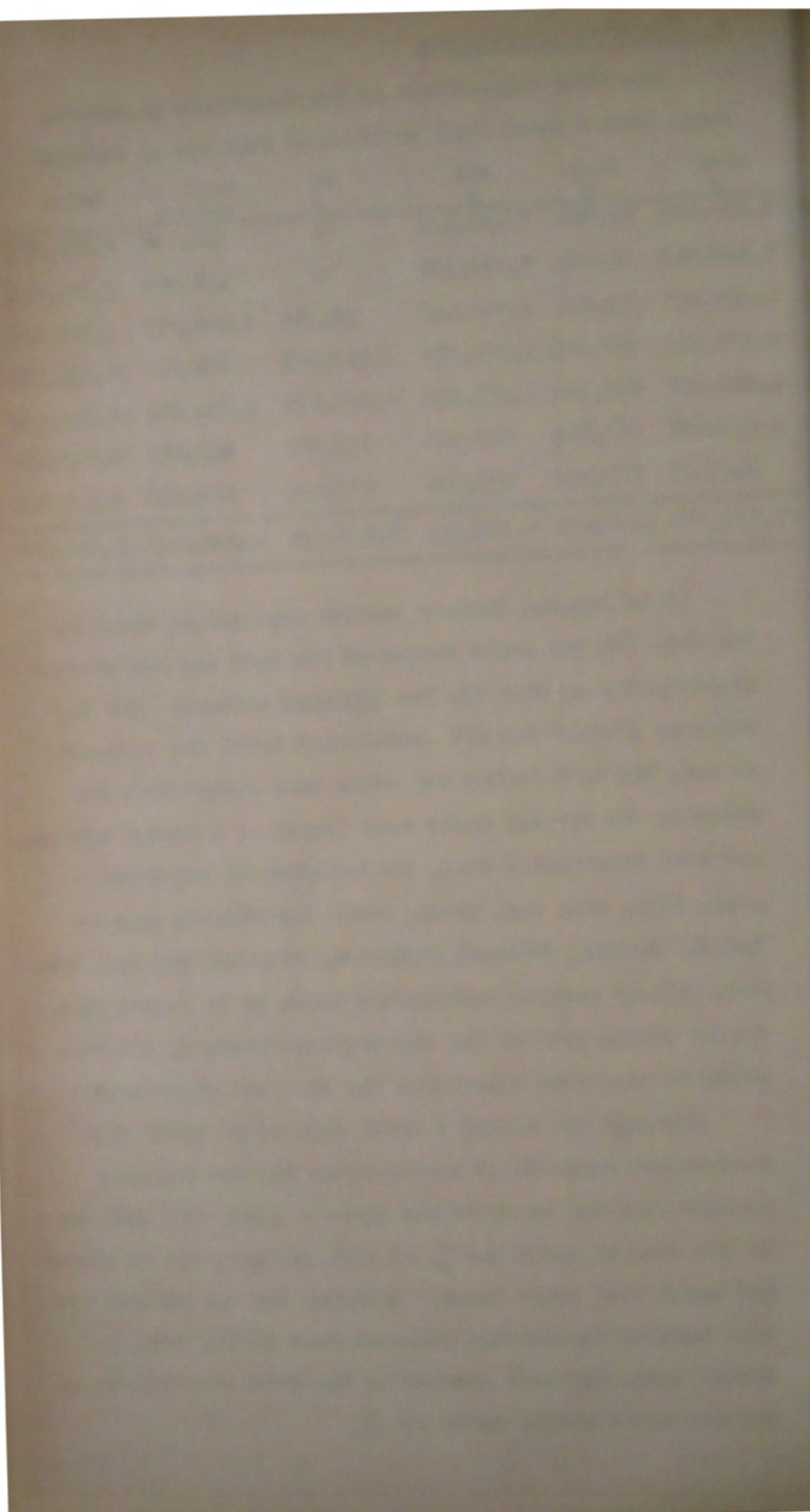
3. REVIEW OF EXPENDITURE.

The total expenditure by the Department on defence works from 1 April 1939 to 31 March 1946 was as follows:

| | Army £ | Navy £ | Air £ | US £ | Civil & General | Total £ |
|---|------------|-----------|------------|-----------|--------------------|------------|
| 0 | 1,271,128 | 74,981 | 1,488,475 | - | 122,115 | 2,956,699 |
| 1 | 1,480,443 | 64,665 | 1,790,876 | - | 436,989 | 3,772,973 |
| 2 | 1,389,971 | 273,870 | 2,181,465 | 40,291 | 1,411,667 | 5,297,264 |
| 3 | 6,471,107 | 906,226 | 5,127,526 | 2,313,788 | 1,980,147 | 16,798,794 |
| 4 | 4,046,071 | 892,904 | 2,433,022 | 2,617,235 | 1,553,501 | 11,542,733 |
| 5 | 1,633,636 | 667,896 | 889,555 | 715,369 | 943,241 | 4,849,697 |
| 5 | 842,423 | 577,957 | 465,664 | 151,448 | 210,550 | 2,248,042 |
| | 17,134,779 | 3,458,499 | 14,376,583 | 5,838,131 | 6,658,210 | 47,466,202 |

These figures include certain expenditure which at the time (in the early stages of the war) was not charged specifically against the War Expenses Account. The War Expenses Account was not established until the outbreak of war, and both before and after this authorities for carrying out defence works were issued as a charge against, and were recoverable from, the Departments concerned - Army, Navy, Air, and, later, other Departments such as Health, Marine, Internal Marketing, National Service, etc. From 1941-42 onwards authorities began to be issued as a direct charge against the War Expenses Account, and this practice continued throughout the war (and afterwards).

Although the period 1 April 1939 to 31 March 1946 covered the duration of hostilities, the War Expenses Account remained in operation after 1 April 1946 and, as in the case of World War I, it will probably not be closed off until some years later. However, for the purposes of this History expenditure incurred from April, 1939, to March, 1946, has been treated as the total expenditure on defence works during World War II.

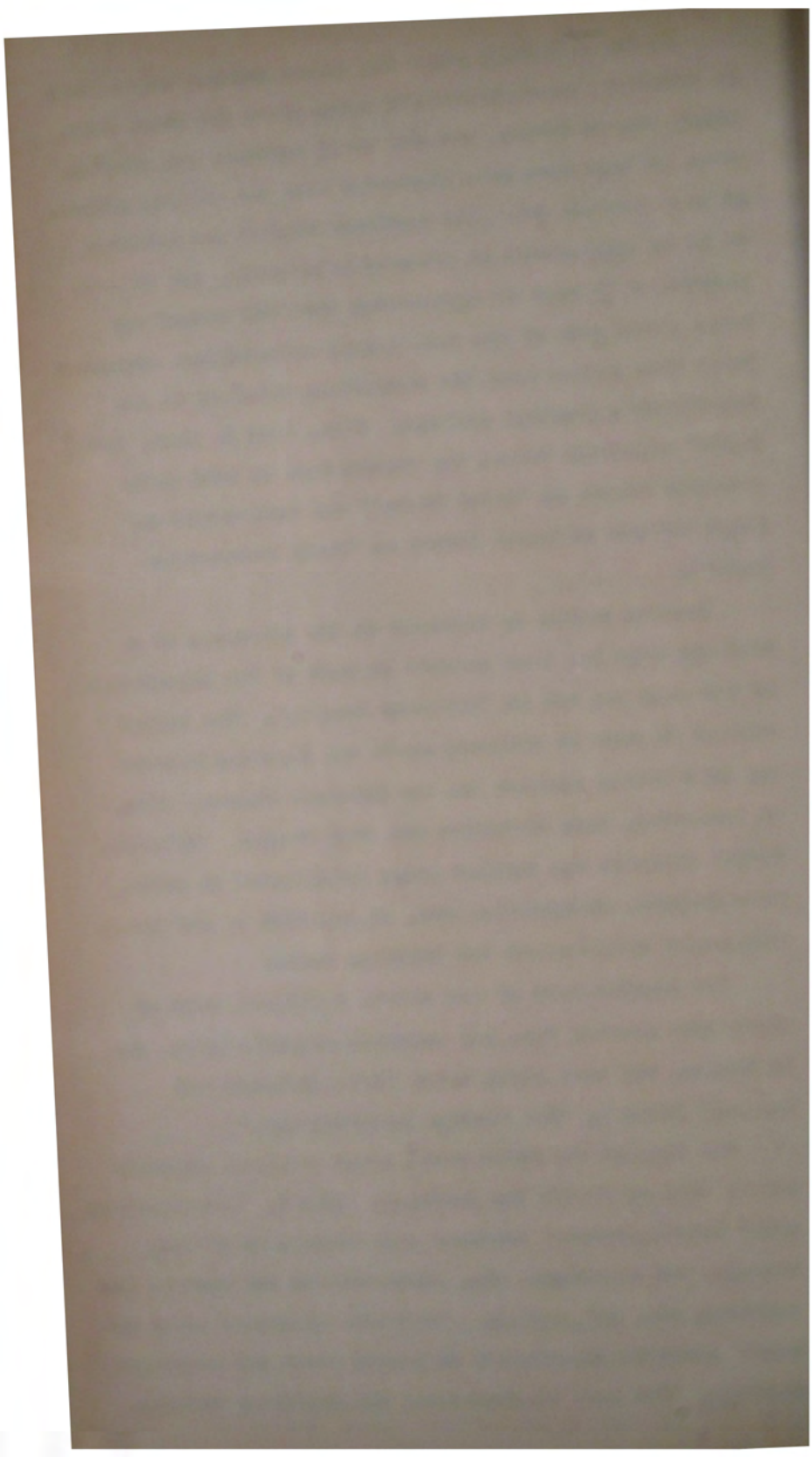


In the following pages the annual defence expenditure is recorded, separate figures being given for Army, Navy, RNZAF, the US Forces, and for civil defences and general. These in turn have been dissected into the various classes of work carried out. The headings adopted are believed to be as appropriate as reasonably possible, and in this connection it must be appreciated that the camouflage names given some of the more secret undertakings concealed their true nature from the accounting officers in the Department's district offices. Thus, item 2. Navy, 'Naval Posts' doubtless covers the expenditure on both radar stations (known as 'Naval Posts') and anti-submarine fixed defence stations (known as 'Naval observation posts').

Roading within or adjacent to the precincts of a military camp has been treated as part of the expenditure on the camp and not as 'Military Roothing'. The latter relates to work on ordinary roads and highways carried out as a charge against the War Expenses Account: also, as indicated, tank obstacles and road blocks. 'Military Camps' includes the smaller camps established on parks, race-courses, showgrounds, etc. in addition to the large, well-known mobilisation and training bases.

The capital cost of new stores buildings, many of which were erected for, and occupied exclusively by, the US Forces, has been shown under 'Civil Defences and General' (item 7, 'New Storage Accommodation.')

The figures for RNZAF works cover overseas expenditure as well as within the Dominion. Item 4, 'Miscellaneous RNZAF Establishments' embraces such matters as office, storage, and workshops, etc. accommodation and hostels and barracks, etc. off station. 'Seaplane Alighting Areas and Bases' includes expenditure on launch bases and emergency moorings. The cost of chartering and operating vessels,



if not chargeable to any particular airfield, appears
in item 12, 'Expeditions.'

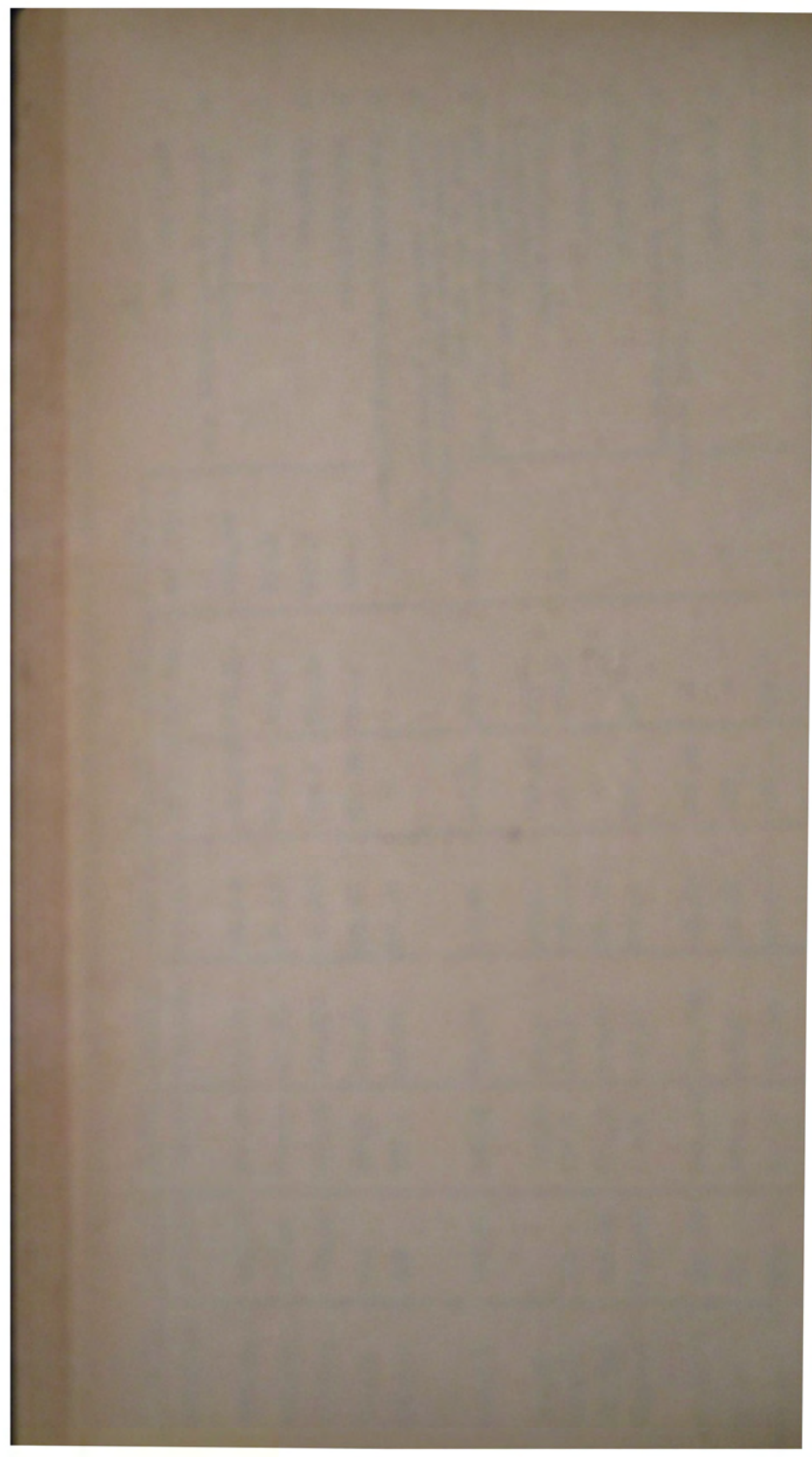
Generally speaking, maintenance and/or restoration
costs have been treated similarly to capital expenditure.



TOTAL GROSS EXPENDITURE ON DEFENCE WORKS BY PUBLIC WORKS DEPARTMENT. 1.4.39 - 31.3.46.

1. ARMY WORKS

| | 1939-40 | 1940-41 | 1941-42 | 1942-43 | 1943-44 | 1944-45 | 1945-46 | TOTAL |
|---|-----------|-----------|---------|-----------|-----------|---------|---------|-----------|
| 1. Military Camps. | 1,095,002 | 1,208,805 | 517,290 | 2,723,224 | 1,244,067 | 487,003 | 274,124 | 7,549,515 |
| 2. Coastal Fortifications and Gun Emplacements. | 141,620 | 134,579 | 342,882 | 793,508 | 681,824 | 205,324 | 101,999 | 2,401,736 |
| 3. A.A. Defences. | 6,036 | 19,546 | 5,587 | 355,859 | 159,550 | 17,503 | 4,446 | 568,527 |
| 4. Magazines. | 8,898 | 15,393 | 7,433 | 278,249 | 529,226 | 69,732 | 30,258 | 939,189 |
| 5. Guard Stations. | 4,448 | 4,188 | 22,835 | 42,599 | 15,730 | 2,264 | 547 | 92,611 |
| 6. Underground Operational Centres. | - | - | - | 61,824 | 36,392 | 1,785 | 222 | 100,223 |
| 7. Office, Storage, & Workshops, etc. Accommodation (excluding capital cost of new stores). | 12,375 | 12,854 | 30,050 | 79,310 | 88,197 | 34,940 | 18,692 | 276,418 |
| 8. Bulk Fuel Stores (including splinter-proofing and camouflage). | - | 273 | 35,657 | 18,822 | 5,388 | 10,101 | - | 70,241 |
| 9. Internment Camps. | 544 | 1,525 | 1,341 | 107,097 | 10,844 | 7,702 | 237 | 129,290 |
| 10. POW Camps. | - | - | - | 20,961 | 128,012 | 55,565 | 23,044 | 227,582 |
| 11. Camouflage. | - | 68 | 24,386 | 79,836 | 12,315 | 2,916 | CR1,077 | 118,444 |
| 12. Military Roading (including tank obstacles & road blocks). | - | - | 34,580 | 358,291 | 385,823 | 224,202 | 127,834 | 1,130,730 |
| 13. M.G. Posts. | - | - | 807 | 36,940 | 5,903 | 3,296 | 475 | 47,421 |
| 14. Radar Stations. | - | 1,220 | 11,715 | 18,001 | 10,257 | 3,089 | 450 | 44,732 |
| 15. Portable Huts, Warehouses, etc. | - | 128 | 104,672 | 1,092,153 | 82,087 | 9,446 | 1,484 | 1,289,970 |
| 16. Hospitals & Convalescent Depots. | - | 60,451 | 246,202 | 392,696 | 512,122 | 466,071 | 258,238 | 1,935,780 |



2. NAVY WORK

| | 1939-40 | 1940-41 | 1941-42 | 1942-43 | 1943-44 | 1944-45 | 1945-46 | TOTAL |
|---|---------|---------|---------|---------|---------|---------|---------|-----------|
| 1. Naval Bases. | 68,047 | 32,256 | 125,246 | 256,643 | 317,168 | 354,426 | 254,500 | 1,408,286 |
| 2. Naval Posts. | - | 149 | 16,484 | 74,020 | 83,159 | 19,555 | 4,096 | 197,463 |
| 3. Coastal Defences. | - | 618 | 11,583 | 63,896 | 4,034 | 2,521 | - | 82,672 |
| 4. Harbour Defences. | - | - | 26 | 81,564 | 37,097 | 2,244 | 3,067 | 123,998 |
| 5. W.T. Stations. | - | 71 | 60 | 13,560 | 2,819 | 6,924 | 4,029 | 27,463 |
| 6. Mine and Armament Depots. | - | 340 | 2,824 | 58,994 | 85,628 | 18,056 | 4,521 | 170,363 |
| 7. Controlled Mine Bases. | - | - | - | 140,864 | 53,682 | CR1,100 | 54 | 193,500 |
| 8. Signal Stations. | - | - | 2,100 | 16,170 | 2,434 | 394 | 31 | 21,129 |
| 9. Bulk Fuel Stores (including splinter-proofing and camouflage). | 29 | 14,644 | 54,205 | 38,692 | 133,727 | 163,007 | 126,651 | 530,955 |
| 10. Barracks, Hostels, etc. | 6,905 | 11,257 | 59,408 | 40,778 | 23,896 | 13,051 | 7,978 | 163,273 |
| 11. Magazines. | - | 5,330 | 1,553 | 99,471 | 35,574 | 2,770 | 4,258 | 148,956 |
| 12. Office, Storage, and Workshops, etc. Accommodation. | - | - | 381 | 19,121 | 105,601 | 86,028 | 168,772 | 379,903 |
| 13. Miscellaneous | - | - | - | 2,353 | 8,085 | - | - | 10,538 |
| TOTALS | 74,981 | 64,665 | 273,870 | 906,226 | 892,904 | 667,896 | 577,957 | 3,458,499 |



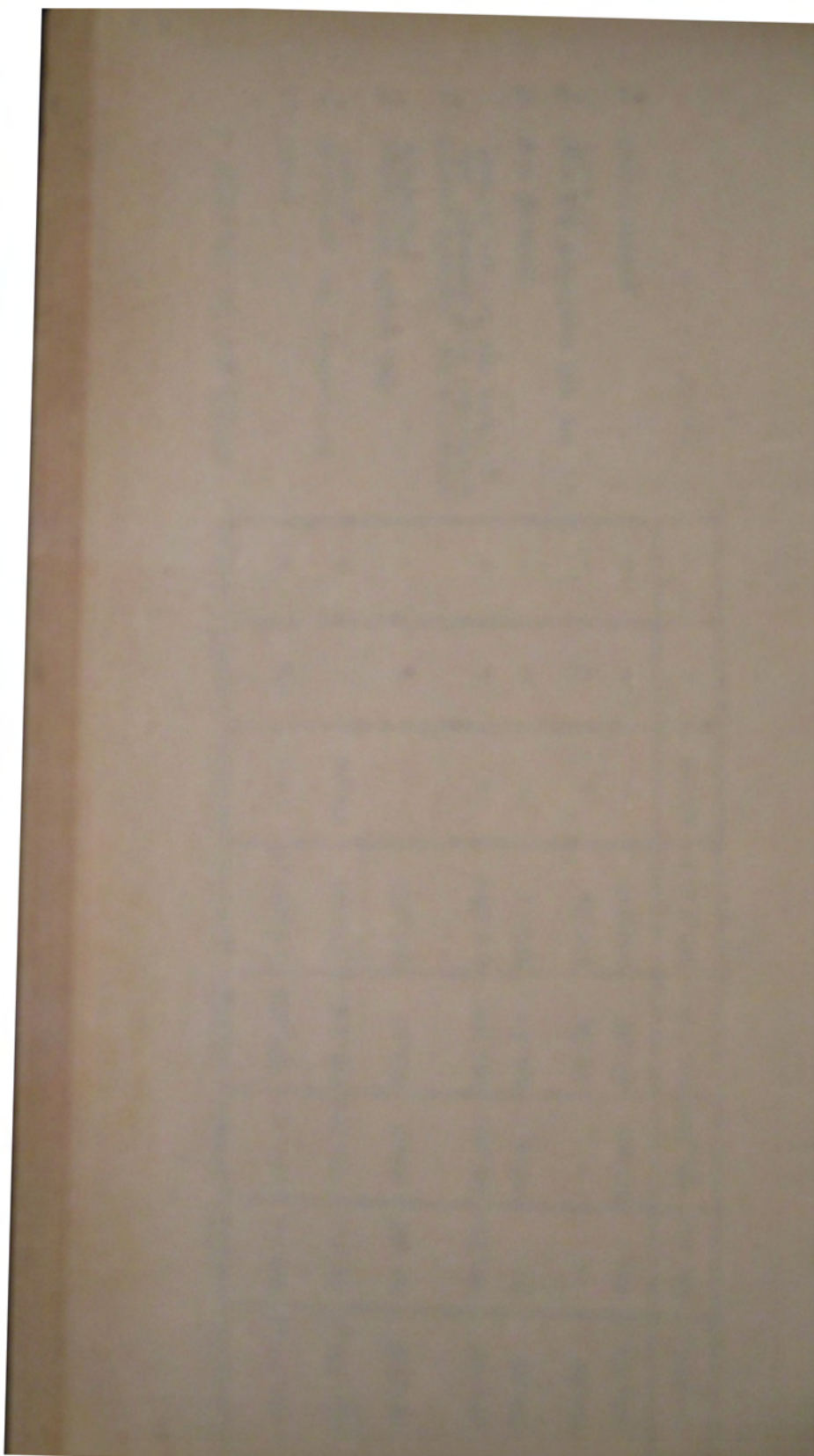
3. RNZAF WORKS (NEW ZEALAND & OVERSEAS).

| | 1939-40 | 1940-41 | 1941-42 | 1942-43 | 1943-44 | 1944-45 | 1945-46 | TOTAL |
|---|-----------|-----------|-----------|-----------|-----------|---------|---------|------------|
| 1. Airfields. | 339,006 | 339,868 | 943,984 | 2,792,042 | 648,515 | 234,522 | 187,902 | 5,485,839 |
| 2. RNZAF Stations. | 995,576 | 1,194,110 | 761,401 | 1,193,289 | 996,368 | 398,081 | 161,703 | 5,700,528 |
| 3. RNZAF Stores Depots. | 31,284 | 118,705 | 64,858 | 168,303 | 273,413 | 85,565 | 16,323 | 758,451 |
| 4. Miscellaneous RNZAF Establishments. | 517 | 11,393 | 45,669 | 65,063 | 98,295 | 43,076 | 33,140 | 297,153 |
| 5. Underground Operational Centres. | - | - | - | 29,702 | 25,350 | 14,214 | 765 | 70,031 |
| 6. Bulk Fuel Stores (including Splinter-proofing and camouflage.) | 7,782 | 7,451 | 45,371 | 237,656 | 87,643 | 12,140 | 2,949 | 400,992 |
| 7. W.T. Stations. | 9,596 | 2,947 | 5,587 | 5,071 | 8,950 | 3,558 | 1,720 | 37,429 |
| 8. Radar (Ground) Stations. | 1,342 | - | 17,340 | 115,506 | 137,494 | 21,680 | 232 | 293,594 |
| 9. Aeradio Stations. | 42,480 | 51,836 | 46,028 | 59,495 | 36,374 | 9,593 | 12,321 | 258,127 |
| 10. Seaplane Alighting Areas and Bases. | 41,483 | 9,932 | 65,607 | 216,226 | 17,337 | 1,989 | 544 | 353,118 |
| 11. Camouflage, Dummy Aircraft, etc. | - | 146 | 29,727 | 107,542 | 7,359 | 279 | - | 145,053 |
| 12. Expeditions (Cape, Pacific, various.) | 3,831 | 18,367 | 37,035 | 59,295 | 55,802 | 43,224 | 37,304 | 254,858 |
| 13. Surveys & Investigations. | 7,957 | 6,441 | 18,412 | 21,218 | 10,058 | 4,747 | 3,792 | 72,625 |
| 14. Miscellaneous. | 7,621 | 29,680 | 100,446 | 57,118 | 30,064 | 16,887 | 6,969 | 248,785 |
| TOTALS | 1,488,475 | 1,790,876 | 2,418,466 | 5,497,506 | 2,137,000 | 822,555 | 399,555 | 14,500,000 |



4. WORKS FOR THE U. S. FORCES.

| | 1939-40 | 1940-41 | 1941-42 | 1942-43 | 1943-44 | 1944-45 | 1945-4 | TOTAL |
|---|---------|---------|---------|-----------|-----------|---------|---------|-----------|
| 1. Camps. | - | - | - | 1,325,807 | 934,583 | 152,194 | 48,982 | 2,461,566 |
| 2. Hospitals, and Convalescent Depots. | - | - | 40,291 | 466,833 | 1,012,899 | 303,878 | 43,505 | 1,867,406 |
| 3. Ammunition Stores and Magazines. | - | - | - | 176,709 | 72,238 | 7,694 | CR. 20 | 256,621 |
| 4. Office, Storage, and Workshops, etc. Accommodation (excluding capital cost of new stores). | - | - | - | 185,813 | 502,434 | 234,756 | 57,581 | 980,584 |
| 5. Ship Repairs. | - | - | - | 12,572 | 18,846 | 2,650 | 19 | 34,087 |
| 6. Huts and Buildings for the Pacific. | - | - | - | 29,117 | 36,951 | - | - | 66,068 |
| 7. Miscellaneous. | - | - | - | 116,937 | 39,284 | 14,197 | 1,381 | 171,799 |
| TOTALS | - | - | 40,291 | 2,313,788 | 2,617,235 | 715,369 | 151,448 | 5,838,131 |

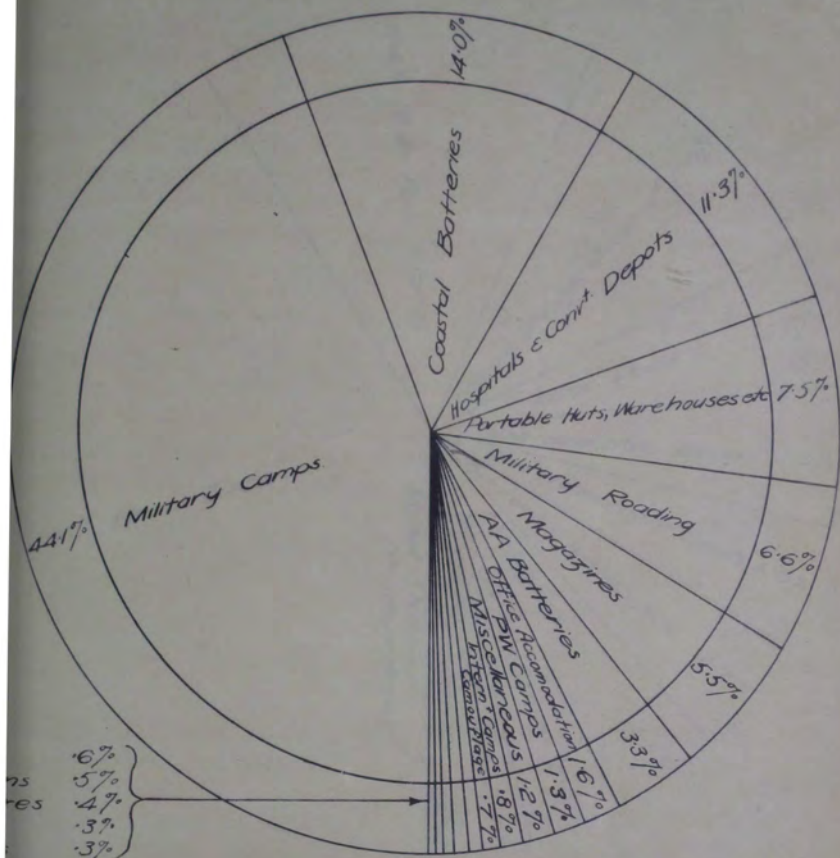


| 5. CIVIL DEFENCES & GENERAL. | 1939-40 | 1940-41 | 1941-42 | 1942-43 | 1943-44 | 1944-45 | 1945-46 | TOTAL |
|---|---------|---------|-----------|-----------|-----------|---------|---------|-----------|
| 1. Air Raid Shelters (erection and demolition). | - | - | 7,364 | 576,186 | 108,435 | 71,827 | 29,746 | 793,658 |
| 2. Splinter-proofing and Camouflaging of Bulk Fuel Tanks. | - | - | 101,665 | 252,589 | 14,286 | 60 | 3,076 | 371,676 |
| 3. Fire Fighting Equipment. | - | - | 42,583 | 154,855 | 125,220 | 6,295 | 499 | 329,452 |
| 4. Black-out of Government Buildings. | - | 13 | 6,882 | 25,038 | 1,588 | 2,048 | - | 35,569 |
| 5. Accommodation for Cheese Workers. | - | 10,000 | 69,936 | 43,997 | 4,695 | 11,418 | 559 | 140,605 |
| 6. Workers' Camps (defence, industrial, Mines, SVP, etc). | - | 3,956 | 6,756 | 55,693 | 110,451 | 49,859 | 9,375 | 236,090 |
| 7. New Storage Accommodation. | - | 18,827 | 66,003 | 490,195 | 766,374 | 332,319 | 79,910 | 1,753,628 |
| 8. Refugee Camps. | - | - | - | 12,621 | 8,808 | 130,359 | 34,563 | 186,351 |
| 9. Dehydration Factories. | - | - | - | - | 135,291 | 276,062 | 37,419 | 448,772 |
| 10. Linen Flax Factories. | 1,216 | 197,348 | 297,665 | 170,514 | 22,726 | 2,509 | 209 | 692,187 |
| 11. Munition Factories. | 87 | 20,701 | 21,951 | 165,652 | 59,201 | 16,982 | 347 | 284,921 |
| 12. Reserve Stocks. | 120,812 | 186,144 | 769,049 | 16,662 | 28,061 | 16,679 | 339 | 1,137,746 |
| 13. Miscellaneous. | - | - | 21,813 | 16,145 | 168,365 | 26,724 | 14,508 | 247,555 |
| TOTALS | 122,115 | 436,989 | 1,411,667 | 1,980,147 | 1,553,501 | 943,241 | 210,550 | 6,658,210 |



EXPENDITURE ON ARMY WORKS

1939-1946



TOTAL DEFENCE EXPENDITURE £47,466,202

Navy £3,458,499

7.3%

US Forces £5,838,131

12.3%

Civil and General £6,658,210

14.0%

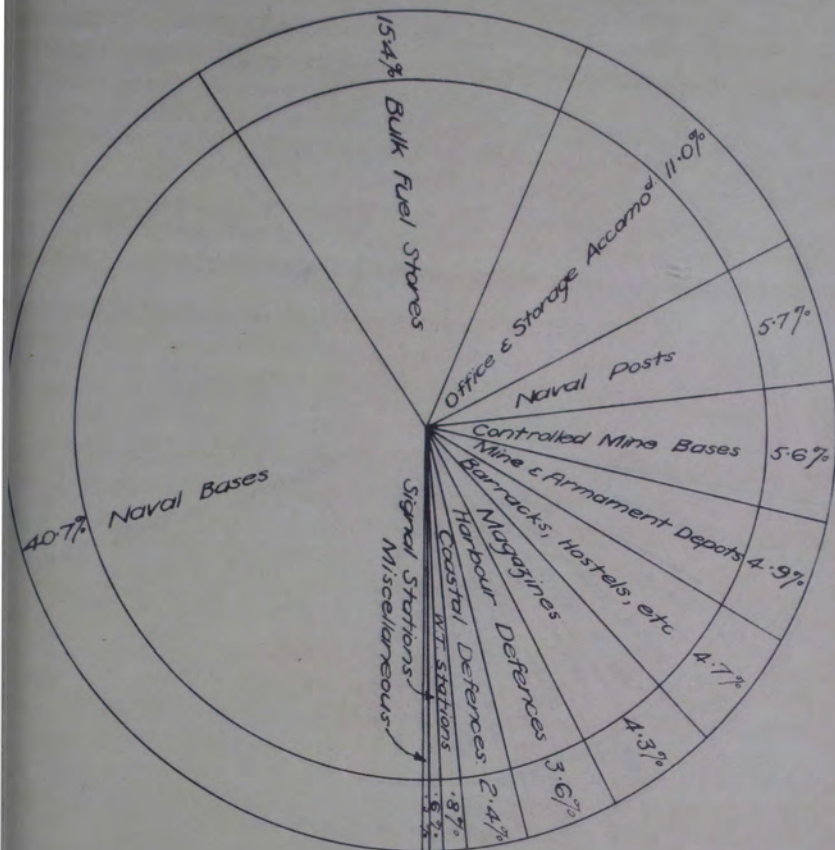
Air £14,376,583

30.3%

Army £17,134,779

36.1%

EXPENDITURE ON NAVY WORKS 1939-1946



TOTAL DEFENCE EXPENDITURE £47,466,202.

Navy £3,458,499

7.3%

U.S. Forces £5,838,131

12.3%

Civil and General £6,658,210

14.0%

Air £14,376,583

30.3%

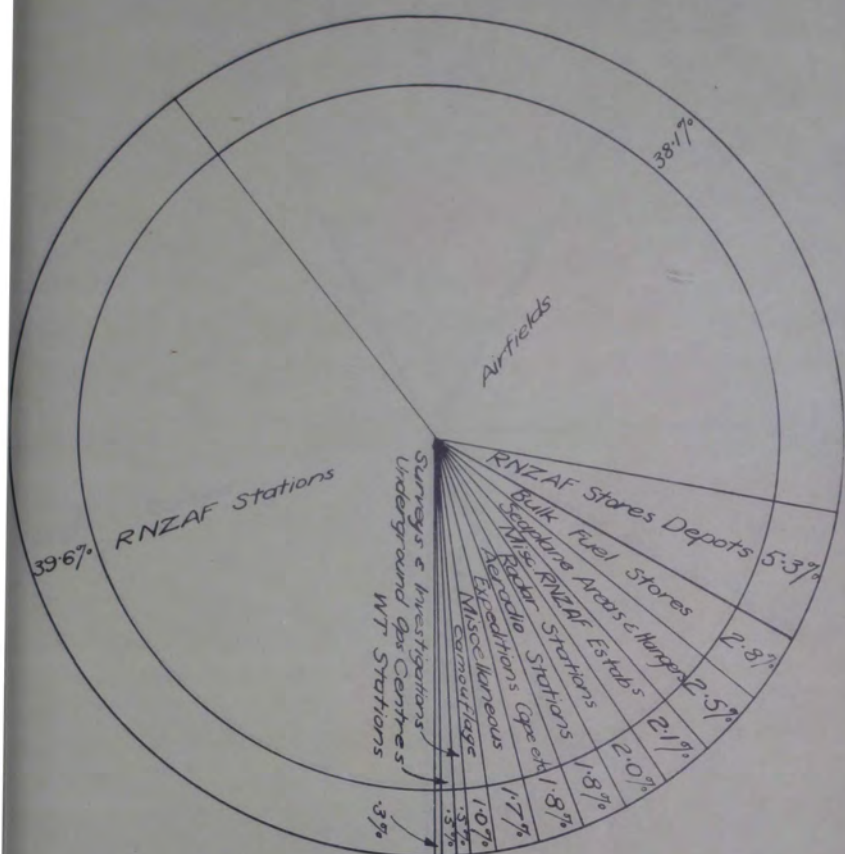
Army £17,134,779

36.1%



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EXPENDITURE ON WORKS FOR THE RNZAF 1939-1946.



TOTAL DEFENCE EXPENDITURE £47,466,202

Navy £3,458,499

US Forces £5,838,131

Civil and General £6,658,210

Air £14,376,583

Army

£17,134,779

7.3%

12.3%

14.0%

30.3%

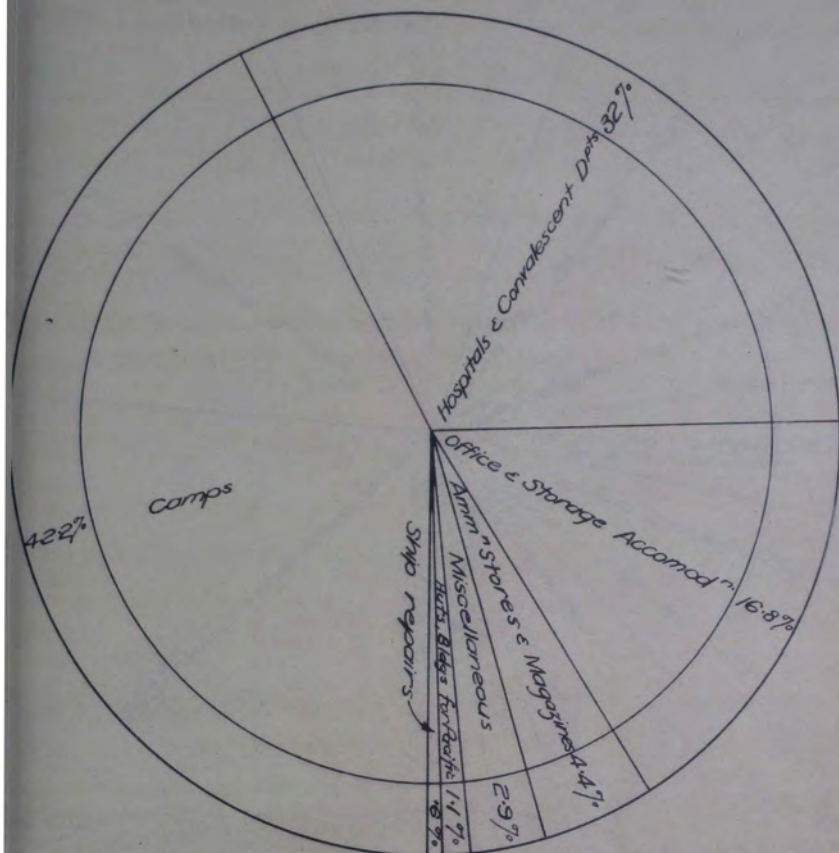
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STATE OF NEW YORK
IN SENATE
JANUARY 1, 1903.



REPORT OF THE
COMMISSIONER OF THE
LAND OFFICE
IN RESPONSE TO A
RESOLUTION PASSED
BY THE SENATE
JANUARY 1, 1903.

EXPENDITURE ON WORKS FOR THE US FORCES 1939-1946



TOTAL DEFENCE EXPENDITURE £47,466,202

Navy £3,458,499

7.3%

U.S. Forces

£5,838,131

12.3%

Civil and General

£6,658,210

14.0%

Air

£14,376,583

30.3%

Army

£17,134,779

36.1%

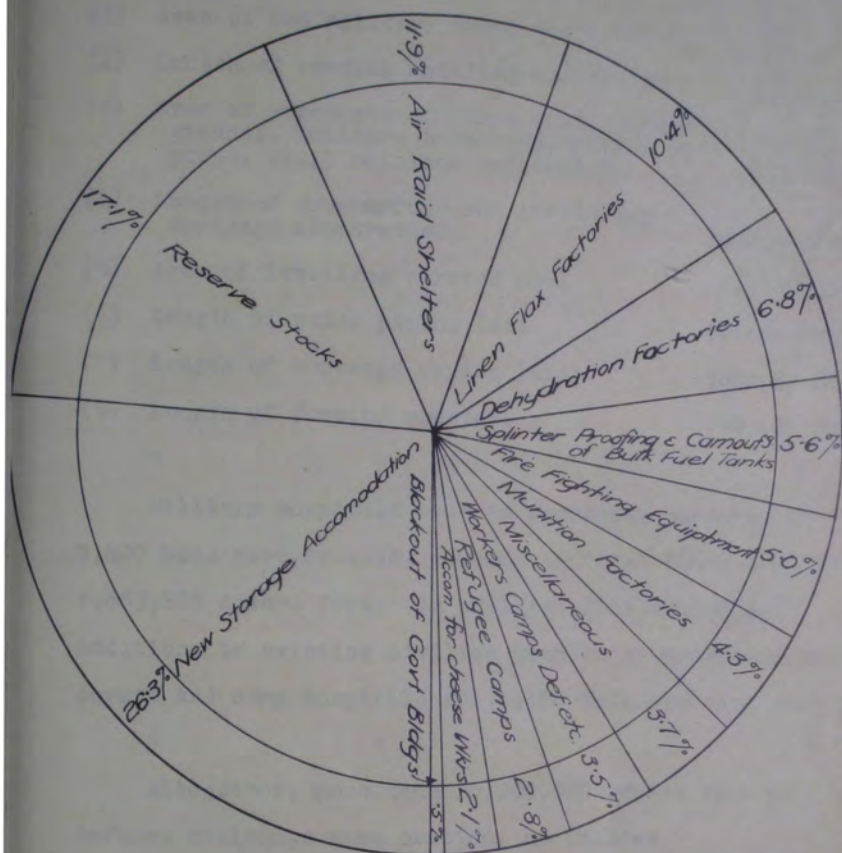
STATE OF NEW YORK

IN SENATE



REPORT OF THE
COMMISSIONER OF THE LAND OFFICE
IN RESPONSE TO A RESOLUTION
PASSED BY THE SENATE
MAY 18, 1884
ALBANY: J. B. LEECH, STATE PRINTER.
1885.

EXPENDITURE ON CIVIL DEFENCES AND GENERAL 1939-1946.



TOTAL DEFENCE EXPENDITURE £47,466,202

Navy £3,458,499

7.3%

US Forces £5,838,131

12.3%

Civil and General £16,658,210

44.0%

Air £14,376,583

30.3%

Army

£17,134,779

36.1%

4. STATISTICS OF DEFENCE ACTIVITIES.

The following figures relate to defence works other than aerodromes, and cover the period from the outbreak of war to 31 March 1946:

- (1) Area of new military camps constructed: 17,104 acres
- (2) Length of roading metalled and sealed: 292 miles
- (3) Area of precincts of camps (i.e. parade grounds, building surrounds, paths, gun parks, etc.) metalled and sealed: 604 acres
- (4) Length of sub-surface and stormwater drainage constructed: 144m. 50 chs.
- (5) Area of levelling carried out: 1,023 acres
- (6) Length of water piping laid: 301m. 66 chs.
- (7) Length of sewerage piping laid: 166m. 60 chs.
- (8) Length of fencing erected: 160m. 21 chs.

* * * *

Military hospitals with an aggregate capacity of 9,400 beds were erected, covering a total floor area of 1,863,285 square feet. In addition (but excluding additions to existing civilian hospitals) convalescent depots and camp hospitals for 1,100 patients were built.

* * * *

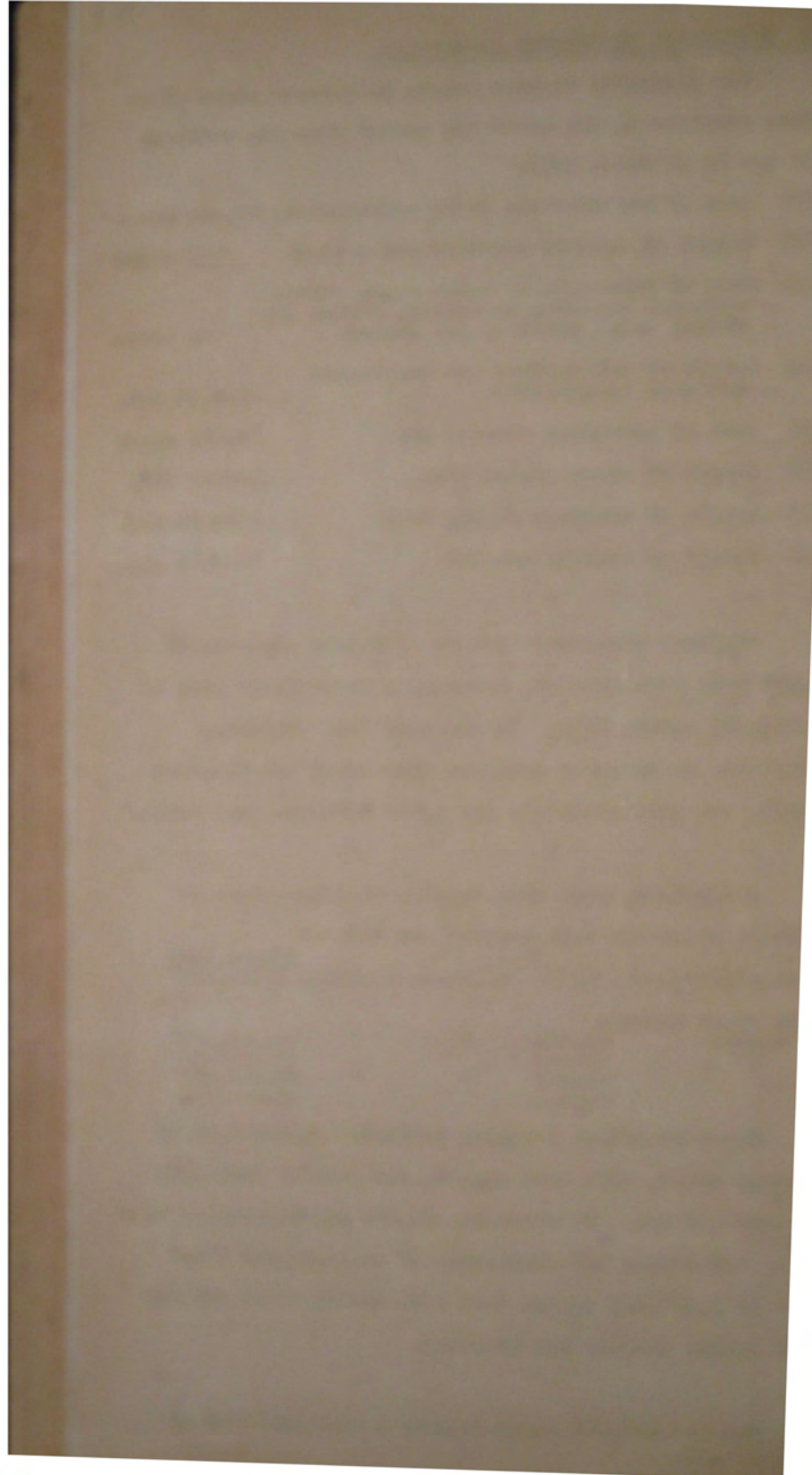
Altogether, more than 20,000,000 square feet of defence buildings were erected, as follows:

| | <u>square feet</u> | | |
|-------------------------|--------------------------|-----------|-------------------|
| On aerodromes: | 4,764 buildings covering | 5,393,008 | |
| On other defence works: | 28,296 | " " | 15,376,282 |
| | <u>33,060</u> | " " | <u>20,769,290</u> |

These buildings included 5,703,710 square feet of storage space, with rail access, and readily adaptable to post-war use. In addition, 28,885 pre-fabricated huts (2-4- and 8-men) and warehouses of an aggregate floor area of 3,506,240 square feet were manufactured for use both in New Zealand and overseas.

* * * *

The 382,147,000 super feet of timber utilised on



defence building construction would have been sufficient to build 37,241 houses.

Included in the Naval work carried out was the driving of 500,000 linial feet of piles, while the construction of one wharf alone absorbed 600,000 super feet of heavy timber.

The aerodrome construction programme commenced before the war. By 31 March 1945 the following stations had been completed and were in use.

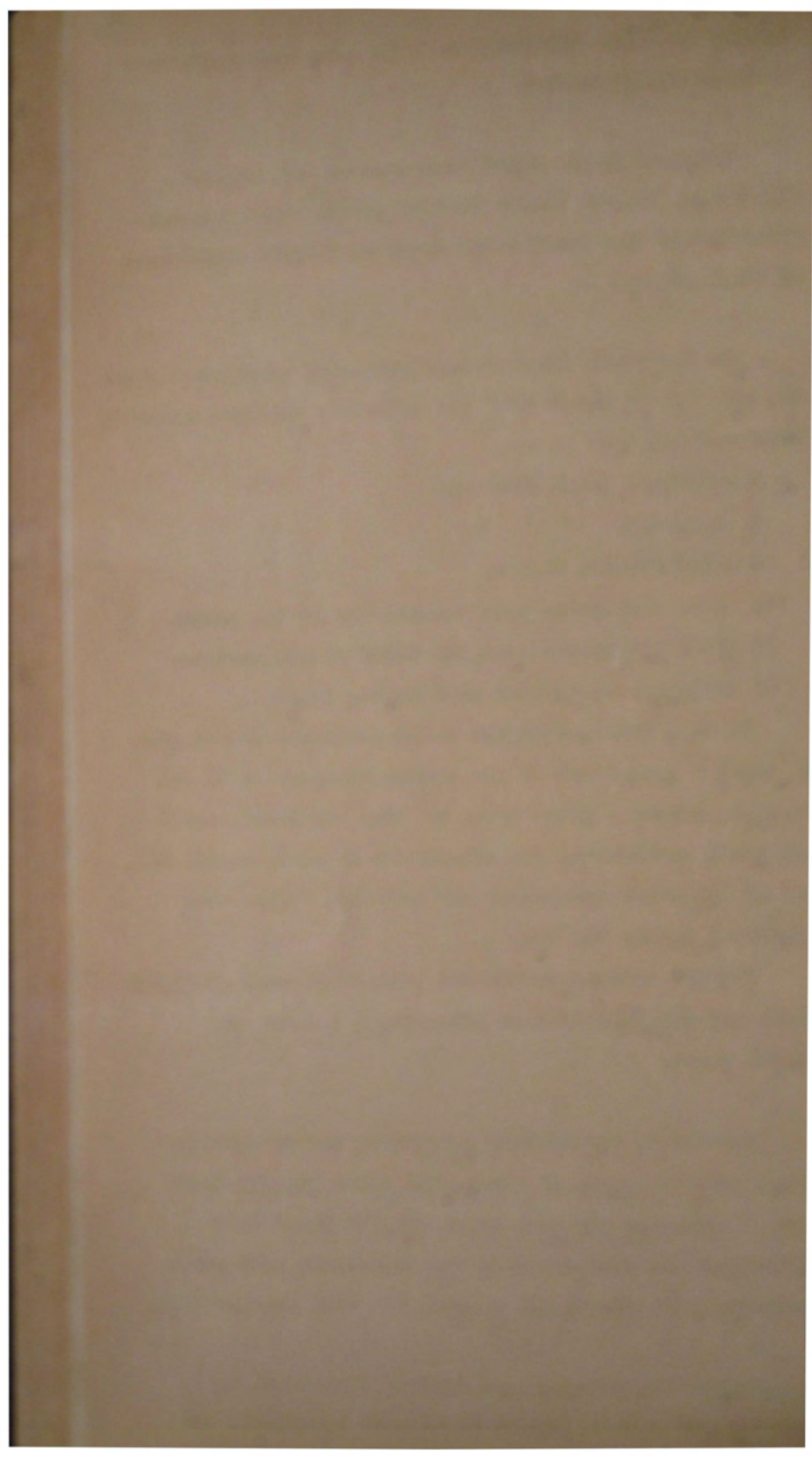
- 5 permanent RNZAF Stations.
- 5 temporary " "
- 8 RNZAF training fields.
- 14 civil aerodromes used temporarily by the RNZAF.
- 47 civil aerodromes used for RNZAF communications.
- 15 emergency aerodromes used by the RNZAF.

To this total of 94 New Zealand establishments must be added 6 aerodromes or air strips constructed in the Pacific, making a grand total of 100. Of these, three new civil aerodromes, ten extensions to civil aerodromes, and 13 temporary aerodromes and training fields were completed during the war.

The New Zealand aerodromes covered an area of 11,000 acres and the Pacific ones 700 acres - a total of 11,700 acres.

Runways on New Zealand aerodromes had an aggregate length of 175 miles, of which 10.4 miles (54,500 feet) were of concrete and 18.2 miles (96,000 feet) were stabilised and sealed. Even the remainder, with grass surfaces, were nearly all classed for 'all weather' use.

Sixty-five hangars were erected throughout the Dominion, of a total square footage of 1,643,632. Of



these, 238,000 square feet were of permanent concrete construction with clear spans of 220 feet.

* * *
Other details of work carried out on aerodromes included:

9,345 acres of ground levelled, drained, topsoiled, and grassed.

23 acres of concrete aprons laid.

123 technical and accommodation buildings erected.

10,774,959 cubic yards of material excavated.

254.36 chains of field tile drains laid.

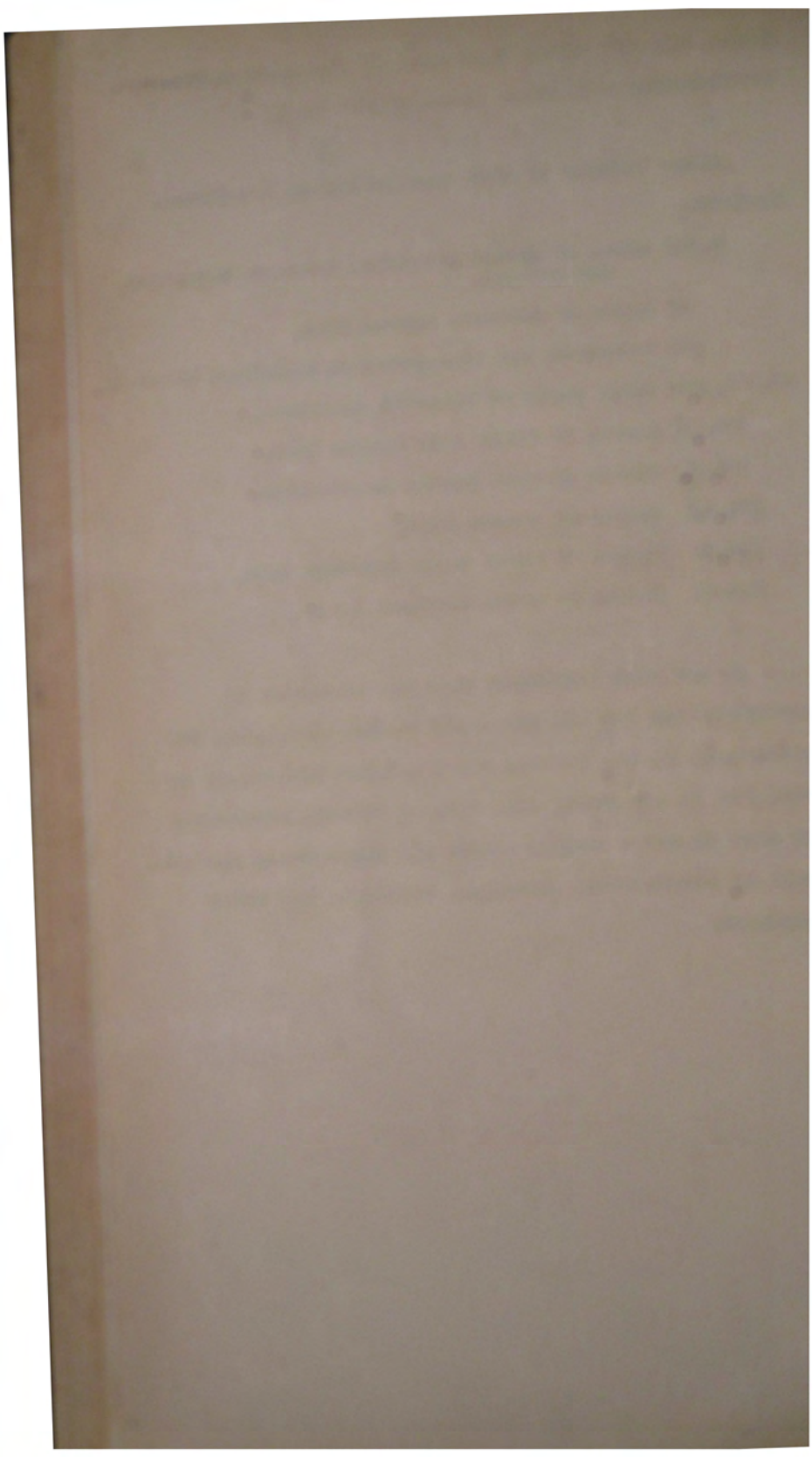
106.8 chains of open drains constructed.

39m.45 chains of sewers laid.

33m.30 chains of storm water drainage laid.

74m.53 chains of water services laid.

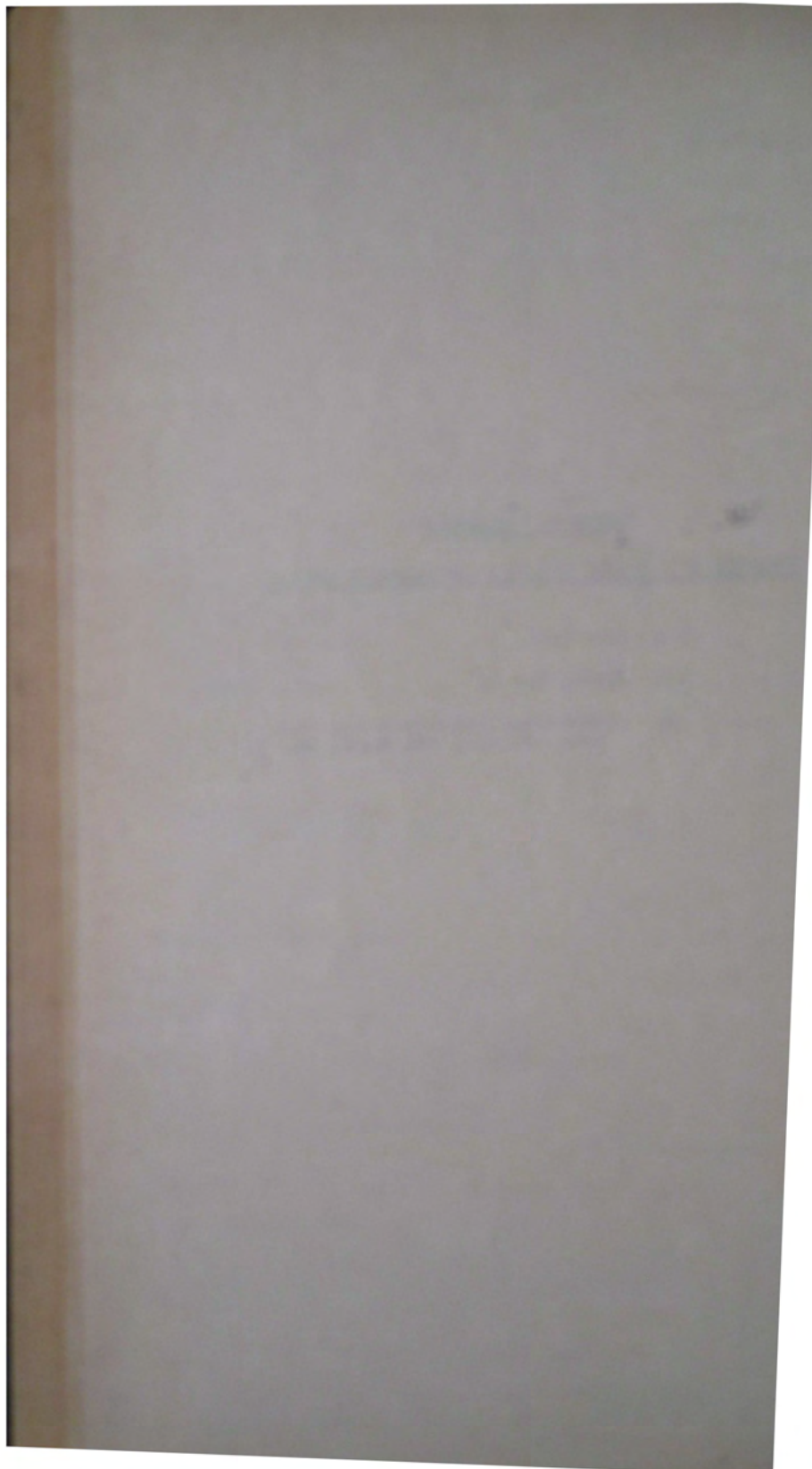
* * *
It has been estimated that the provision of accommodation for all the armed forces (including the Americans) in New Zealand was a project equivalent to building 17 new towns each with an average population of some 10,000 - complete with all engineering services such as electricity, sewerage, drainage, and water supplies.



PART 1. GENERAL

CHAPTER 3 : EARLY HISTORY OF DEFENCE WORKS.

- (1) Pre-1914.
- (2) World War I.
- (3) Peace-time Defence Works and
Preparedness for World War II.

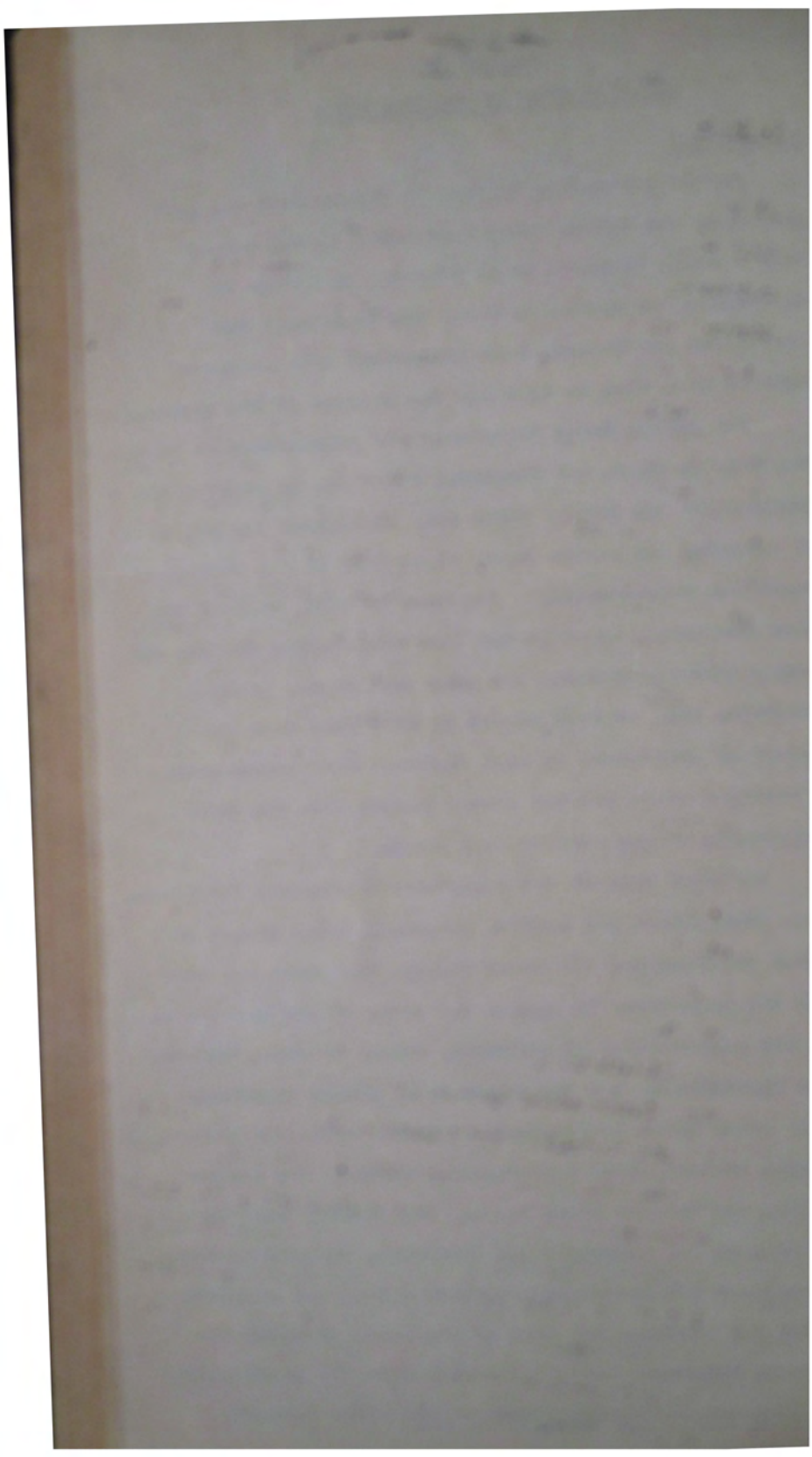


EARLY HISTORY OF DEFENCE WORKS.1. PRE-1914

Before proceeding to deal in detail with the part played by the Public Works Department in the war of 1939 - 1945, it might be of interest to review in retrospect the manner in which the Department has throughout its history been associated with measures adopted from time to time for the defence of the country.

The Public Works Department was established in 1870, the year in which the Fox-Vogel Ministry, by passing the Immigration and Public Works Act, introduced the policy of carrying out public works in advance of the colony's immediate requirements. Previous to this, each of the nine provincial councils had been responsible for its own public works programme, and only such roads, bridges, railways, etc. as were needed to keep pace with the spread of settlement in each district were constructed - a practice which did not always accord with the future well-being of the country as a whole.

Although some of the Department's original functions, e.g. immigration and working railways, later passed to other Departments, the trend through the years has been for the Department to expand the scope of its activities. To the construction of railways, roads, bridges, harbours and lighthouses, and the erection of public buildings, were later added hydro-electric development, irrigation, rivers control, land improvement, drainage and reclamation, and various other works. But notwithstanding changes in its structure and functions, the Public Works Department has always been entrusted with the responsibility for carrying out most of the works required for defence purposes, its relationship with the Armed Forces in this respect reaching back to the early days of colonisation.



Beginning in 1883, the New Zealand Government's expenditure on defence measures was recorded year by year in the Public Works Statement, under Votes entitled 'Contingent Defence' and 'Harbour Defences'. The former, although a Vote in the Public Works Fund, was controlled by the Minister of Defence and covered in addition to the cost of constructing drill halls, stores, rifle ranges, and similar types of buildings, all supplies required by the Armed Forces from arms and ammunition, clothing and equipment, to field batteries and mine laying vessels. Expenditure to 31 March 1881, when the Vote first appeared in the Public Works Fund, aggregated £259,000. By 31 March 1902, this had risen to £696,836, including an expenditure of £227,336 during 1889 - 1902, the years of the Boer War. The million mark was passed in 1915 - 16, although the Vote was from about 1910 onwards restricted to the construction of defence buildings, rifle ranges, etc., other charges having been transferred to a Defence Department Vote in the Consolidated Fund. The Vote 'Contingent Defence' was closed in 1930-31, the total expenditure recorded being £1,389,448, after allowing for credits in subsequent years.

As stated, this Vote was under the control of the Minister of Defence, and the only works carried out by the Public Works Department under its authority would be those undertaken at the specific request of the military authorities.

Harbour Defences. Up to the end of the financial year 1884-1885 a total of only £52,232 had been spent on the colony's harbour defences, but in his Statement for 1885 the then Minister of Public Works (the Hon. E. Richardson) reported to the House that 'at the end of March last it was considered advisable, owing to the threatened outbreak of war with Russia, to place the chief ports of the colony in a state of defence as far as the means at the disposal of the colony admitted, and to commence the

works were proceeded with vigorously, and in about three months the whole of the guns available in the colony were mounted, and the necessary magazines, stores, barracks, and enclosing parapets are now in a fair state of completion'. The Minister went on to detail the works undertaken for the protection of Auckland, Wellington, Lyttelton, and Port Chalmers, including the laying of submarine mines and the establishment of complete systems of torpedo defence.

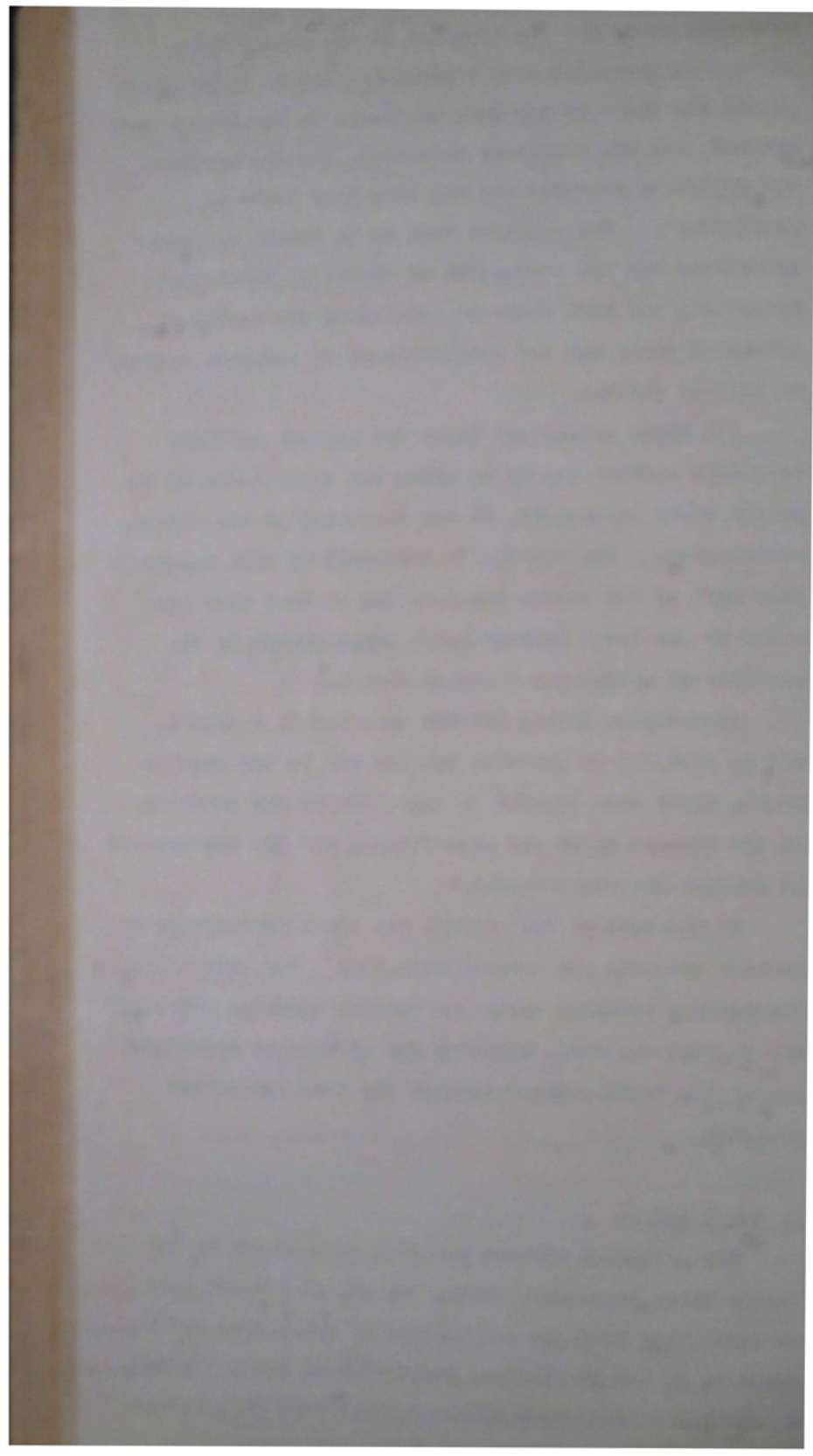
All works authorised under the Harbour Defences Vote were carried out by or under the supervision of the Public Works Department, at the direction of the military authorities. The Minister's Statement of 1886 records that much of the labour required was at that time provided by the Armed Constabulary, supplemented by the services of unemployed civilian workers.

Expenditure during 1885-86 amounted to £133,975, and to £148,705 in 1886-87, falling off in the ensuing years, which were devoted to improvements and additions to the various forts and mine-fields, and the construction of further gun emplacements.

At the turn of the century the total expenditure on harbour defences had reached £496,541. The last expenditure incurred under the heading 'Harbour Defences' was in 1917-18, when, allowing for credits in subsequent years, the total charged against the Vote aggregated £544,808.

2. WORLD WAR 1.

The principal defence projects carried out by the Public Works Department during the war of 1914-18 were in connection with the preparation of facilities for the training of the New Zealand Expeditionary Force. Prior to the war no permanent military camps were in existence in the Dominion, and training of the New Zealand



Expeditionary Force had at first to be carried out under canvas. Semi-permanent training centres were, however, soon established at Trentham, Featherston, Narrow Neck, Avondale, Awapuni, and Papawai, commencing as canvas camps and ultimately becoming hatted encampments equipped with all essentials for the instruction, accommodation, messing, and entertainment of the troops undergoing training.

The largest camps were at Trentham and Featherston, and it was in respect of the erection of these that the Public Works Department was mainly concerned. Until December, 1915, the bulk of the training of all arms was effected at Trentham, which accommodated a maximum of 4,500 men (with subsidiary canvas camps holding from 1,200 to 2,000 men). In January, 1916, the Featherston Camp was ready, with accommodation for 7,500 troops, 4,500 in hutments and 3,000 under canvas.

Trentham Camp. In his report to the Minister of Public Works in the Public Works Statement of 1916 the Engineer-in-Chief detailed the work carried out at Trentham Camp, comprising the erection of huts (70 men's and 16 officers') cookhouses, guard-rooms, orderly rooms, power houses, a boiler house, latrines, bathhouses, ablution stands, a disinfecter house, stores of various kinds, drying rooms, a dining room for the officers' mess, a chiropodist's hut, a dental surgery, a mortuary, a fire manual shed, and a brick incinerator. Extensive alterations had been made to other buildings. One hundred and ten chains of road formation and metalling had been carried out, also 150 chains of concrete channelling and 346 chains of open channelling. A 450,000 gallon reservoir had been provided, together with tanks for fire service, sewerage, and hospital purposes. Water reticulation involved the laying of 200 chains of piping, 121 chains of steel drainpipes, and nearly two miles of earthenware pipes.

The first part of the book is devoted to a general
introduction of the subject, and to a discussion of the
principles which govern the action of the mind.
The second part is devoted to a description of the
various faculties of the mind, and to a discussion of the
principles which govern their action.
The third part is devoted to a description of the
various passions of the mind, and to a discussion of the
principles which govern their action.
The fourth part is devoted to a description of the
various virtues of the mind, and to a discussion of the
principles which govern their action.
The fifth part is devoted to a description of the
various vices of the mind, and to a discussion of the
principles which govern their action.
The sixth part is devoted to a description of the
various diseases of the mind, and to a discussion of the
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The seventh part is devoted to a description of the
various remedies of the mind, and to a discussion of the
principles which govern their action.
The eighth part is devoted to a description of the
various effects of the mind, and to a discussion of the
principles which govern their action.
The ninth part is devoted to a description of the
various causes of the mind, and to a discussion of the
principles which govern their action.
The tenth part is devoted to a description of the
various consequences of the mind, and to a discussion of the
principles which govern their action.



AN EARLY VIEW OF TRENTHAM CAMP, AS IT APPEARED IN 1914.

Photographs of the Camp taken during World War II will be found in Part 2, Section 1.

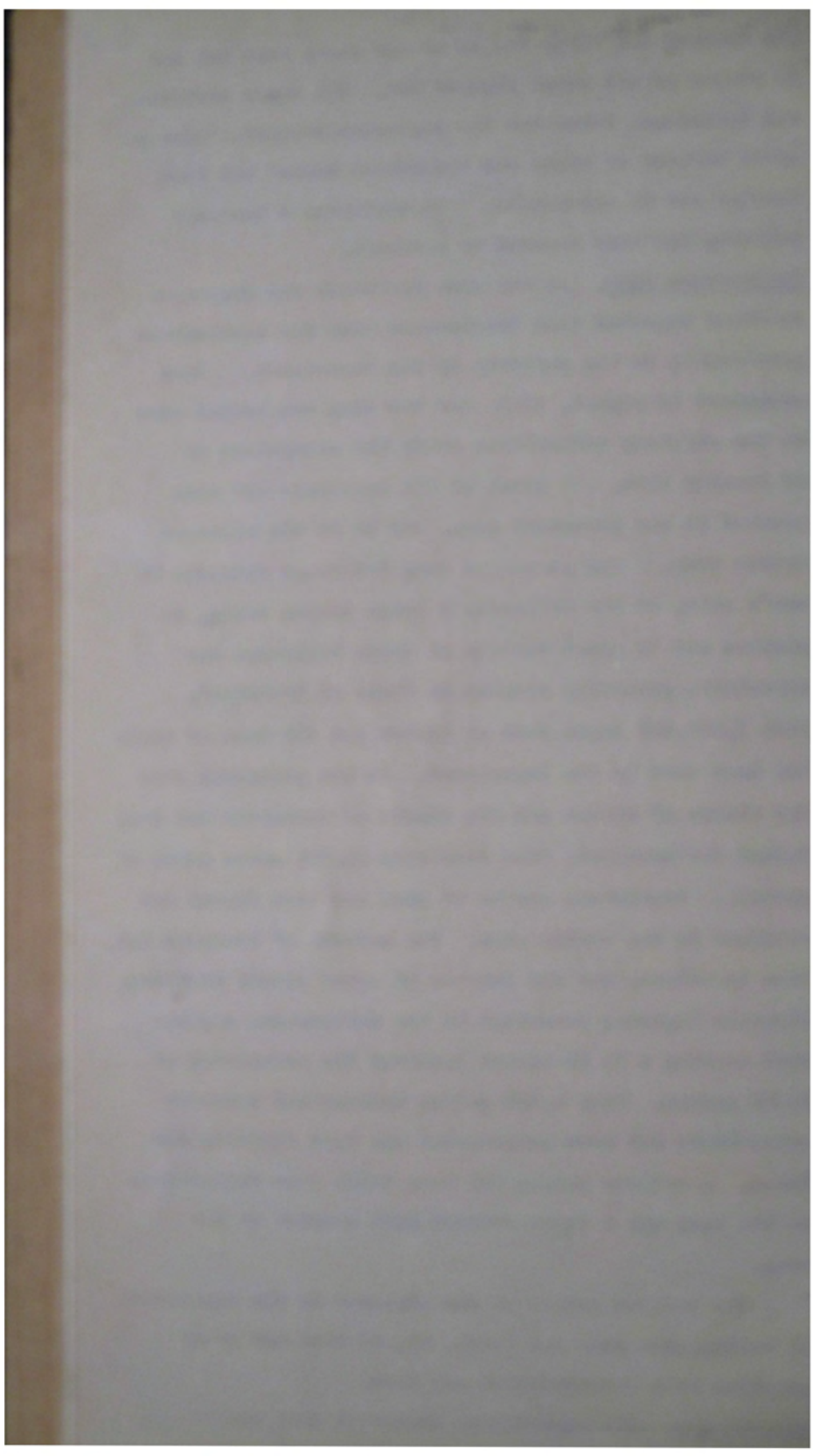


One hundred and fifty chains of new canal were cut and 50 chains of old canal cleaned out. All these services and buildings, commented the Engineer-in-Chief, 'also a great variety of minor and incidental works' had been carried out by day-labour. In addition, a hospital building had been erected by contract.

Featherston Camp. In the same Statement the Engineer-in-Chief reported that Featherston Camp was constructed practically in its entirety by the Department. Work commenced in August, 1915, and the camp was handed over to the military authorities ready for occupation on 25 January 1916. A total of 233 buildings had been erected in the permanent camp, and 19 in the adjacent canvas camp. The permanent camp buildings included 90 men's huts, 16 for officers, 8 large dining halls, 20 stables and 'a great variety of other buildings and structures generally similar to those at Trentham'. Over 3,000,000 super feet of timber and 27½ tons of nails had been used by the Department. In the permanent camp 24½ chains of street and 20½ chains of footpaths had been formed and metalled, this requiring 23,000 cubic yards of gravel. Twenty-six chains of road had been formed and metalled in the canvas camp. Two systems of drainage had been installed, and two sources of water supply provided. Electric lighting generated by two suction-gas engines each driving a 75 KW dynamo involved the connecting of 2,300 points. Nine 6,000 gallon underground concrete water-tanks had been constructed for fire fighting purposes. A railway siding had been built from Featherston to the camp and a large station yard erected at the camp.

The maximum number of men employed by the Department at Featherston camp was 1,050, all of whom had to be provided with accommodation and food.

Expenditure. All expenditure connected with the





THE FEATHERSTON CAMP OF WORLD WAR I.

TOP : Under canvas. MIDDLE : Just after the camp had been taken over by the army in Feb 1916 LOWER : A closer view of the camp buildings





establishment of training camps for the 1st New Zealand Expeditionary Force was charged against a War Expenses Account (as in World War II). The precise amount spent by the Public Works Department out of this Account is not recorded, but the total nett expenditure on military camps in New Zealand reached £1,212,455.4.9. (1) of which Trentham and Featherston each cost upwards of £300,000. The provision of hospitals and sanatoria also involved considerable expenditure, the hospital building at Trentham alone costing £7,195.10.8. (2).

In addition, drill halls, barracks, defence offices, and similar buildings and works continued to be erected and maintained out of Vote: Defence in the Public Works Fund.

Roll of Honour, 1914-1918. Of a total permanent staff of about 650, 202 joined the New Zealand Expeditionary Force. The casualties were: Killed in action nine, died of wounds ten, died of sickness two, missing one, wounded 64, gassed one. Decorations awarded comprised three DSO.s, six MC.s, two DCM.s, and one MM, while six men gained other distinctions.

3. PEACE-TIME DEFENCE WORKS AND PREPAREDNESS FOR WORLD WAR II.

In the years between the two World Wars the Public Works Department continued to act as the constructional agency of the Service Departments. Works in the 'twenties were confined mainly to the erection of stores buildings, magazines, drill halls, rifle ranges, etc. for the Army, as well as repairs, alterations, and renovations to existing structures.

Buildings at Featherston Camp were dismantled and re-erected as drill halls, stores, and miniature rifle ranges at various towns, and were also put to use for

(1) Appendix III to Report on Defence Forces of NZ, 1925.
(2) Ibid.

The first part of the paper discusses the importance of the study of the history of the United States. It is pointed out that the study of history is not only a means of understanding the past, but also a means of understanding the present and the future. The author argues that the study of history is essential for the development of a nation and for the well-being of its people.

The second part of the paper discusses the role of the government in the development of the United States. It is pointed out that the government has played a major role in the development of the country, and that its actions have shaped the course of history. The author argues that the government should continue to play a role in the development of the country, and that its actions should be guided by the principles of justice and fairness.

The third part of the paper discusses the role of the individual in the development of the United States. It is pointed out that the actions of individuals have shaped the course of history, and that the individual has a responsibility to contribute to the development of the country. The author argues that the individual should be encouraged to exercise his or her rights and responsibilities, and that the government should protect these rights and responsibilities.

The fourth part of the paper discusses the role of the future in the development of the United States. It is pointed out that the future is uncertain, and that the actions of the present will shape the future. The author argues that the future should be planned for, and that the actions of the present should be guided by the principles of justice and fairness.

The fifth part of the paper discusses the role of the United States in the world. It is pointed out that the United States has a responsibility to lead the world, and that its actions should be guided by the principles of justice and fairness. The author argues that the United States should continue to play a role in the world, and that its actions should be guided by the principles of justice and fairness.

Sanitorium.

A new mobilisation base and training camp at Ngaruawahia was erected for the Northern Command between 1925 and 1929. This included a large ordnance depot which enabled stores at Featherston to be transferred, and facilitated the final closing-down of that camp.

The camps at Burnham and Trentham were improved and extended and other camps and forts maintained and added to from time to time.

Oil storage tanks of a total capacity of 10,000 tons were erected for the Navy near Galliope Dock in 1925-26.

Destined to become a most important part of the Dominion's defence works programme, the construction of aerodromes and flying fields commenced from 1923 onwards, when the Department undertook the development of a military aerodrome at Hobsonville as a combined aeroplane and seaplane base. By 1929 the aeroplane landing field and its hangar (with all necessary buildings and services) had been completed and put into use, and work was proceeding on the provision of two seaplane hangars.

Defence works of all description were restricted to bare essentials during the depression of the early 1930's, except that in September, 1930, a scheme for the establishment of a chain of landing grounds throughout the country had been approved by the Government, and the Public Works Department was charged with the responsibility for undertaking the survey and construction work involved 'using unemployed labour wherever possible'. The earliest military aerodromes (following on Hobsonville) were Wigram, where work commenced in 1934 and Ohakea, selected as a site in 1937. By 1938 Wigram was being developed as a flying training school, Hobsonville as an aircraft base and repair depot, and construction had commenced on new operations stations at Ohakea and Whenuapai.

the first of these was the discovery of gold in California in 1848. This discovery led to a great influx of people to California, and the state became a free state in 1850. The second of these was the discovery of gold in Nevada in 1859. This discovery led to a great influx of people to Nevada, and the state became a free state in 1864. The third of these was the discovery of gold in Colorado in 1858. This discovery led to a great influx of people to Colorado, and the state became a free state in 1876. The fourth of these was the discovery of gold in Idaho in 1860. This discovery led to a great influx of people to Idaho, and the state became a free state in 1890. The fifth of these was the discovery of gold in Montana in 1862. This discovery led to a great influx of people to Montana, and the state became a free state in 1889. The sixth of these was the discovery of gold in Wyoming in 1869. This discovery led to a great influx of people to Wyoming, and the state became a free state in 1890. The seventh of these was the discovery of gold in Utah in 1871. This discovery led to a great influx of people to Utah, and the state became a free state in 1896. The eighth of these was the discovery of gold in Arizona in 1876. This discovery led to a great influx of people to Arizona, and the state became a free state in 1909. The ninth of these was the discovery of gold in New Mexico in 1878. This discovery led to a great influx of people to New Mexico, and the state became a free state in 1906. The tenth of these was the discovery of gold in Texas in 1884. This discovery led to a great influx of people to Texas, and the state became a free state in 1845. The eleventh of these was the discovery of gold in Louisiana in 1885. This discovery led to a great influx of people to Louisiana, and the state became a free state in 1812. The twelfth of these was the discovery of gold in Mississippi in 1886. This discovery led to a great influx of people to Mississippi, and the state became a free state in 1817. The thirteenth of these was the discovery of gold in Alabama in 1887. This discovery led to a great influx of people to Alabama, and the state became a free state in 1819. The fourteenth of these was the discovery of gold in Georgia in 1888. This discovery led to a great influx of people to Georgia, and the state became a free state in 1788. The fifteenth of these was the discovery of gold in Florida in 1889. This discovery led to a great influx of people to Florida, and the state became a free state in 1822. The sixteenth of these was the discovery of gold in South Carolina in 1890. This discovery led to a great influx of people to South Carolina, and the state became a free state in 1776. The seventeenth of these was the discovery of gold in North Carolina in 1891. This discovery led to a great influx of people to North Carolina, and the state became a free state in 1776. The eighteenth of these was the discovery of gold in Virginia in 1892. This discovery led to a great influx of people to Virginia, and the state became a free state in 1776. The nineteenth of these was the discovery of gold in Maryland in 1893. This discovery led to a great influx of people to Maryland, and the state became a free state in 1776. The twentieth of these was the discovery of gold in Delaware in 1894. This discovery led to a great influx of people to Delaware, and the state became a free state in 1776. The twenty-first of these was the discovery of gold in Pennsylvania in 1895. This discovery led to a great influx of people to Pennsylvania, and the state became a free state in 1776. The twenty-second of these was the discovery of gold in New Jersey in 1896. This discovery led to a great influx of people to New Jersey, and the state became a free state in 1776. The twenty-third of these was the discovery of gold in New York in 1897. This discovery led to a great influx of people to New York, and the state became a free state in 1776. The twenty-fourth of these was the discovery of gold in Connecticut in 1898. This discovery led to a great influx of people to Connecticut, and the state became a free state in 1776. The twenty-fifth of these was the discovery of gold in Rhode Island in 1899. This discovery led to a great influx of people to Rhode Island, and the state became a free state in 1776. The twenty-sixth of these was the discovery of gold in Massachusetts in 1900. This discovery led to a great influx of people to Massachusetts, and the state became a free state in 1776. The twenty-seventh of these was the discovery of gold in Vermont in 1901. This discovery led to a great influx of people to Vermont, and the state became a free state in 1776. The twenty-eighth of these was the discovery of gold in New Hampshire in 1902. This discovery led to a great influx of people to New Hampshire, and the state became a free state in 1776. The twenty-ninth of these was the discovery of gold in Maine in 1903. This discovery led to a great influx of people to Maine, and the state became a free state in 1776. The thirtieth of these was the discovery of gold in New Brunswick in 1904. This discovery led to a great influx of people to New Brunswick, and the state became a free state in 1776. The thirty-first of these was the discovery of gold in Nova Scotia in 1905. This discovery led to a great influx of people to Nova Scotia, and the state became a free state in 1776. The thirty-second of these was the discovery of gold in Prince Edward Island in 1906. This discovery led to a great influx of people to Prince Edward Island, and the state became a free state in 1776. The thirty-third of these was the discovery of gold in Newfoundland in 1907. This discovery led to a great influx of people to Newfoundland, and the state became a free state in 1776. The thirty-fourth of these was the discovery of gold in the British Isles in 1908. This discovery led to a great influx of people to the British Isles, and the state became a free state in 1776. The thirty-fifth of these was the discovery of gold in the rest of the world in 1909. This discovery led to a great influx of people to the rest of the world, and the state became a free state in 1776.

1930 that the Aerodromes Branch of the Public Works Department was established to work in conjunction with the civilian and military aviation authorities.

By 1939, records the Public Works Statement of that year, special urgency had been accorded the expansion of RNZAF Stations, including the erection of increased accommodation - both residential and technical - at existing stations and the provision of a number of new stations.

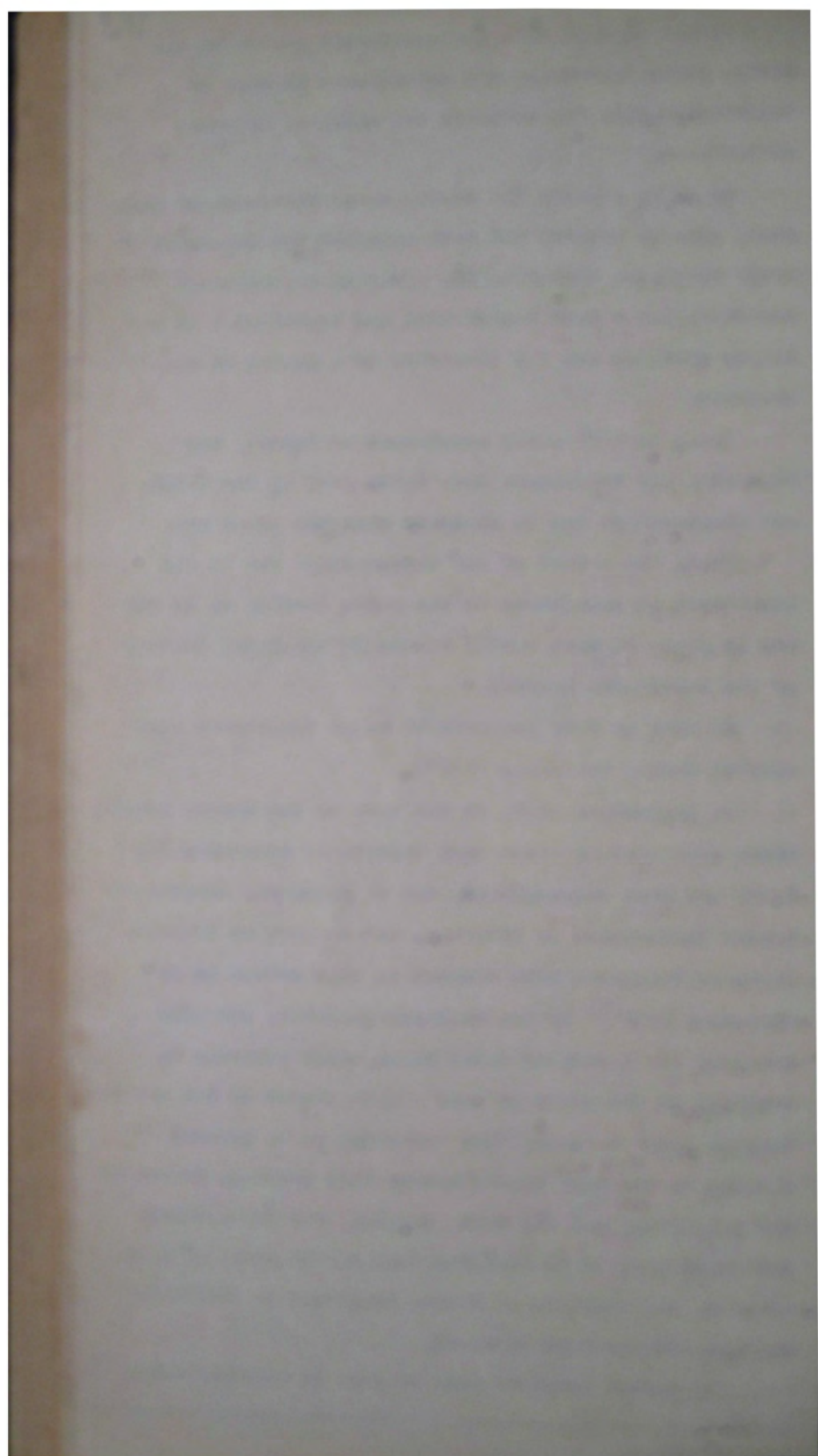
Early in 1939 civil aerodromes at Taieri, New Plymouth, and Woodbourne were taken over by the RNZAF, and construction was in progress when war broke out.

(N.B. The extent of the work carried out by the Department on aerodromes in the years leading up to the war is given in more detail in the Official War History of the Aerodromes Branch).

No Army or Navy projects of major importance were started during the early 1930's.

In September, 1938, at the time of the Munich crisis, three mobilisation bases each capable of accommodating 8,000 men were contemplated, one at Papakura, another at either Featherston or Trentham, and a third at Burnham. District Engineers were advised to this effect on 29 September 1938⁽¹⁾ by the Engineer-in-Chief, who also outlined the aerodrome works which would probably be required in the event of war. 'With regard to the mobilisation base' he said, 'the intention is to proceed firstly as the most urgent matter with roading, formation and metalling, and the water supply. For the accommodation of men, it is realised that canvas camps will be erected, the erection of wooden buildings to follow as defence requirements dictate'.

The matter remained more or less in abeyance until



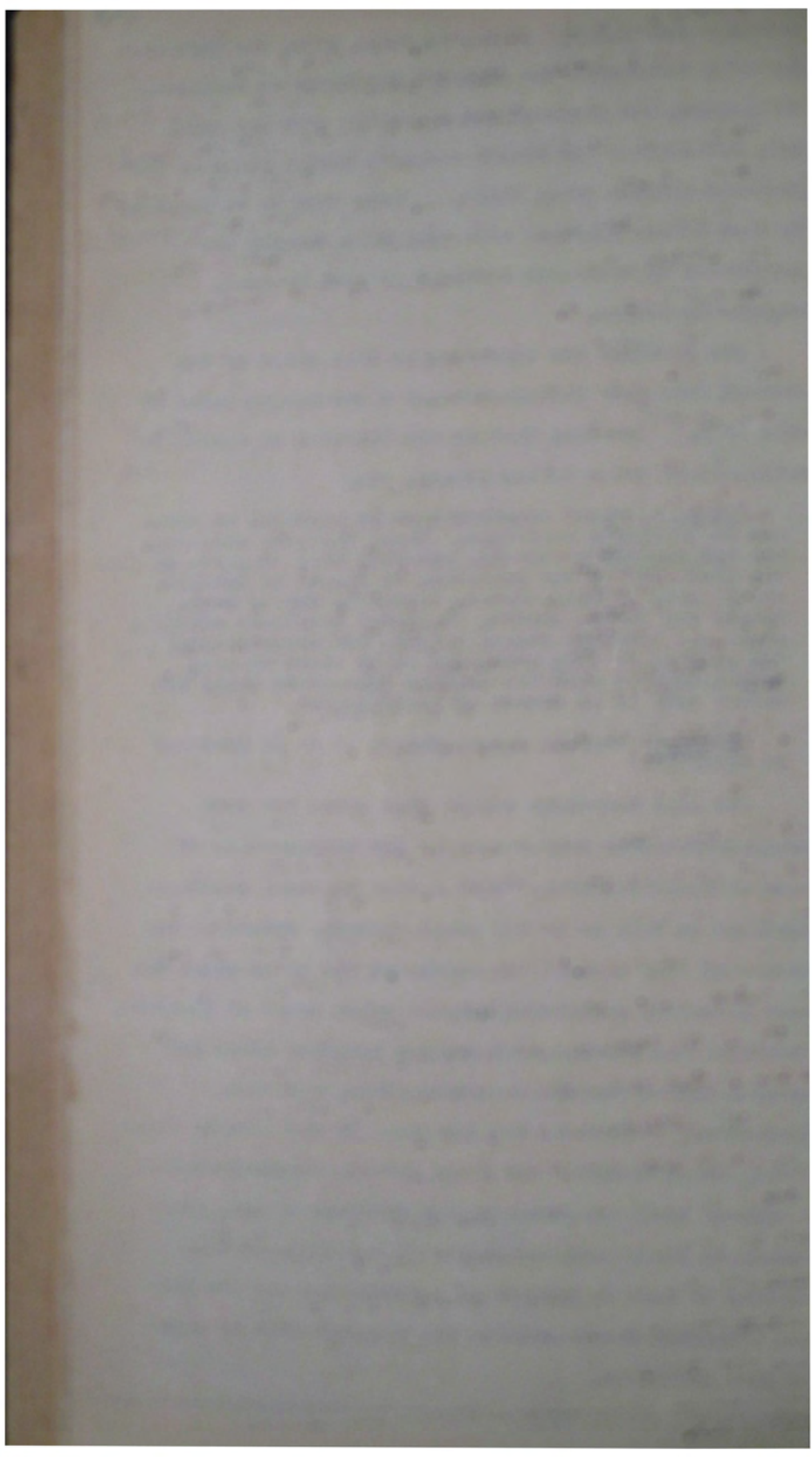
nearly a year later. Then, in July, 1939, the Engineer-in-Chief instructed the District Engineers at Auckland, Wellington, and Christchurch to confer with the local Army authorities and obtain complete layout plans of the proposed brigade group camps. These were to be supplied to Head Office together with schedules showing the quantities of materials involved in each project, especially timber.

The position was clarified at this stage by the receipt from Army Headquarters of a memorandum dated 19 July 1939, ⁽¹⁾ stating that it was intended to establish mobilisation bases in two phases, viz:

'Phase 1, where accommodation is provided in tents and in available buildings. Where suitable buildings are not already available, priority will be given to the provision of the following at places of mobilisation: main office, stores, hospital, drying room, tables and forms, cooking shelters, latrines, ablution sheds and benches, shower houses, and incinerators. The purpose of this provision is to carry on camp administration with the minimum discomfort while the hatted camp is in course of construction.

'Phase 2, wherein accommodation is to be provided in hutments.'

The Army Secretary stated that sites for each mobilisation base were chosen by the headquarters of each military district, 'with a view to their strategic location as well as to the usual features affecting the choice of camp sites.' He mentioned the sites which had been selected, comprising brigade group camps at Papakura, Trentham, and Burnham, and smaller training camps for mounted rifles regiments at Silverdale, Clevedon, Pahautanui, Addington, and Dunedin. In addition to these camps, which were for the field forces, accommodation on a reduced scale was required for fortress troops, although in their case the essential buildings already existed or were in process of construction and all that was necessary was to enlarge the accommodation as soon as time permitted.



The Army Secretary went on to say that each military district had been made responsible for the lay-out of its own phase one (canvas) camp. Plans of some of the key buildings needed for phase one had been prepared at Army Headquarters, and were being distributed to military districts and to the Public Works Department. Sets of drawings of military buildings with typical camp lay-outs, relating to phase two, had also been deposited by Army Headquarters with the Government Architect, but as these were based on English designs it was realised that most of them would be unsuitable unless revised to meet local conditions.

The Army Secretary stated that the canvas camps would require temporary services in the nature of roads, water, and electric power, and that schemes for the provision of these would best be drawn up by the Public Works Department on the lay-outs prepared by military districts.

With regard to phase two, continued Army's memorandum, no action thus far had been asked of military districts other than the setting aside of an area. The general principles to be observed in connection with a hatted camp were, from the military point-of-view: (a) each unit should be self-contained with its own parade ground and vehicle park, the area depending of course on the size of the unit, and (b) great care must be exercised in the lay-out of traffic circuits, in order to prevent congestion.

'As the construction of these camps will be in the hands of the Public Works Department' commented the Army Secretary, 'it is considered that the only satisfactory system of preparing the organisation for carrying out the work expeditiously will be for the Public Works Department to assume the entire responsibility of laying-out camps and designing the buildings in co-operation, of

The first part of the paper discusses the importance of the study of the history of the United States. It is argued that a knowledge of the past is essential for a full understanding of the present. The author then proceeds to a detailed examination of the early years of the Republic, from the time of the signing of the Declaration of Independence to the end of the War of 1812. This section covers the political, economic, and social developments of the period, and the role of the various states in the formation of the new nation.

The second part of the paper deals with the period from 1812 to 1860. This was a time of great change and growth for the United States. The author examines the expansion of the territory, the development of the economy, and the increasing tensions between the North and the South. The role of the federal government in these developments is also discussed. The section concludes with a discussion of the events leading up to the Civil War.

The third part of the paper covers the period from 1860 to 1890. This was a time of rapid industrialization and the growth of the United States as a world power. The author discusses the economic changes, the expansion of the railroad system, and the development of the West. The role of the federal government in these developments is also discussed. The section concludes with a discussion of the events leading up to the Spanish-American War.

The fourth part of the paper covers the period from 1890 to the present. This was a time of continued growth and change for the United States. The author discusses the economic changes, the expansion of the United States into the Pacific, and the development of the United States as a world power. The role of the federal government in these developments is also discussed. The section concludes with a discussion of the events leading up to the present.

requirements.'

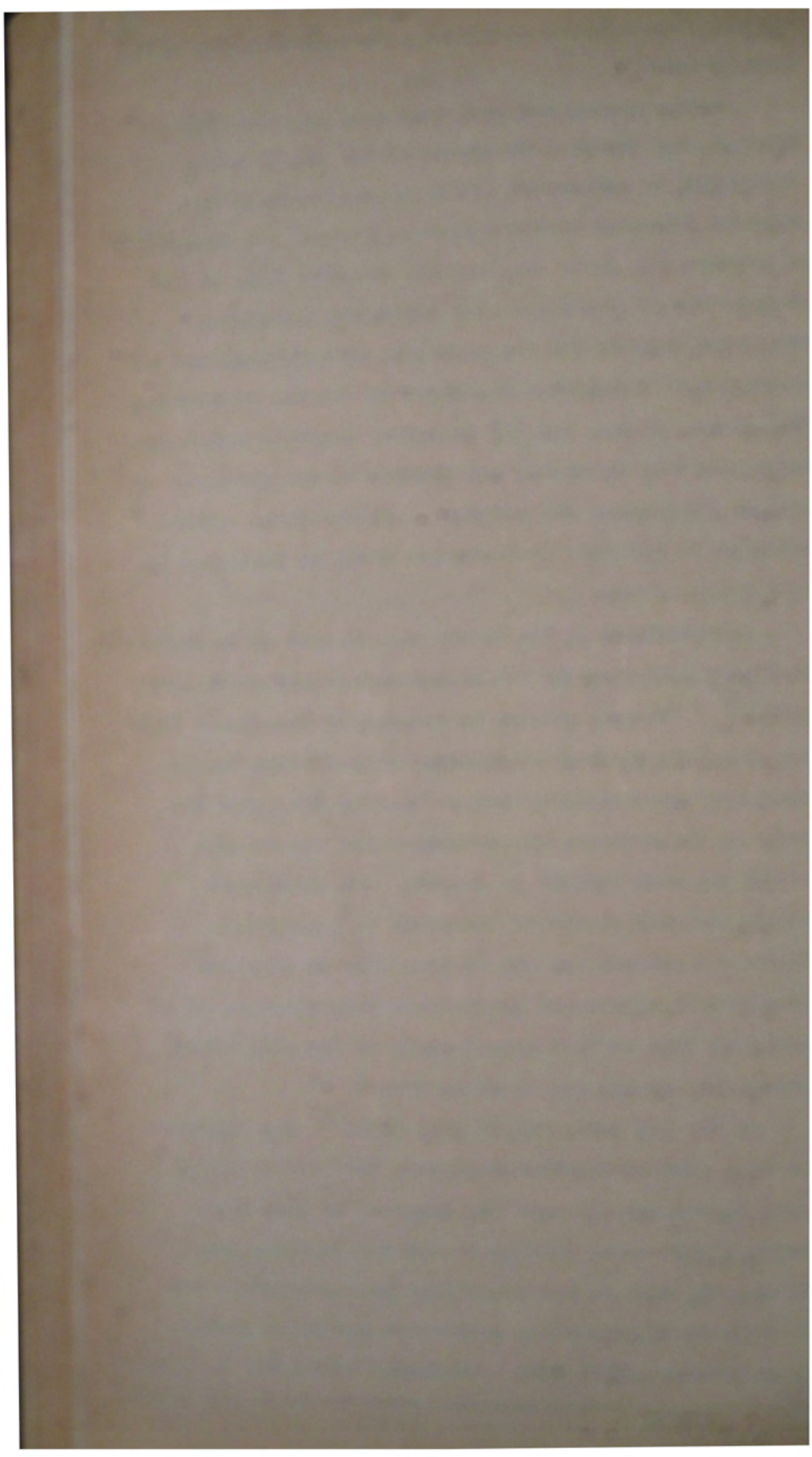
In conclusion, the Army Secretary specifically requested that District Engineers of the Public Works Department be instructed (1) to co-operate with the relevant district military headquarters in the preparation of schemes for phase one, and (2) to undertake, in the preparation of phase two: (a) surveying the sites, preparing schemes for the provision of services, and co-operating with military districts in the use of existing buildings, if any, and (b) designing suitable buildings, arranging camp lay-outs, and organising the provision of building materials and labour. All necessary information as to military requirements would be furnished by Army Headquarters.

Instructions in the matter were passed on to District Engineers concerned by the Engineer-in-Chief on 25 July 1939.⁽¹⁾ 'Please arrange to proceed in accordance with the proposals in Army Headquarter's memorandum for the necessary engineering investigations in the field and study of the organisation necessary for the erection should the time arrive' he stated. He added that recommendations should be submitted to Head Office if District Engineers thought it desirable to purchase materials in advance of prospective requirements, or if they felt that certain urgent works on the camp sites 'should be carried out in peace time.'

On the following day, 26 July 1939,⁽²⁾ the Engineer-in-Chief advised District Engineers that the building plans in respect of phase two supplied by Army Headquarters were being amended in the Public Works Head Office, but that as submitted they were sufficient for the purpose of estimating quantities and other preliminary action. Sets were accordingly being sent to each

(1) 23/112 P.1.

(2) Ibid.



he emphasised that careful attention must be given to arrangements for sanitation, cooking, heating, lighting, drying, bathing (including provision of hot water), and laundering, firstly in regard to phase one and secondly for phase two. 'Naturally' he remarked 'all these matters will as far as desirable be subjects of conference between district commands and district offices of the Public Works Department.'

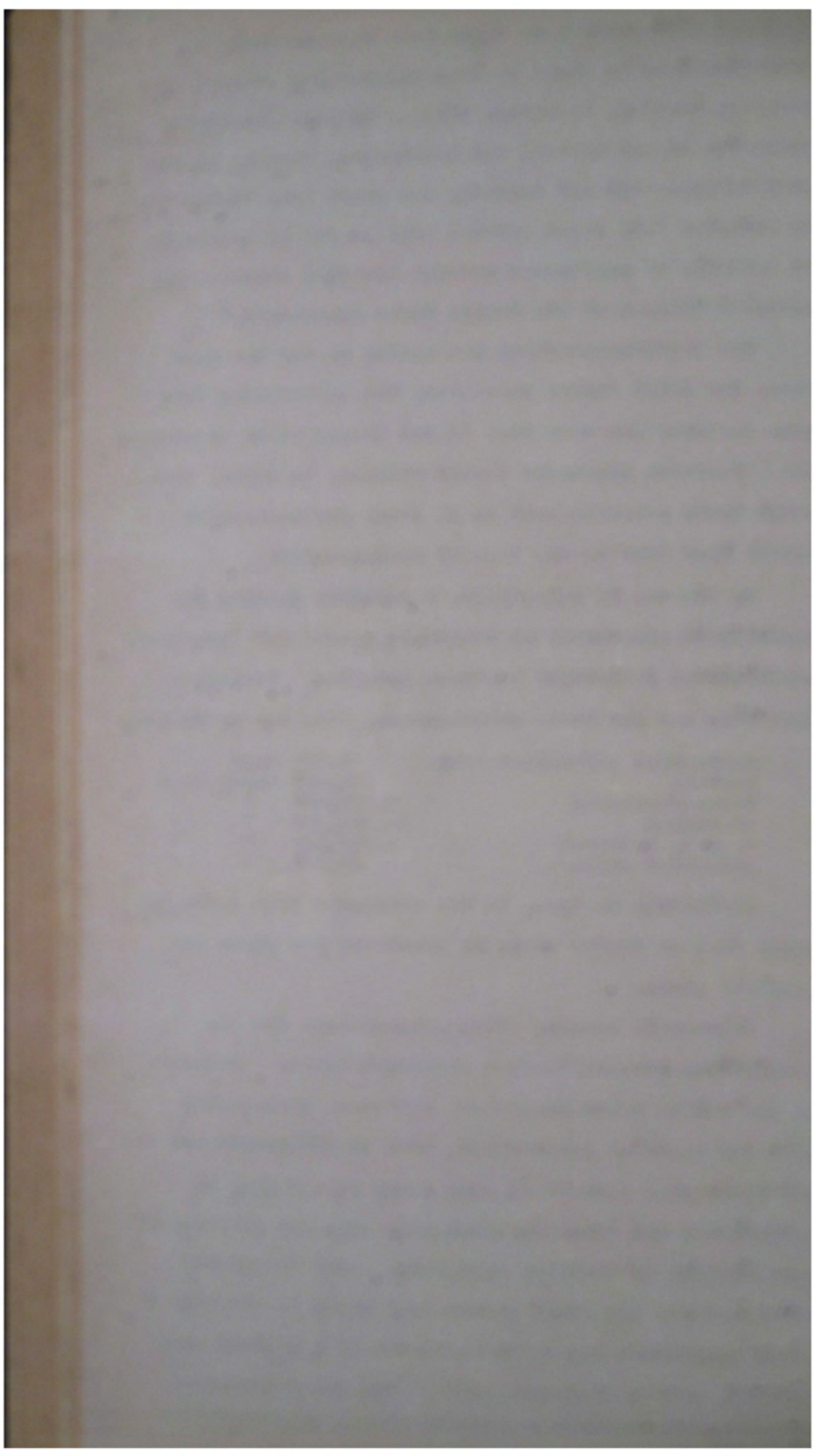
The Engineer-in-Chief was unable to say how soon phase two would follow phase one, but indications from Army Headquarters were that it was likely to be immediately. District Engineers should realise, he added, that camps would probably have to be ready for occupation within from four to six days of mobilisation.

By the end of July, 1939, a schedule showing the approximate quantities of materials needed for 'emergency mobilisation buildings' had been compiled. Including both Army and Air Force requirements, this was as follows:

| | | | |
|----------------------------|------------|------------|---|
| Corrugated galvanised iron | 2,682 tons | | |
| Sarking | 574,000 | super feet | |
| Weatherboarding | 5,479,000 | " | " |
| Scantling | 10,367,500 | " | " |
| T. & G. Flooring | 3,227,800 | " | " |
| Connector rings | 68,700 | " | " |

Additional to this, it was estimated that 3,000,000 super feet of timber would be necessary for phase one (canvas) camps.

Throughout August, 1939, preparations for the possibility of mobilisation continued apace. Officers of the Public Works Department conferred continually with the military authorities, both in Wellington and in the districts, surveys of camp sites were rushed to completion, and investigations made into the question of availability of building materials. The Government Architect and his staff worked long hours in adapting to local conditions the British designs of a typical camp lay-out, and on 21 August 1939⁽¹⁾ the Under-Secretary



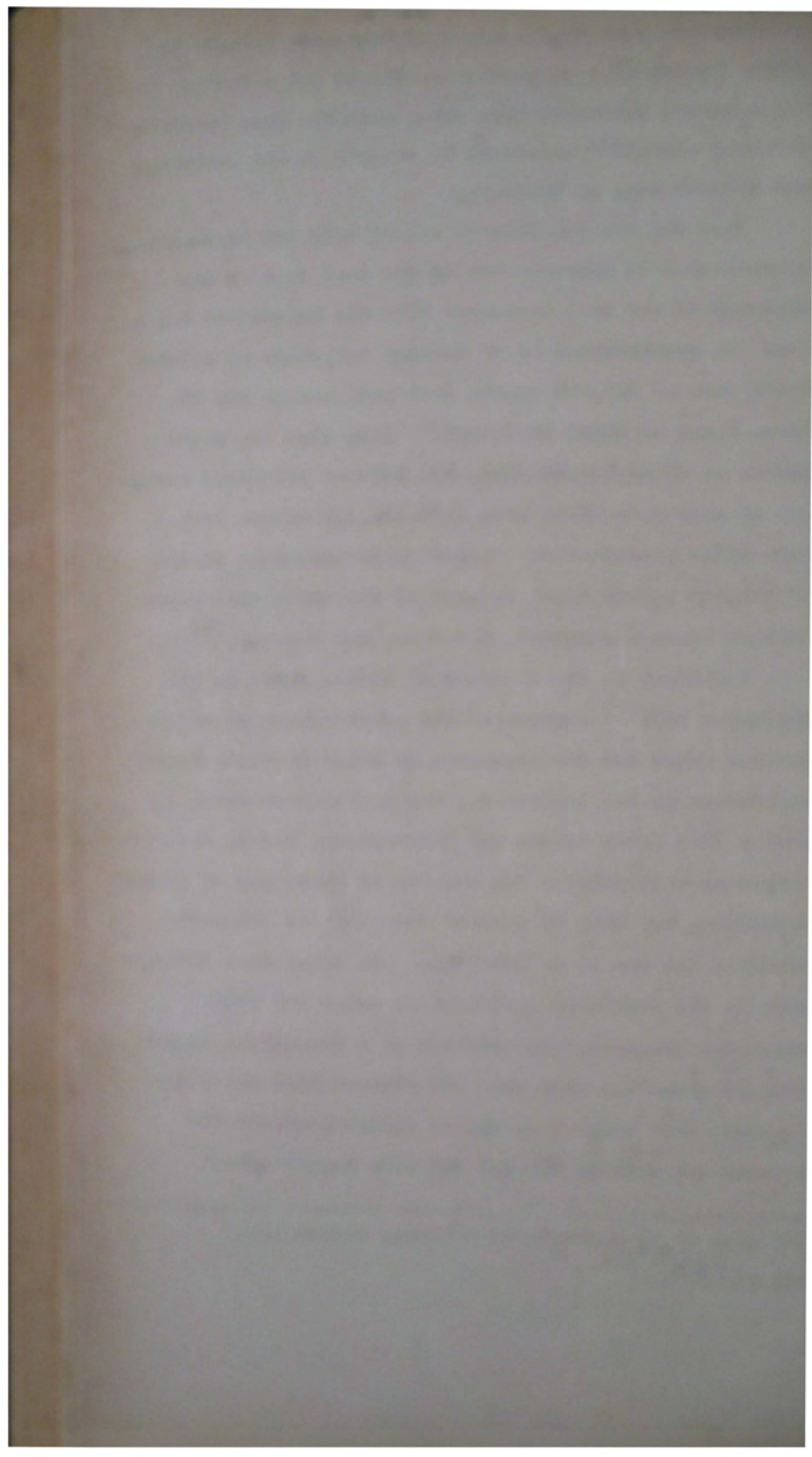
new headquarters for approval (which was given forthwith) a suggested lay-out of (a) a tented and (b) a hutted battalion camp site, modelled upon Northern Military Command's proposals in respect of the projected new brigade camp at Papakura.

That the way was cleared effectively for an immediate commencement is demonstrated by the fact that at the outbreak of war on 3 September 1939 the Department had in hand the construction of 70 defence buildings of a total floor area of 795,750 square feet (all except two of these being on RNZAF Stations). Less than two weeks later, on 13 September 1939, 650 defence buildings covering an aggregate floor area of 1,584,330 square feet, were under construction, including 96 (covering an area of 217,250 square feet) at each of the three main mobilisation bases - Papakura, Trentham, and Burnham. (1)

Reporting to the Minister of Public Works on 19 September 1939 (2) concerning the construction of mobilisation camps and the expansion of RNZAF Stations being undertaken by the Department, the Engineer-in-Chief stated that minor delays had taken place, mainly owing to temporary difficulties arising out of shortages of certain materials, but that in general the work was proceeding smoothly and was up to schedule. He added that 'although work on the emergency mobilisation camps and RNZAF expansion programme only started on 5 September, remarkable progress has been made and reports from all points indicate that completion may be expected within the periods set down by the Air and Army Departments.'

(1) Memo of 13 Sep 1939 to Building Controller
23/112 P.1.

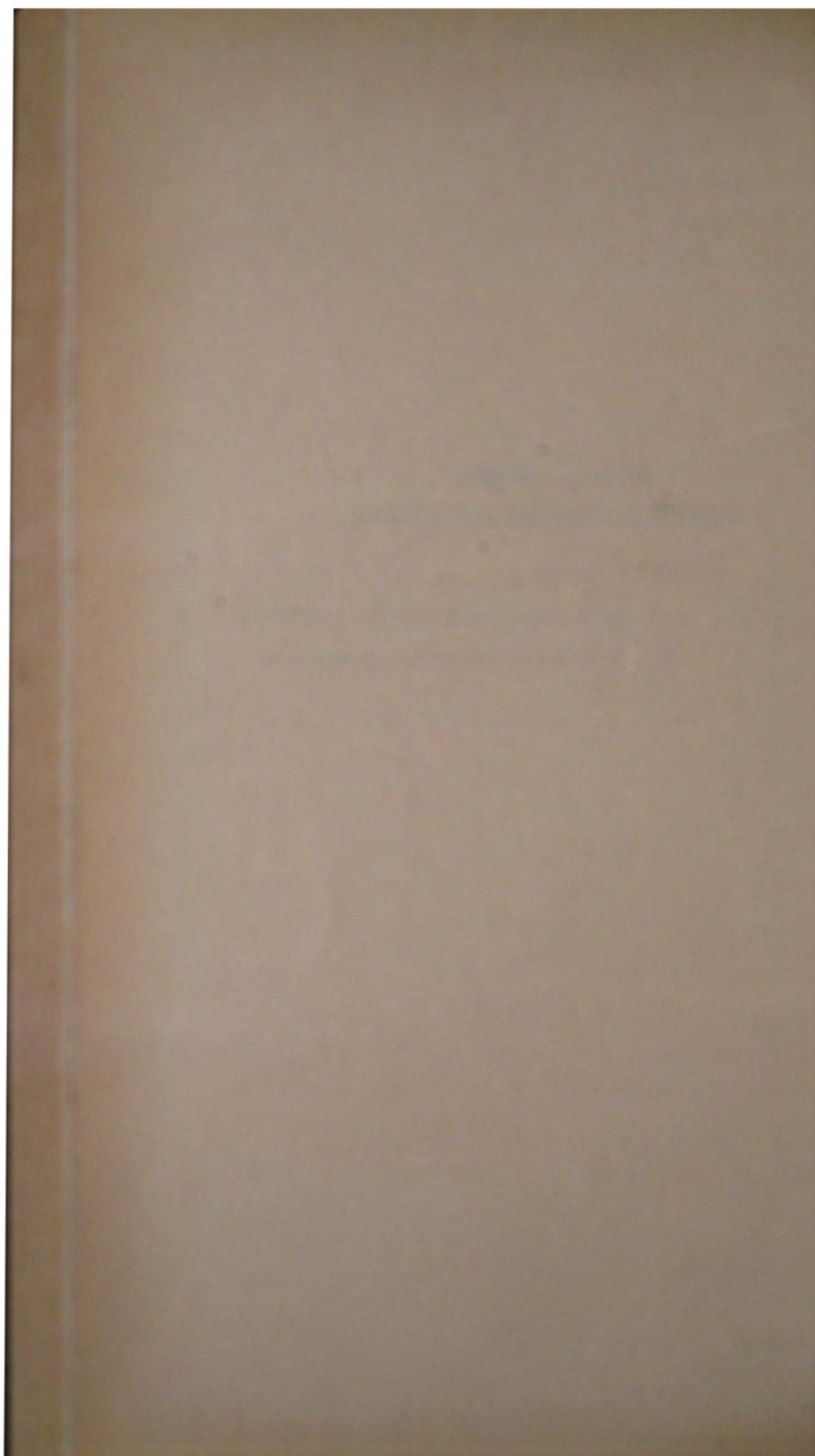
(2) 23/112 P.1.



PART 1. GENERAL

CHAPTER 4 : PRE-WAR PRECAUTIONS

- (1) War Book.
- (2) Building Co-ordination Committee.
- (3) Building Production Committee.



PRE-WAR PRECAUTIONS.

1. WAR BOOK.

The Public Works Department was represented on the New Zealand Committee of Imperial Defence as far back as 1933. In its secret report dated 15 November 1933⁽¹⁾ the New Zealand Committee of Imperial Defence was stated to be '..... a committee of representatives of all Departments of State who may be concerned in any way with the activities of the nation in war: particularly in the transitional stage from peace to war'. This report featured prominently the need for the preparation of a War Book, which was defined as:

'(1) To provide, in a concise and convenient form, a record of all the measures that are required in passing from a state of peace to a state of war - i.e. in initiating what are known as the Precautionary and War Stages.

'(2) To ensure not only that all Departments in any way concerned with the defence of the country shall know the precise measures required of them at each stage of the process, but also that the actions of the several Departments are closely and continuously co-ordinated.'

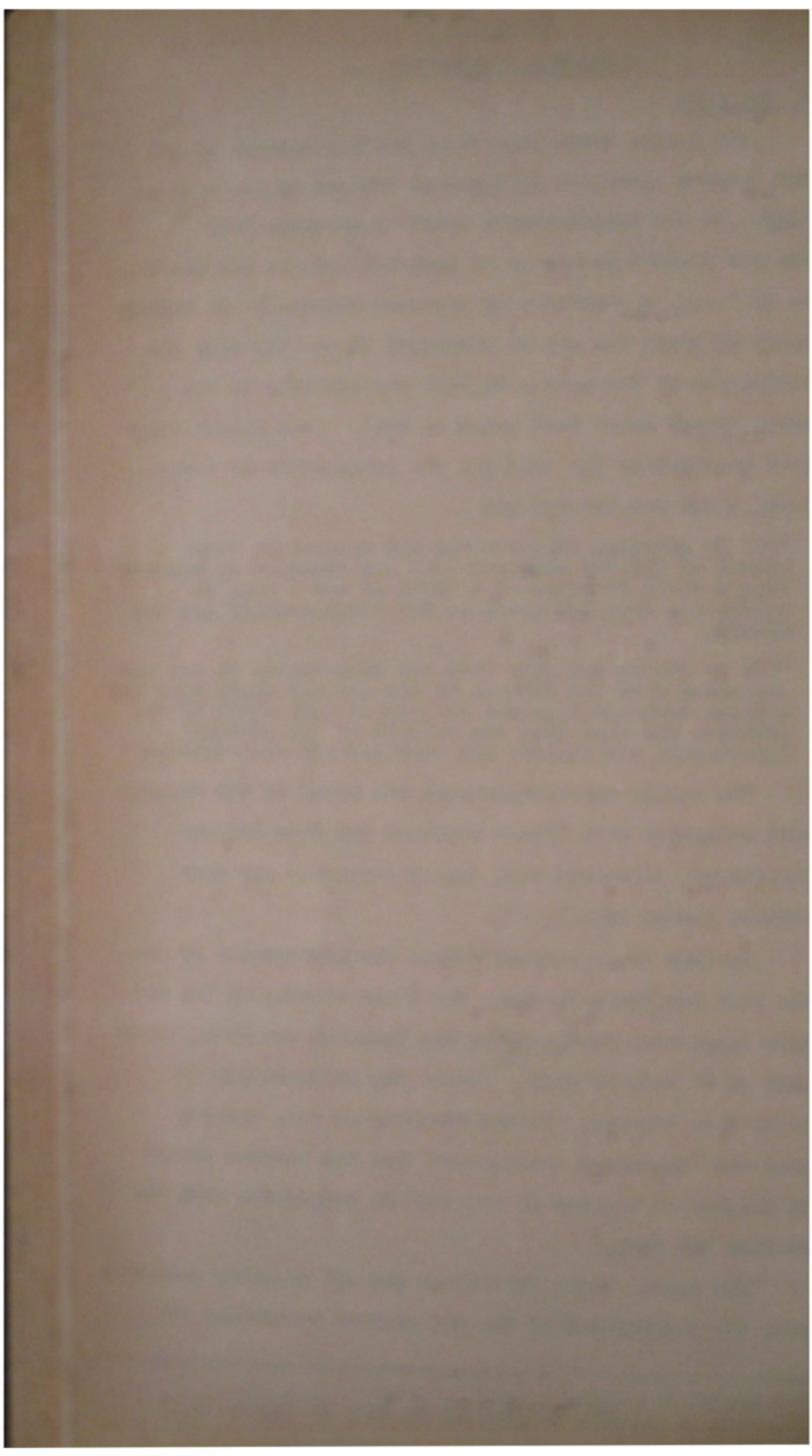
The Public Works Department was cited as the Department concerned with 'Joint Overseas and Home Defence Committee', entrusted with 'works necessary for Home Defence (camps etc).'

Several years elapsed before the preparation of the War Book was taken further, the first meeting of the War Book Committee, Organisation for National Security, being held on 21 October 1937⁽²⁾ under the chairmanship of Major W.G. Stevens. It was resolved at this meeting that the 'suggested arrangement' for New Zealand should be considered chapter by chapter' in comparison with the British War Book.'

The Public Works Department was not directly concerned with the preparation of the New Zealand Government War

(1) Report N.Z.C.I.D., A.1.

(2) Copy of Minutes of Meeting on file in P.W.D., H.O.



Book, and it was not until August, 1939, that the departmental War Book was completed and distributed among senior officers of Head Office and the districts. It consisted in the main of extracts from the New Zealand Government War Book, in keeping with the provisions of clauses 7 and 8 of the general preface of the latter, which read:

'7. The Government War Book cannot show all the detailed action to be taken within the various Government Departments. It is laid down, therefore, that each Department concerned in any way in special war action should maintain a departmental War Book, arranged in any convenient form.

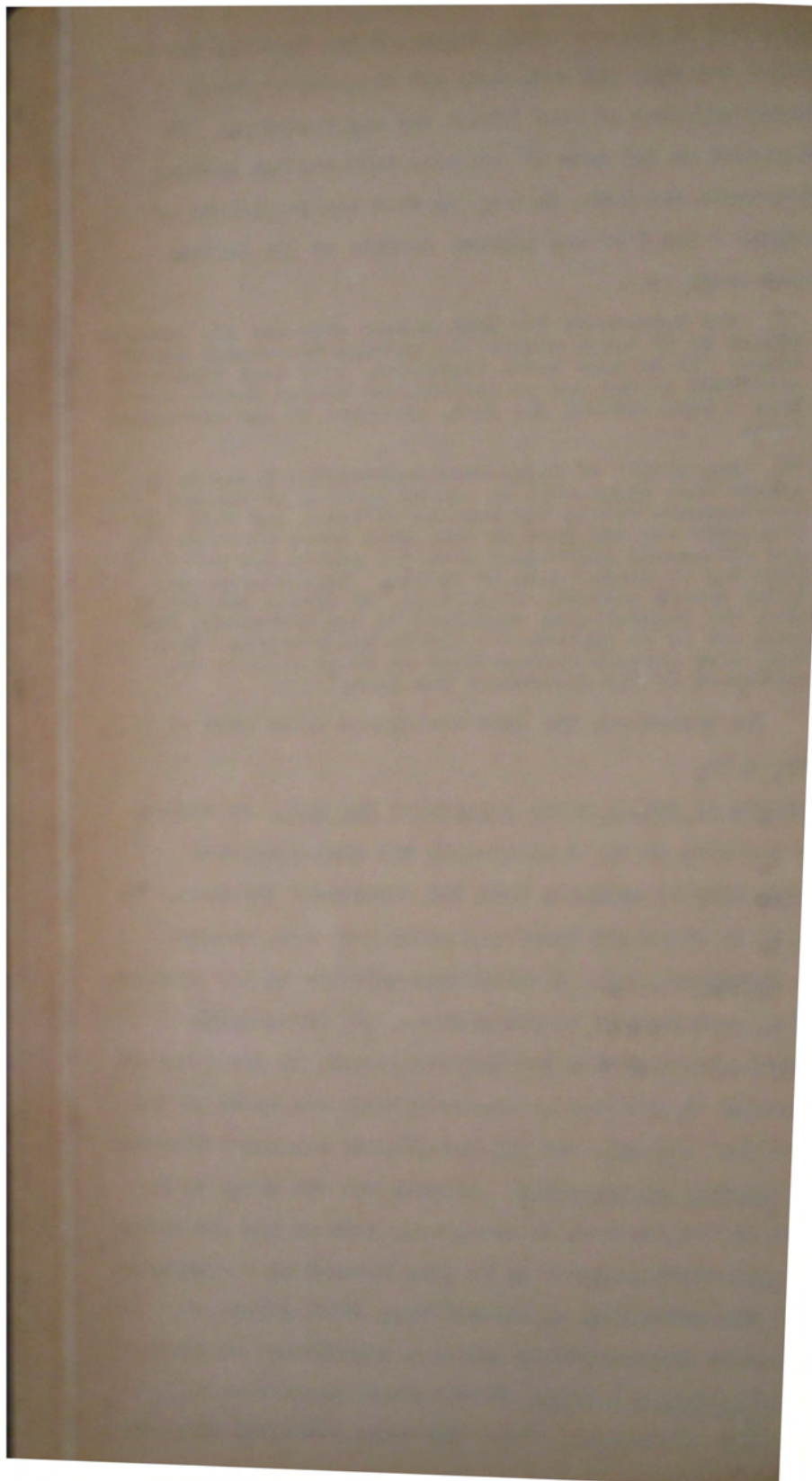
'8. The object of these departmental War Books is to ensure that there will be smooth working of the war arrangements within the various offices, and that all officials who may have to deal with those arrangements are thoroughly conversant with the papers and machinery they may be called upon to handle. Departmental War Books should explain, inter alia, in detail how and by whom the instructions contained in the Government War Book are to be implemented within Departments. They will also include instructions on minor matters not mentioned in the Government War Book.'

The Government War Book was issued under date of June, 1939.

Contents of Public Works Department War Book. As stated,

the contents of the departmental War Book consisted principally of extracts from the Government War Book. It ran to 21 pages and comprised seven sections, namely:

- (1) Communications: Instructions relative to (a) addressing of departmental correspondence, (b) telegraphic communications within New Zealand (using, in the event of a message in code being necessary, what was known as the 'Playfair' cipher), and (c) telegraphic messages overseas.
- (2) Internal Arrangements: Setting out the steps to be taken in the event of an emergency, such as the gazetting of regulations proposed to be administered in the Department, and protection of non-military vital points - especially hydro-electric and main transformer stations.
- (3) Mobilisation - Army: Public Works Department to construct mobilisation camps and other essential accommodation.



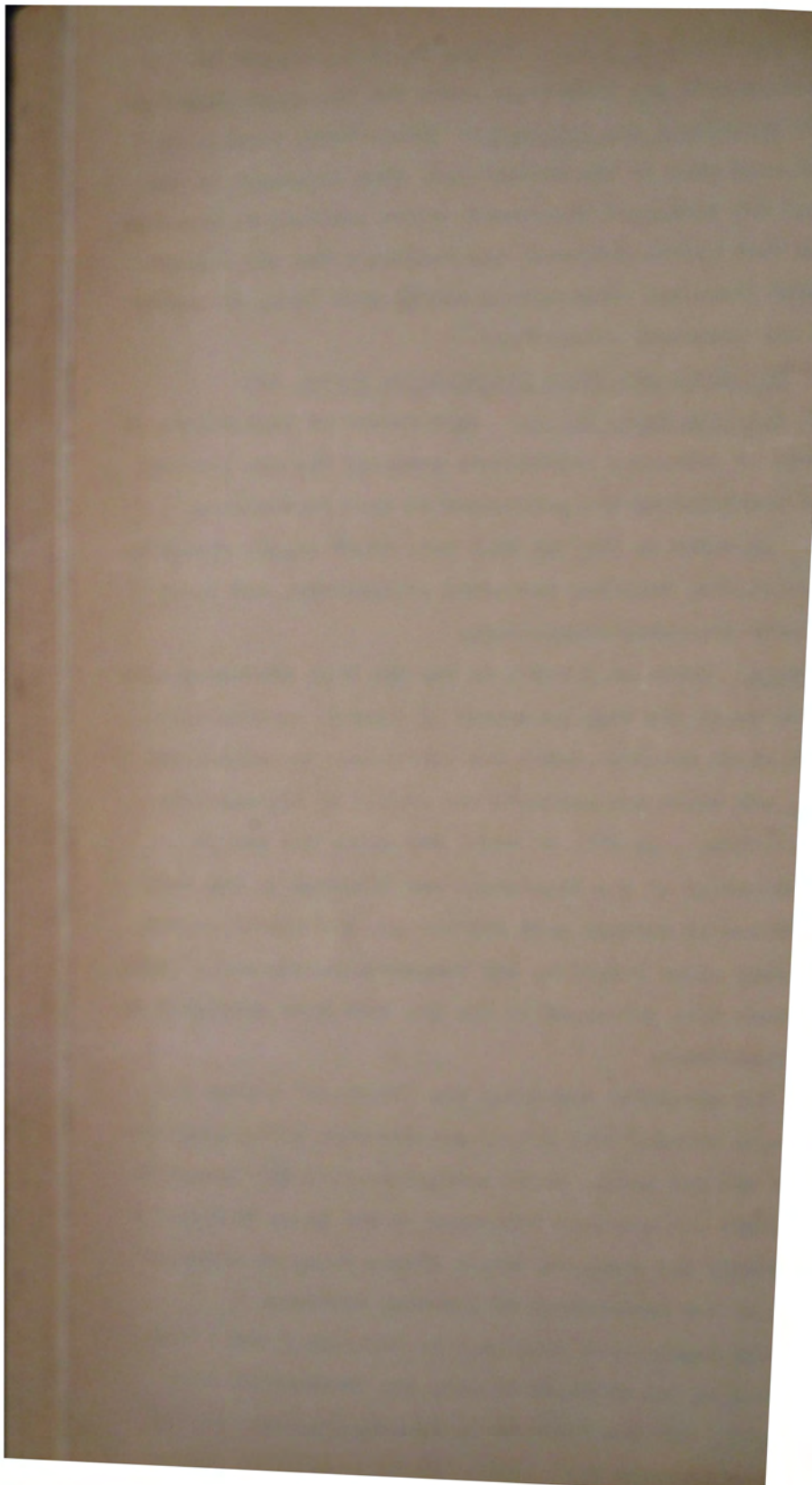
- (4) Mobilisation - Air: Public Works Department to proceed with Air Department works and buildings programme.
- (5) Censorship and Publicity: Public Works Department affected only to the extent that, when requested by the Post and Telegraph Department, radio stations at Mangahao and Tuai (hydro-electric) and Jackson's Bay and Milford Sound (isolated construction works) were to be subjected to any necessary censorship.
- (6) Buildings and Other Construction Works, and
- (7) Electric Power Supply: Appointment of controllers in terms of emergency regulations prepared for the purpose, and implementing the provisions of such regulations.

Appended to the War Book were draft supply emergency regulations, building emergency regulations, and electricity emergency regulations.

Summary: Sections 3 and 4 of the War Book condensed into a few words the huge programme of defence construction with which the Department was confronted throughout the war, and which predominates the record of its war-time activities. As will be seen, virtually the entire organisation of the Department was diverted to the construction of defence work for our own and allied forces, and many other functions and responsibilities which could not have been envisaged in the War Book were entrusted to the Department.

The necessity for using the 'Playfair' cipher for messages between Head Office and district offices fortunately did not arise, while compliance with the direction to submit all overseas telegrams to the Prime Minister's Department for despatch caused little delay or inconvenience in the transaction of ordinary business.

The regulations mentioned in sections 2 and 7 were gazetted on the outbreak of war, and controllers were appointed, but the Director of Housing Construction and not the Permanent Head, Public Works Department, became



passed to his Department. The Chief Electrical Engineer was appointed Electricity Controller. His Division (now a separate Department - State Hydro-electric) was also primarily responsible - in collaboration with the Army authorities - for the protection of hydro-electric and main transformer stations.

2. BUILDING CO-ORDINATION COMMITTEE:

A Building Co-ordination Committee was set up by the Acting Prime Minister in 1937 to investigate and report on 'the position of Government building operation and proposals in relation to the available force of skilled tradesmen and the supply of building materials'. The committee comprised the Secretary to the Treasury, as chairman, and representatives of the Labour, Railways, Education, Industries & Commerce, Post & Telegraph, Housing Construction, and Public Works Departments. In its report dated 7 September 1937 ⁽¹⁾ the committee recommended, inter alia, that Cabinet should not authorise any buildings work until reported on by the committee, and that an order of priority be determined for each centre or district.

(2)

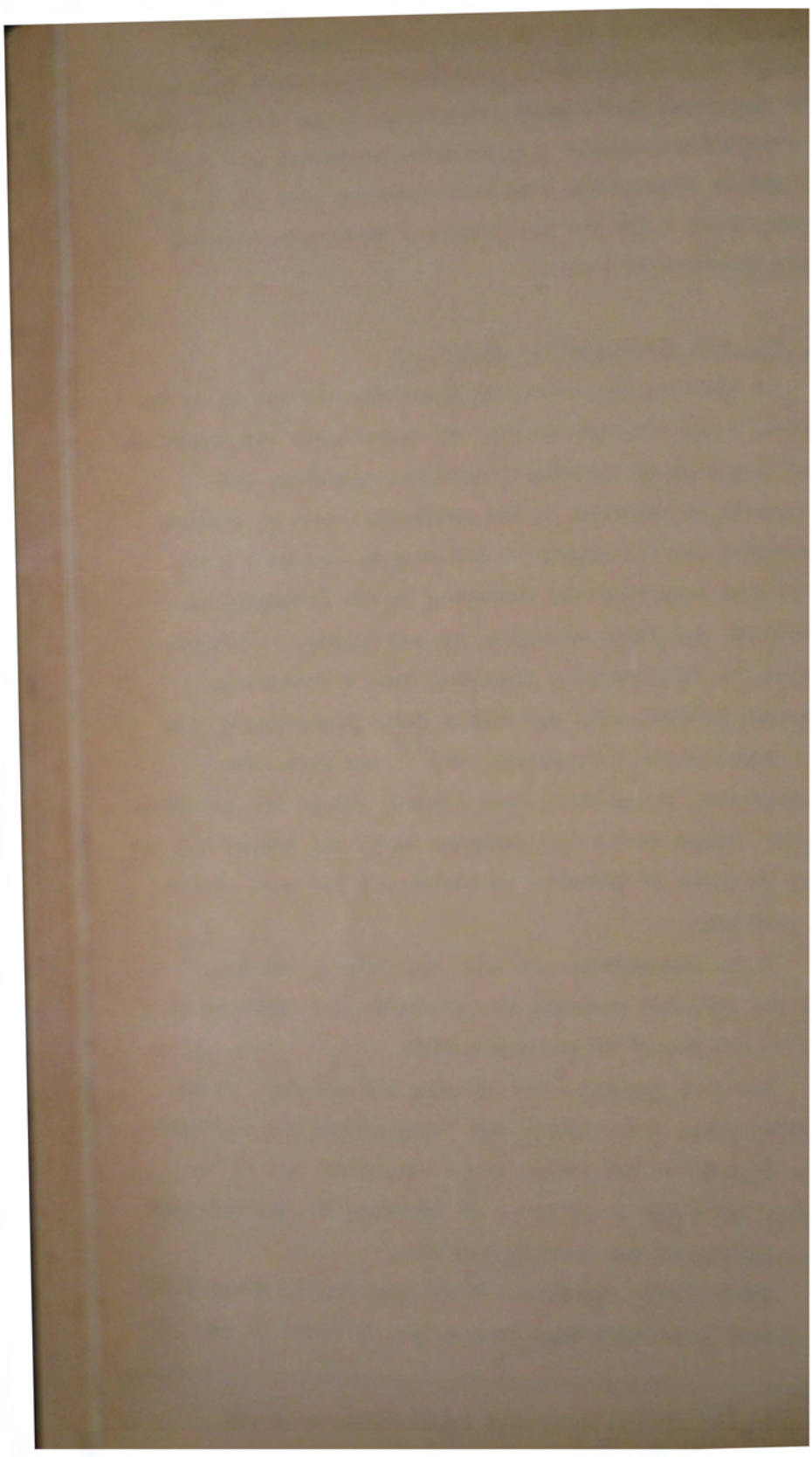
These recommendations were approved by Cabinet, and the decision conveyed to members by the chairman in his memorandum of 17 September 1937.

Thus was control over building construction in New Zealand first established, and foreshadowed the difficulties with which the Public Works Department was to be confronted a few years later in carrying out the war-time requirements of the defence services.

Thenceforth, the Public Works Department, along with all other Government Departments, had to apply to the

(1) 24/2539, p.1.

(2) Memo of 15 Sept 1937 from Prime Minister to his Ministers: copy on 24/2539, p.1.



Building Co-ordination Committee for (1) approval to invite tenders for building works and (2) concurrence in acceptance of tenders.

At a meeting convened by the Minister of Labour at Wellington on 30 January 1939⁽¹⁾ 'to consider ways and means of meeting the Government's requirements of Housing Construction and other State Buildings', the Government Architect mentioned that the Public Works Department was in charge of certain defence contracts which were most urgent. He had been told by the Government that these contracts must be completed within 12 months, and he did not know when he might have to conscript all the labour he could get.

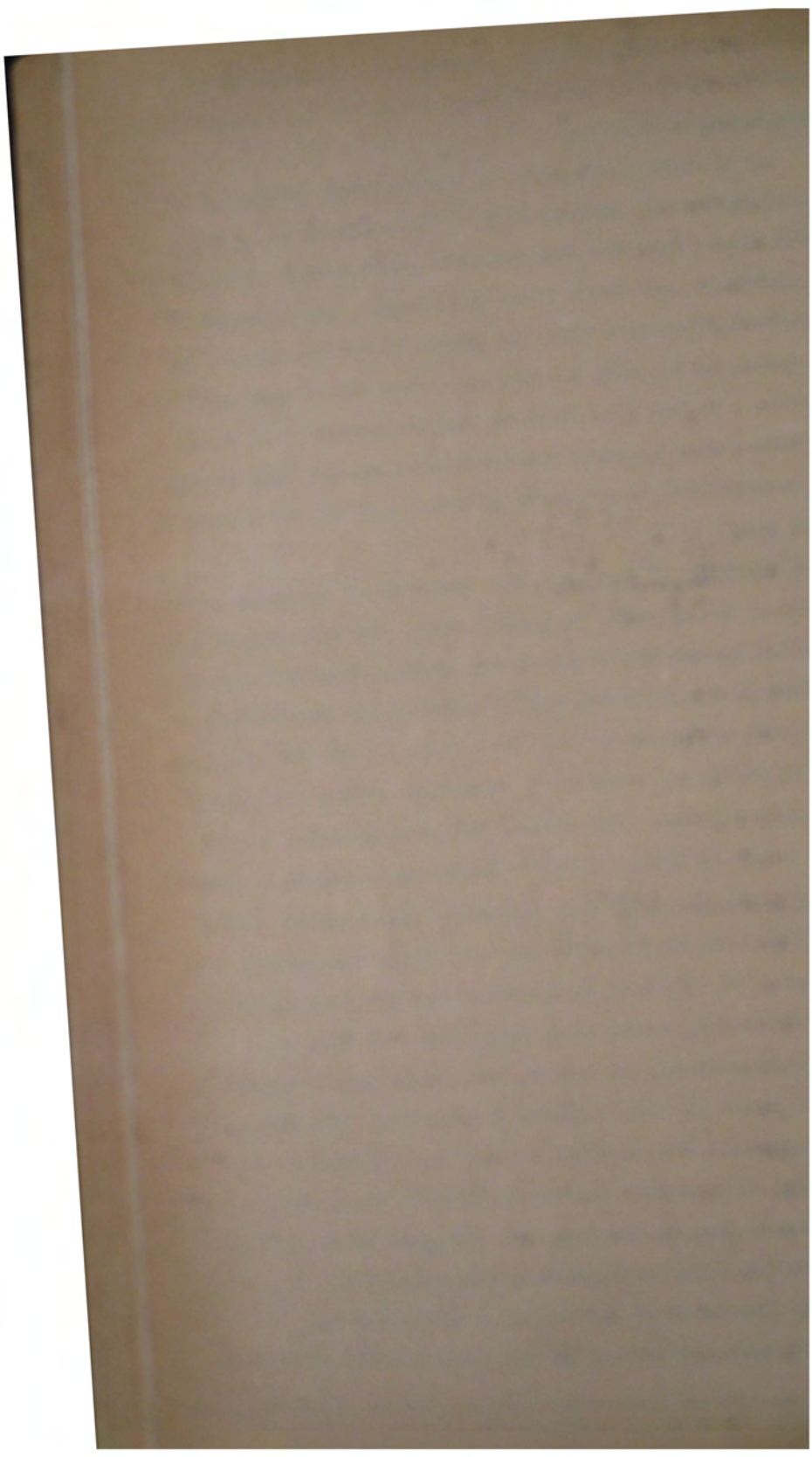
Acute Shortage of Labour: The shortage of building tradesmen still being acute in March, 1939, the chairman of the Building Co-ordination Committee circularised Government Departments on 23 March 1939⁽²⁾ asking for particulars of all works estimated to cost more than £1,000 the commencement of which was considered essential during the financial year 1939-40. The Public Works Department, in its reply dated 13 April 1939,⁽³⁾ submitted a schedule showing that all buildings it then had under construction had a total value of £2,558,450, and that buildings proposed to be erected in 1939-40, as a charge against the Public Works Fund only, would cost £153,100. The Service Departments, which, of course, had large building programmes ahead of them, replied separately. The Public Works Department's proposed expenditure in 1940-41 on buildings as a charge against the Public Works Fund and the Electric Supply Account, was £835,000 which included £600,000 for a new Government Printing Office.

The functions of the Building Co-ordination Committee were taken over by the Commissioner of Defence

(1) Copy of minutes on 24/2539.

(2) 24/2539.

(3) Ibid.



3. BUILDINGS PRODUCTION COMMITTEE:

One of the many committees set up under the Organisation for National Security at the time of the European crisis in the latter half of 1938 was the Building Production Committee - really a sub-committee of the National Supply Committee. The chairmanship was assigned to the Public Works Department.

The Building Production Committee comprised representatives of the Public Works, Railways, Housing Construction, State Forest, Industries & Commerce, and Labour Departments, and the Standards Institute. The general functions of the committee were defined as 'to organise and promote the undertaking of constructional works according to the importance thereof in the public interest.' The responsibilities of the committee in the event of an emergency were stated to be as follows:

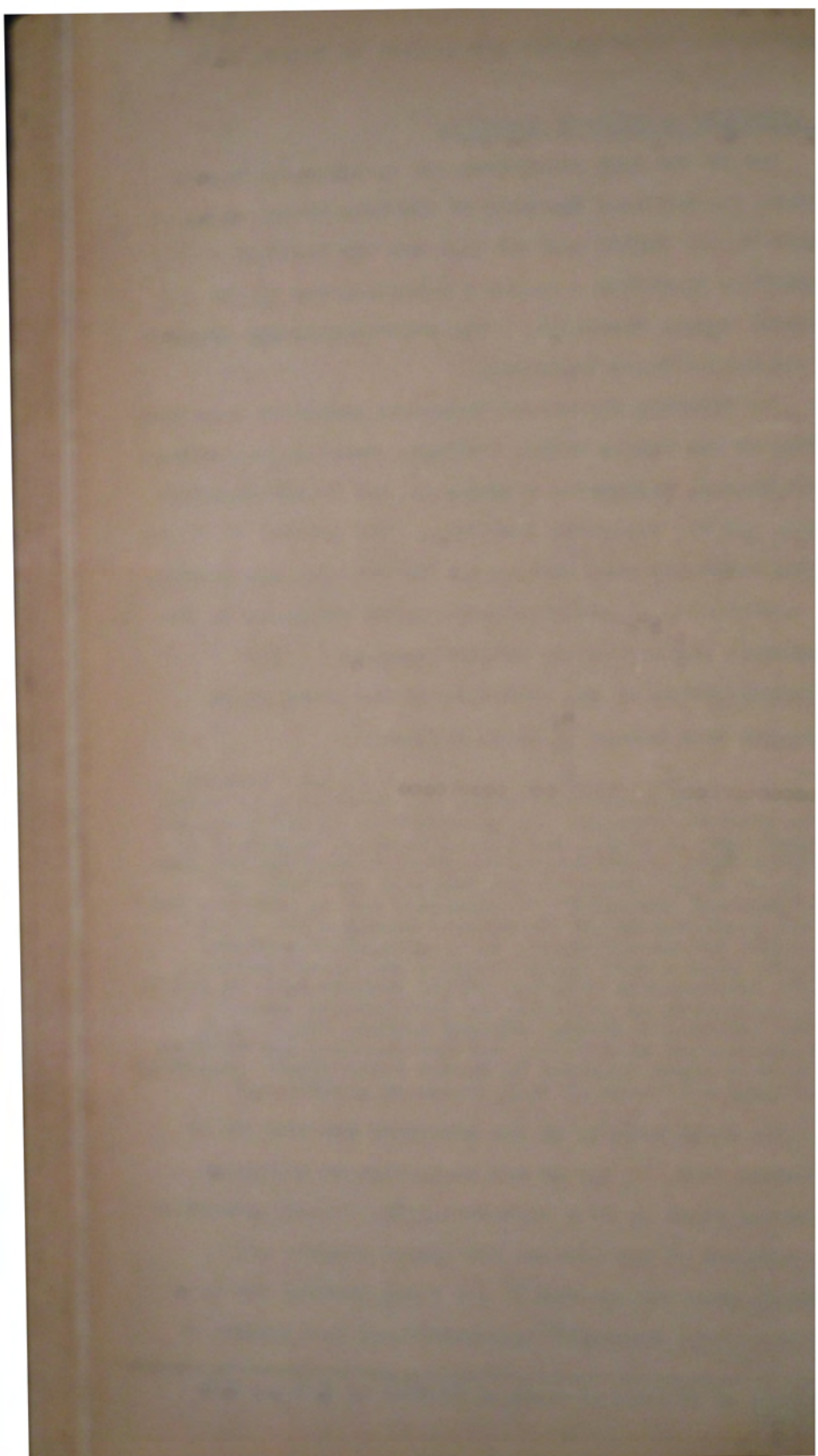
'..... to take control over all constructional works and materials, in order to provide, firstly, for the erection of all necessary mobilisation camps, air flying schools, magazines or other defence constructional works, including the laying of water, drainage and sewerage services, and electrical reticulation; secondly, having provided for the requirements of the defence services and other urgent Government works, to control constructional works with a view to maintaining the normal building and construction industry of the country with as little interference as possible, so that persons engaged in the building industry, related trades, and general construction activities, and not required for military service might continue to pursue their normal avocations without hindrance to their means of livelihood.'

The first meeting of the committee was held on 19 September 1938,⁽¹⁾ and it met thereafter at irregular intervals right up to 2 September 1939, the day preceding the outbreak of war between the United Kingdom and Germany, when the seventh⁽²⁾ and final meeting was held. At the initial meeting⁽³⁾ sub-committees were formed to

(1) Copy of minutes of meeting on file in P.W.D., H.O.

(2) Ibid.

(3) Ibid.

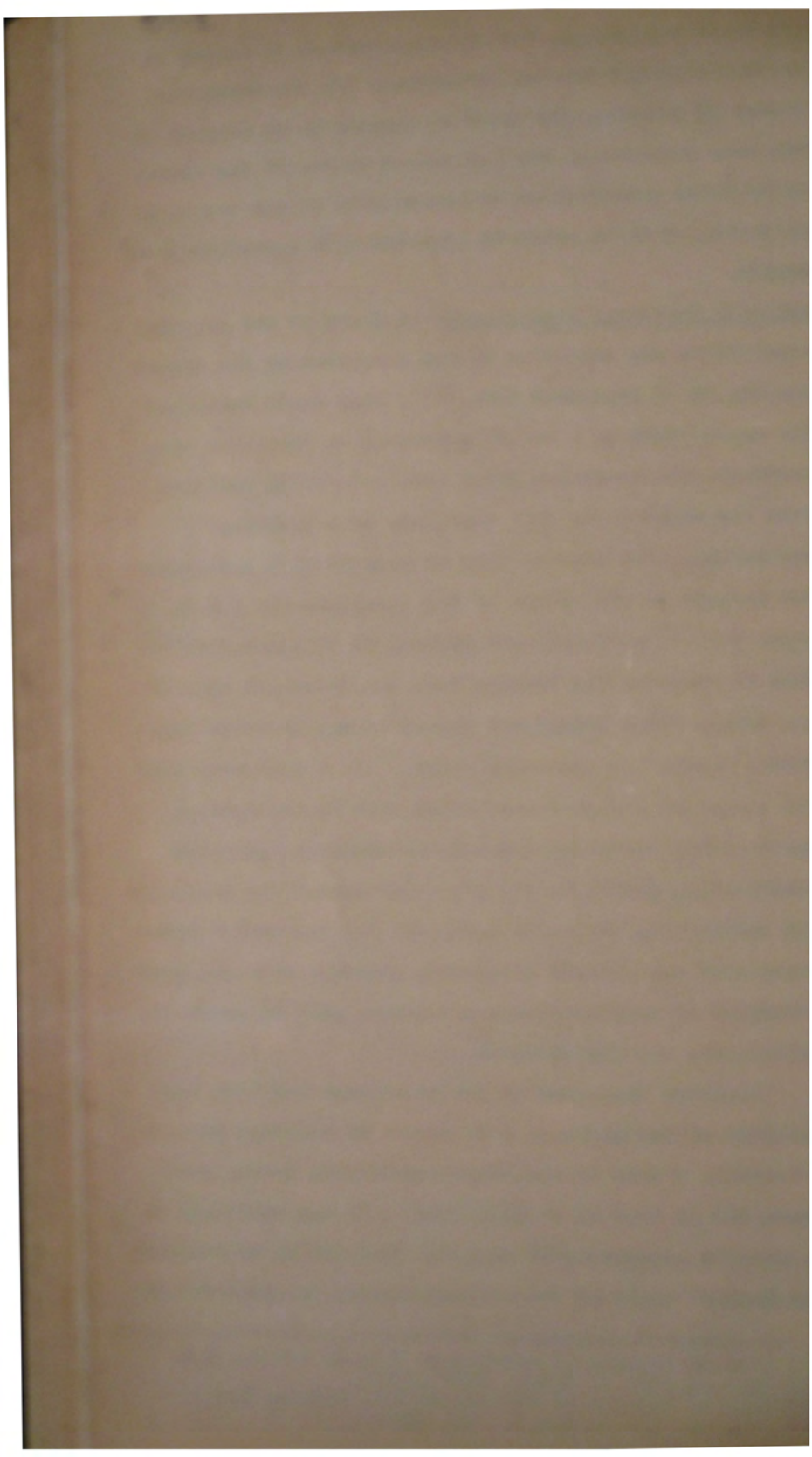


(1) make regulations for the organisation of labour in the building and related industries, (2) determine the degree of priority and order of urgency to be adopted in the same industries, and (3) make a survey of the stocks of building construction materials held in the Dominion, on order, or which could be imported with a continuity of supply.

Building Emergency Regulations: A draft of the proposed regulations was submitted to the committee at its second meeting on 20 September 1938.⁽¹⁾ This draft envisaged the appointment of a Building Production Committee to undertake the functions which were eventually allotted, when the regulations were gazetted, to a Building Controller. The desirability of appointing a controller was brought to the notice of the committee (by O.N.S. paper 106)⁽²⁾ at its fourth meeting on 28 March 1939,⁽³⁾ when it recorded its opinion that the Permanent Head of the Public Works Department should be appointed to that office should the necessity arise. On 2 September 1939 the committee passed a resolution that in its opinion the Building Emergency Regulations should be gazetted immediately, giving as its principal reason the necessity for controlling stocks of materials, as the Public Works Department was already proceeding urgently with the construction of mobilisation camps (phase one) at Auckland, Wellington, and Christchurch.

District Engineers of the Department had been kept informed of the position with regard to building control proposals, a copy of the draft regulations having been forwarded to them on 21 July 1939. It was mentioned in a covering memorandum⁽⁴⁾ that the 'Controller of Building Production' would be the officer holding the position of

(1) Copy of minutes of meeting on file in P.W.D., H.O.
(2) Copy on file in P.W.D. Head Office.
(3) Copy of minutes of meeting on file P.W.D., H.O.
(4) Copy on file in P.W.D. Head Office.



the Public Works Department, so that in the event of a national emergency and the necessity arising for bringing the regulations into force, the whole responsibility provided under the regulations would become a departmental one, and the Department would be vested with full powers under the regulations to carry out the functions assigned to it. On Sunday, 3 September 1939, ⁽¹⁾ the Minister of Public Works telegraphed all District Engineers direct as follows: 'Reference emergency building regulations being gazetted and Government statement. Application for permit and other forms in post Monday. Notify applicants accordingly and arrange distribution to those applying. Advise sub-offices.'

The Building Emergency Regulations were gazetted on 11 September 1939 ⁽²⁾. On the following day the Engineer-in-Chief advised District Engineers that the Director of Housing Construction had been appointed Building Controller, and that in view of the fact that the Department of Housing Construction's staff was not 'built up or organised to the extent of rendering certain services or supplying certain information that the Controller may require' it was the desire of the Building Controller that the district building committees as then constituted remain in office. (The district building committee consisted of the District Engineer and District Storekeeper, Public Works Department, and the District Employment Officer, Labour Department).

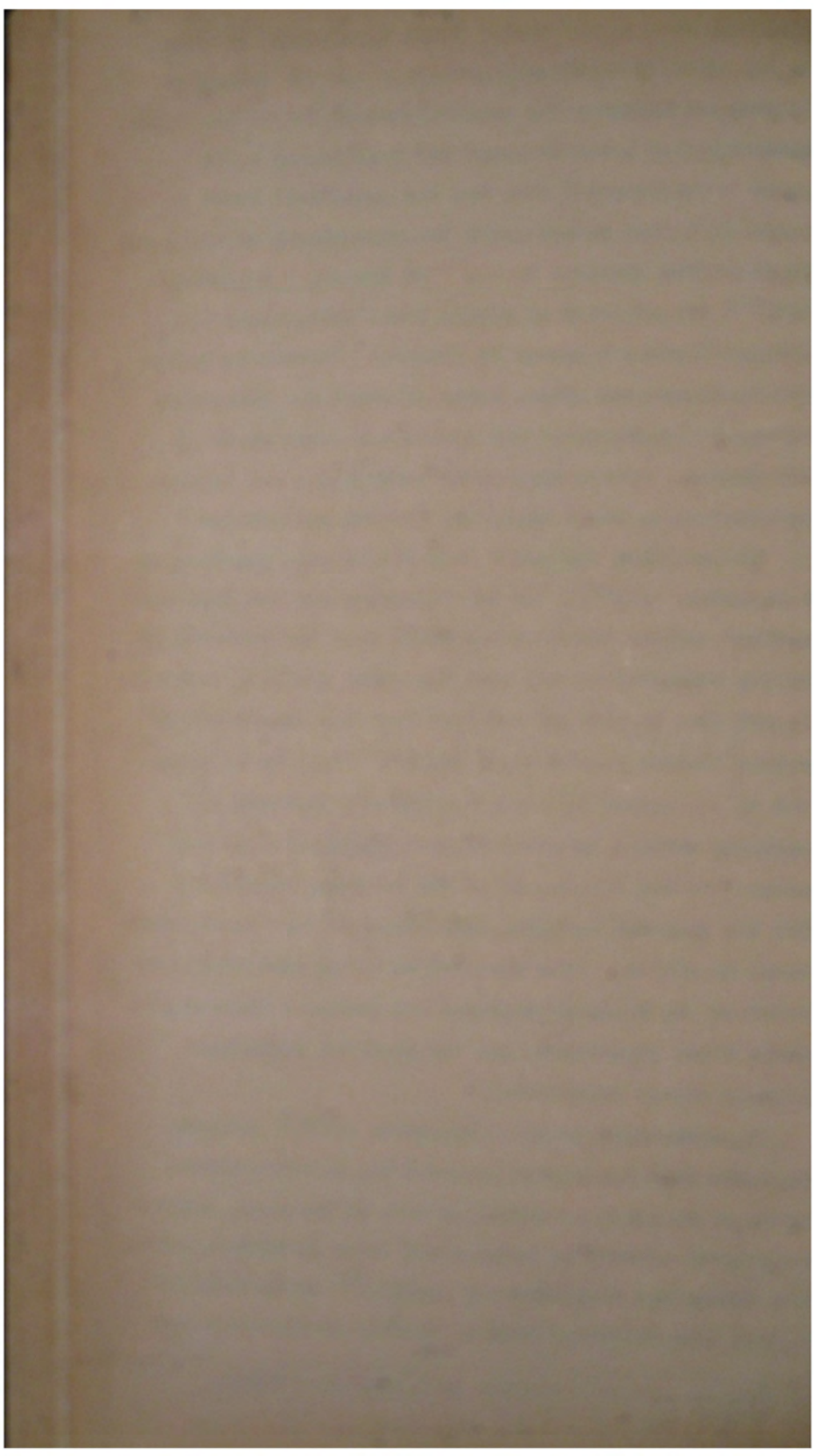
By memorandum dated 13 September 1939 ⁽³⁾ District Engineers were instructed to carry out a comprehensive survey of building construction then in progress, including private as well as defence and other Government works. This survey was completed and reports ⁽⁴⁾ submitted, but by that time the Department of Housing Construction had

(1) Copy of telegram on file in P.W.D. Head Office.

(2) Serial No. 1939/155.

(3) Copy on file in P.W.D., Head Office.

(4) On file in P.W.D. Head Office.



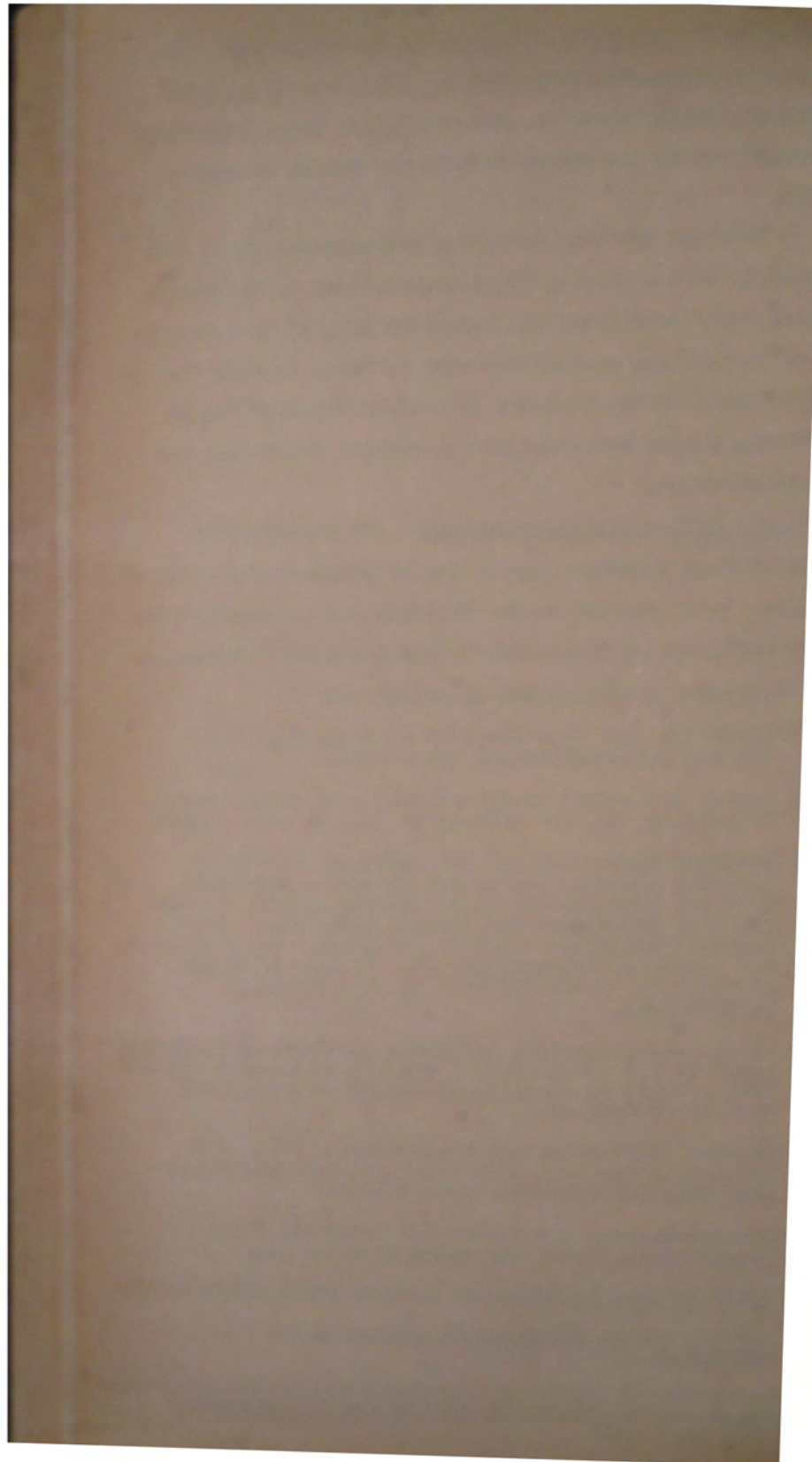
drawn up the necessary organisation to enable its district offices to take over the functions of District Building Controllers, so that the Public Works Department dropped out of the matter towards the end of December, 1939.

Thus the Building Emergency Regulations, which were drawn up with a view to being administered in the Public Works Department, with the Permanent Head of that Department as Building Controller, were in fact, through the appointment of the Director of Housing Construction as Building Controller, assigned to another Department for administration.

Priority in Building Construction: The sub-committee appointed to determine the degree of priority and order of urgency to be adopted in the building and related industries submitted on 29 September 1938 a report⁽¹⁾ embodying the following general order of precedence:

- (1) Constructional work required in connection with defence and mobilisation operations.
- (2) Urgent Government constructional work requirements in relation to such matters as food or coal stores.
- (3) Building operations for the increase in size of existing factories or of new factories demandant upon the requirements of Government policy, including both Government and private buildings. This includes buildings required for storage accommodation, not otherwise included in (2). It also includes building and works involved in fire fighting requirements.
- (4) Government buildings, including particularly buildings required for accommodation and administrative requirements. This class includes school buildings and hospital buildings.
- (5) Private residential buildings already under construction, subject, of course, to materials being available and not being commandeered.
- (6) Private factory and industrial buildings under construction other than those in class (3).
- (7) State housing buildings at present under construction.
- (8) Private office buildings at present under construction.

(1) Attachment to Minutes of 3rd Meeting of Committee, 29 Sept 1938.



those included in class (3).

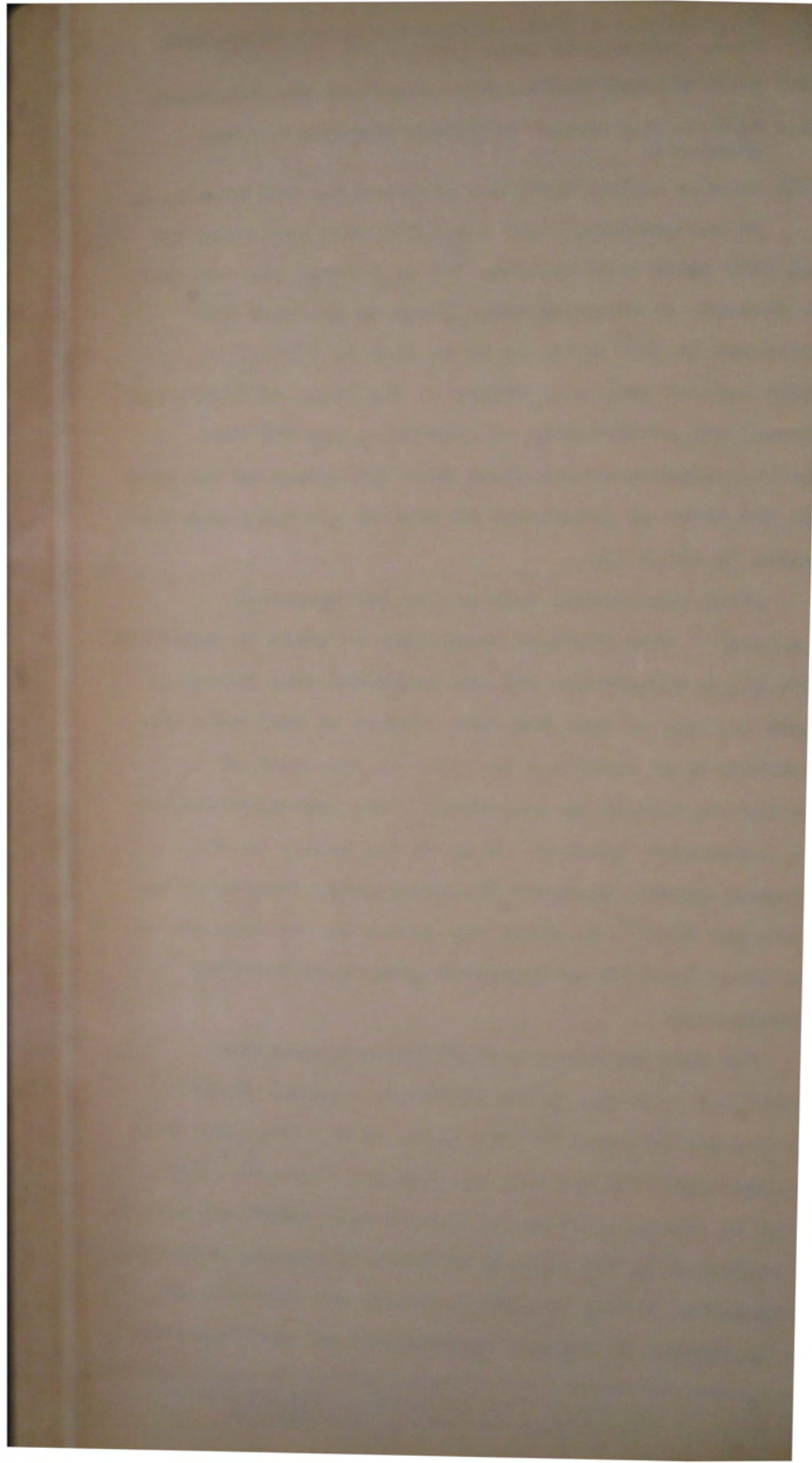
- (10) State housing buildings proposed but not commenced.
- (11) Private residential buildings proposed but not commenced.
- (12) Private office buildings proposed but not commenced.

It was commented that (1) local body buildings had not been taken into account, (2) no attempt had been made to classify engineering works (such as bridges) (3) buildings in each class up to as high as (3) and (4) might require reclassification in the light of individual urgency and availability of materials, and (4) fire fighting considerations might have the effect of increasing the order of precedence of some of the buildings included in class (3).

After considering this report the committee resolved⁽¹⁾ that district committees be asked to ascertain from local authorities and gas companies what emergency organisation, if any, had been planned to deal with the restoration of essential services in the event of interruption through an emergency. This investigation was not undertaken, however, owing to the easing of the European crisis, District Engineers being instructed on 6 October 1938⁽²⁾ to defer any action in the meantime on the whole question of emergency control of building construction.

The only further record of the sub-committee's activities is that, in the committee's annual report⁽³⁾ for the period ended 31 July 1939, it was mentioned that the sub-committee had duly carried out its work. The order of precedence finally decided upon would, of course, be reflected in the issuing of building permits under the regulations, which, as stated, became the function of the Department of Housing Construction as administrators

(1) Copy of minutes on file in P.W.D., Head Office.
(2) Copy of memo on file in P.W.D., Head Office.
(3) Copy on file in P.W.D., Head Office.

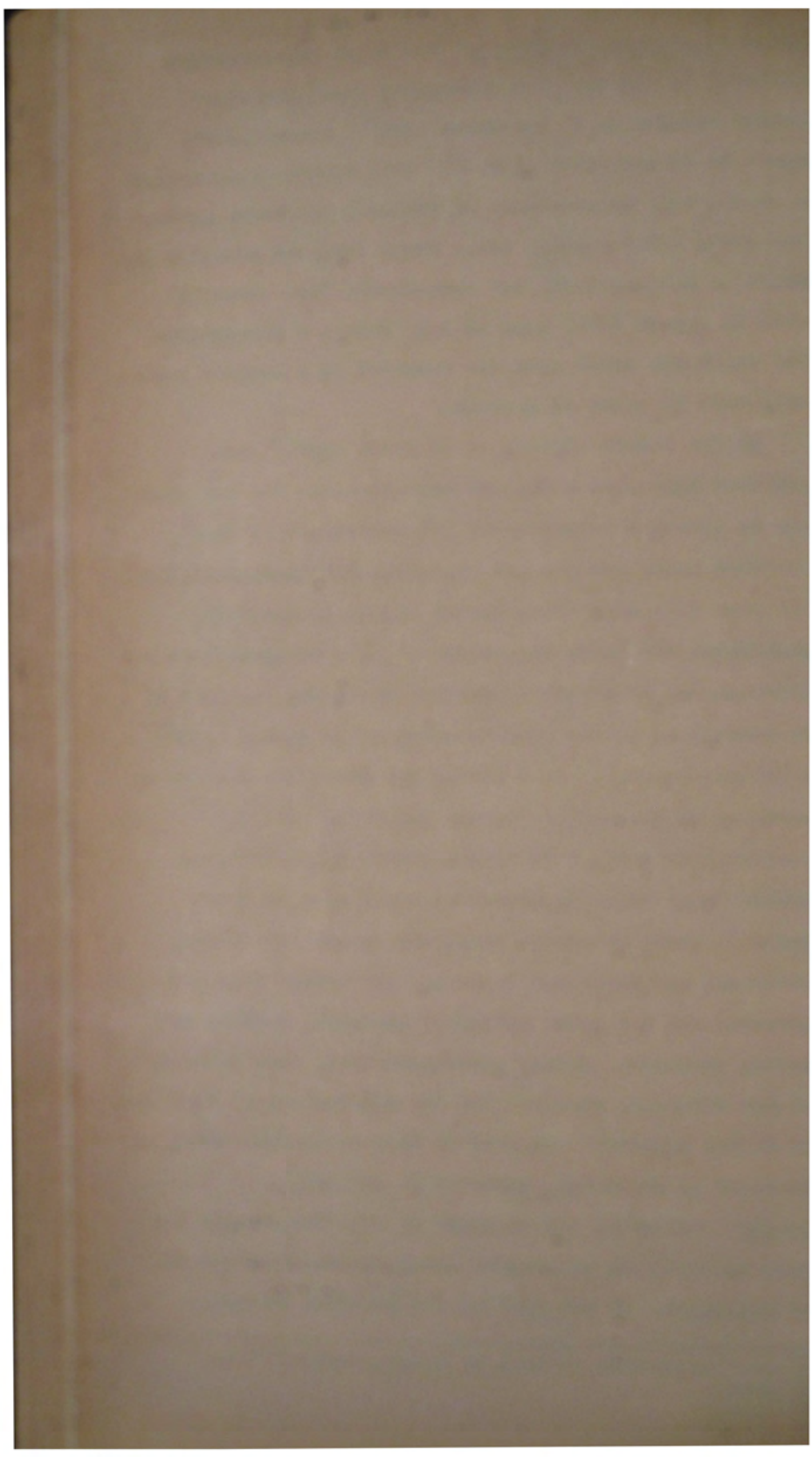


Survey of Building Materials: The third sub-committee appointed by the Building Production Committee at its initial meeting on 19 September 1938⁽¹⁾ presented its report on 23 September 1938.⁽²⁾ This report concentrated on stocks held by merchants of building hardware, galvanised iron, water-piping, etc., found that the position was generally satisfactory, but recommended that steps be taken to indent 2,000 tons of G.C. iron - a recommendation which was acted upon and resulted in a reserve stock being held in store at Trentham.

At its fourth meeting on 28 March 1939⁽³⁾ the committee appointed a further sub-committee for the purpose of making a re-survey of (1) the stocks of 'key' materials held, and (2) the necessity for exercising control over such materials, having regard to available substitutes and local manufacture. The sub-committee's investigation disclosed a position which was reported to the committee, at its sixth meeting on 30 August 1939⁽⁴⁾ as 'disquietening'. As a result the committee decided to recommend to the Supply Control Committee that the Government be advised to indent immediately stocks of certain 'key' building materials which were in short supply. These materials comprised electrical cables, electrical equipment and fittings, galvanised pipe and fittings, tin and lead, builders' hardware, cooking and heating equipment, glass, galvanised iron, wire netting, and raw materials required for the manufacture of fittings, etc in New Zealand. The cost of this equipment, which was purchased in Australia, amounted to £62,500.

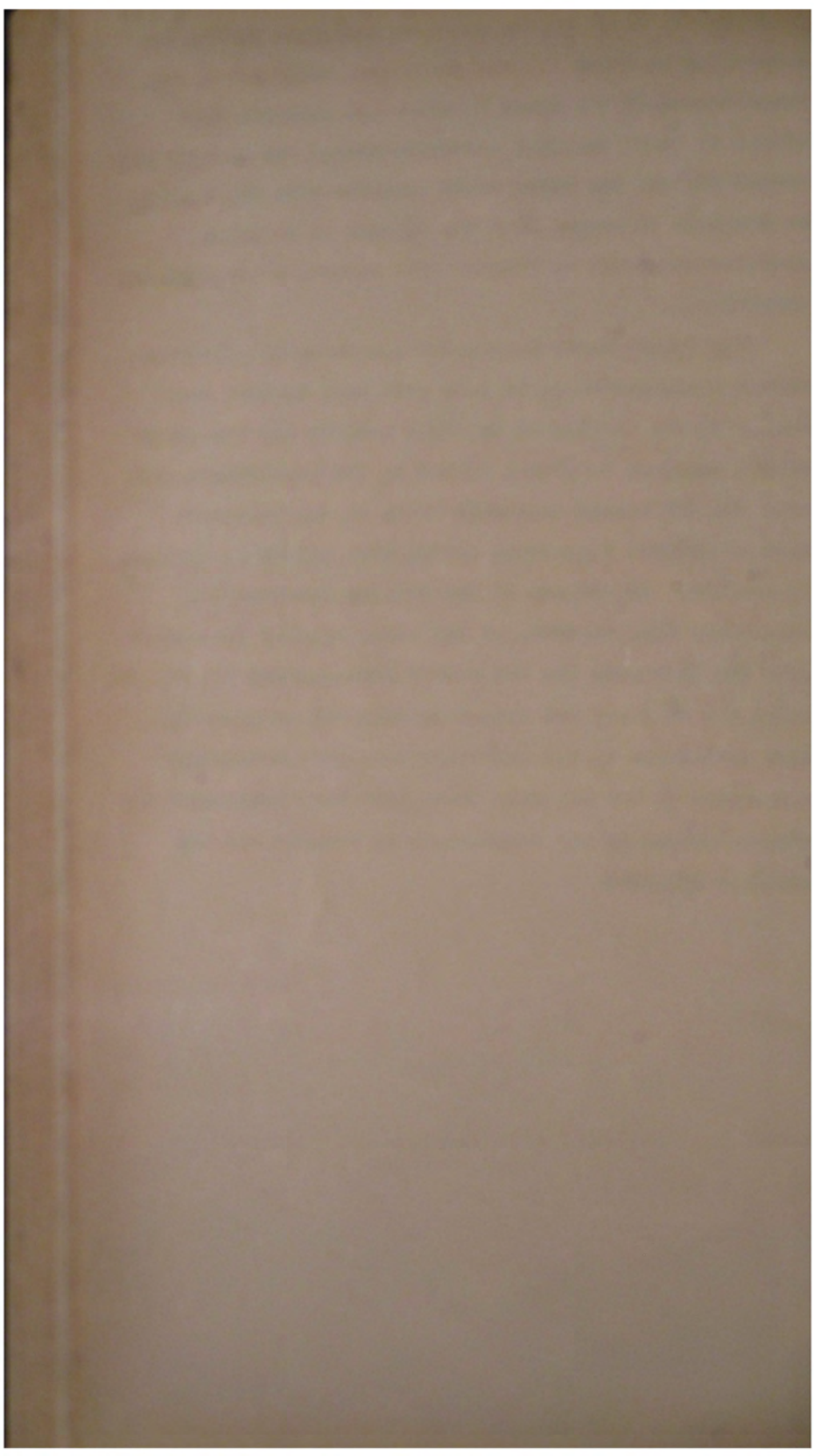
Summary: Following the outbreak of war, the purpose for which the Building Production Committee had been set up was fulfilled. It had drafted the Building Emergency

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- (1) Copy of minutes on file in P.W.D., Head Office.
 - (2) Ibid.
 - (3) Ibid.
 - (4) Ibid.



...prepared the forms necessary to enable the Controller to carry out his functions; ascertained the requirements of the Armed Services and surveyed the stocks of 'key' building materials needed for defence construction; and had taken every possible step which could be foreseen to ensure that the control of building construction would be brought into operation smoothly and effectively.

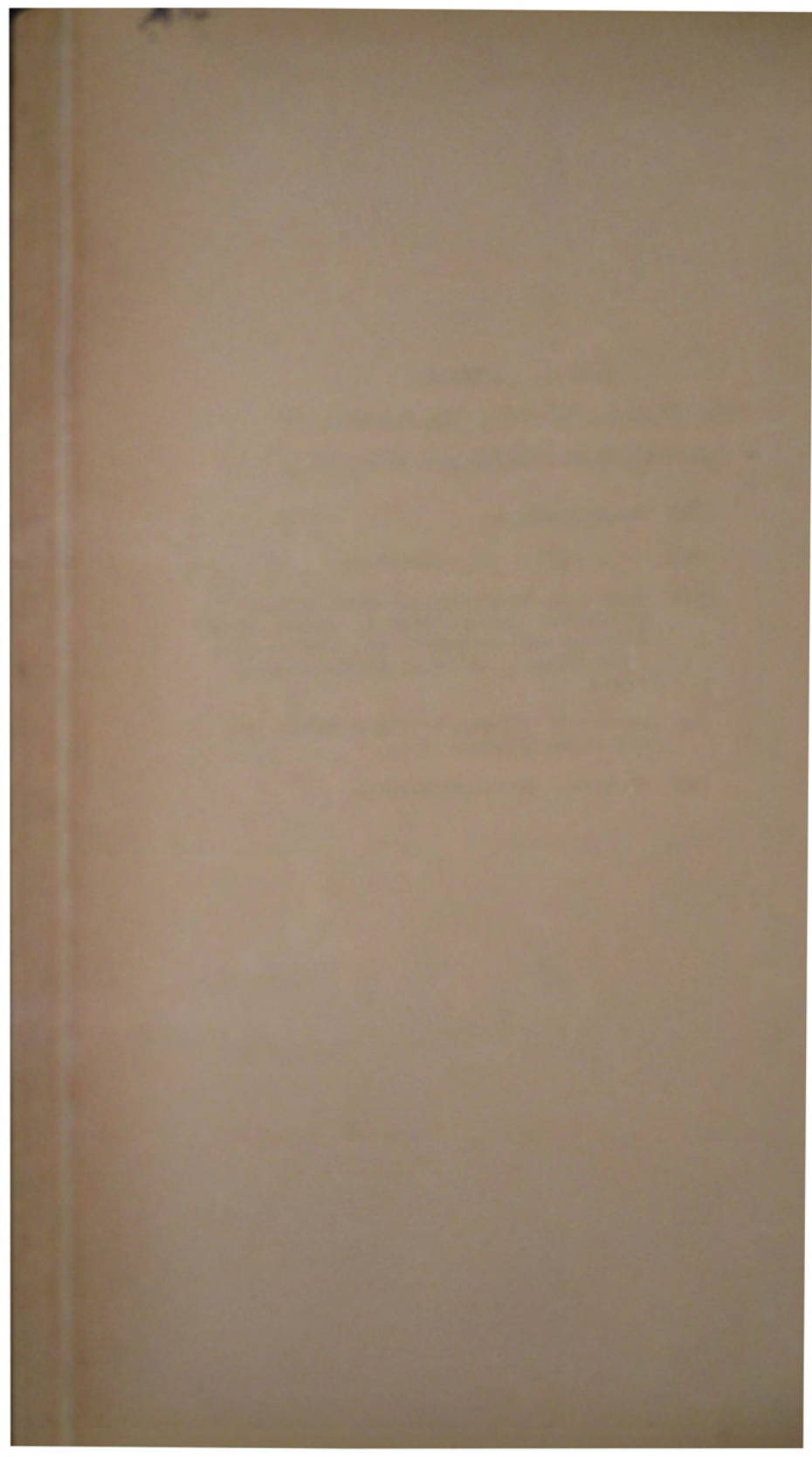
The Public Works Department's wide-spread district office organisation would have been able to take over forthwith the issuing of building permits and the other duties involved in giving effect to the regulations, but this did not become necessary owing to the Permanent Head of another Department having been appointed Building Controller. An officer of the Housing Construction Department was, however, at all times closely associated with the committee (as the member representing his Department) and no doubt the investigations and preparatory work undertaken by the committee were of considerable assistance to the Building Controller and facilitated the administration of the regulations by himself and his district officers.



PART 1. GENERAL.

CHAPTER 5 : ORGANISATION, CONTROL AND
WAR-TIME FUNCTIONS OF THE DEPARTMENT.

- (1) Constitution.
- (2) Head Office Organisation.
- (3) War-time Functions of Head Office
Branches: Architectural, Engineering
(Design and Mechanical), Administra-
tive (Legal, Stores, Accommodation,
etc.)
- (4) District Offices - Constitution and
War-time Organisation.
- (5) Post-war Re-organisation.



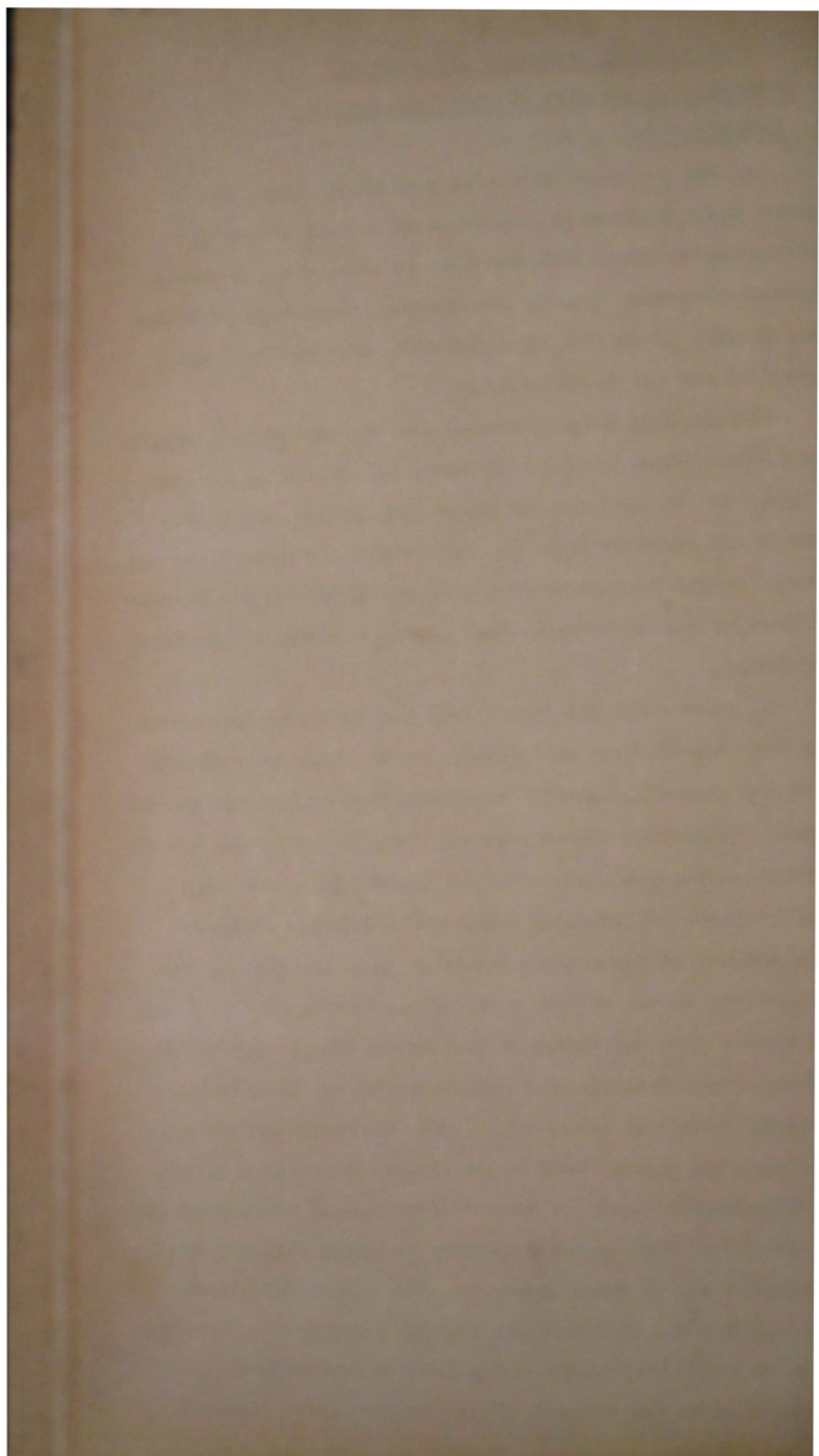
ORGANISATION, CONTROL, AND WAR-TIME
FUNCTIONS OF THE PUBLIC WORKS DEPARTMENT.

1. CONSTITUTION.

At the outbreak of war in September, 1939, the Public Works Department consisted of a Head Office in Wellington, district offices (12) at Whangarei, Auckland, Tauranga, Gisborne, Napier, Taumarunui, Stratford, Wellington, Nelson, Greymouth, Christchurch, and Dunedin, and a number of sub and works offices.

Controlling the Department was the Minister of Public Works (designated Minister of Works as from 16 April 1943 in terms of the Ministry of Works Act, 1943), and it was through the Minister that the Government's instructions and policy directions were normally communicated to the Permanent Head of the Department, the Engineer-in-Chief and Under Secretary.

In peace-time the Department was concerned primarily with the construction of 'public' works, such as railways, roads and highways, public buildings, hydro-electric development, irrigation, river control, land drainage and development, reclamation, harbours and lighthouses, and many other projects of national and local interest. Most of these classes of works were financed from Votes under the jurisdiction of the Minister of Public Works; that is, they were within what was known as the Public Works Fund or the section of the Consolidated Fund relating to 'Maintenance of Public Works and Services'. But the resources of the Department had always been at the disposal of other Government Departments, and, in fact, a substantial proportion of its activities were usually devoted to works required by, and carried out at the expense of, its sister Department. These, of course, included the Service Departments, and the extent to which the Public Works Department has been associated with the defence of the country since earliest times is detailed in part 1, chapter 3. The manner in



DIRECTOR OF WORKS TO ARMY
HONORARY GROUP CAPTAIN:
DIRECTOR GENERAL OF WORKS & BUILDINGS TO R.N.Z.A.F.

OF PUBLIC WORKS

GOVT ACCOMMODATION BOARD
DEPUTY CHAIRMAN OF:
PUBLIC WORKS TENDERS BOARD

PERMANENT HEAD
ENGINEER - IN - CHIEF
UNDER SECRETARY

AVS
DEER

AERODROME
ENGINEER

CHIEF
DESIGNING
ENGINEER

CHIEF
MECHANICAL
ENGINEER

INSPECTING
ENGINEERS

CHIEF
ELECTRICAL
ENGINEER

GOVT
ARCHITECT

ASST ENGINEER
IN CHIEF

COMMUNICATED DIRECT WITH DIST ENGINEERS
ON ARCHITECTURAL MATTERS

NORMAL CHANNEL OF COMMUNICATION
BETWEEN H.O. AND DISTRICT ENGINEERS

ASSISTANT
UNDER
SECRETARY

ALSO
ACCOUNTS
OFFICER

STAFF
CLERK

OFFICE
INSPECTORS

LEGAL AND
LAND REVENUE
OFFICERS

CHIEF
ACCOUNTANT

STORES
MANAGER

SENIOR
CLERK

CHIEF
CLERK

ALSO
BRANCH

PHOTO
STAFF

MECH
STAFF

LEGAL
BRANCH

SECTS
BRANCH

STORES
BRANCH

OTHER H.O. CLERICAL STAFF INCLUDING
ROADS CLERK - RECORDS CLERK
EMPLOYMENT OFFICER, ETC.

COMMUNICATED DIRECT
WITH ACCOUNTS OFFICER
AND H.O. AND DISTRICT
ENGINEERS

DISTRICT ELECTRICAL OFFICES AT
PALM Nth CH CH AND INVER GILL

DISTRICT OFFICES AT: WHANGAREI - AUCKLAND - TAURANGA - GISBORNE - NAPIER - TAUMARUNUI - WANGANUI - WELLINGTON - NELSON - GREYMOUTH - CH CH - DUNEDIN

SUB - AND
WORKS OFFICES



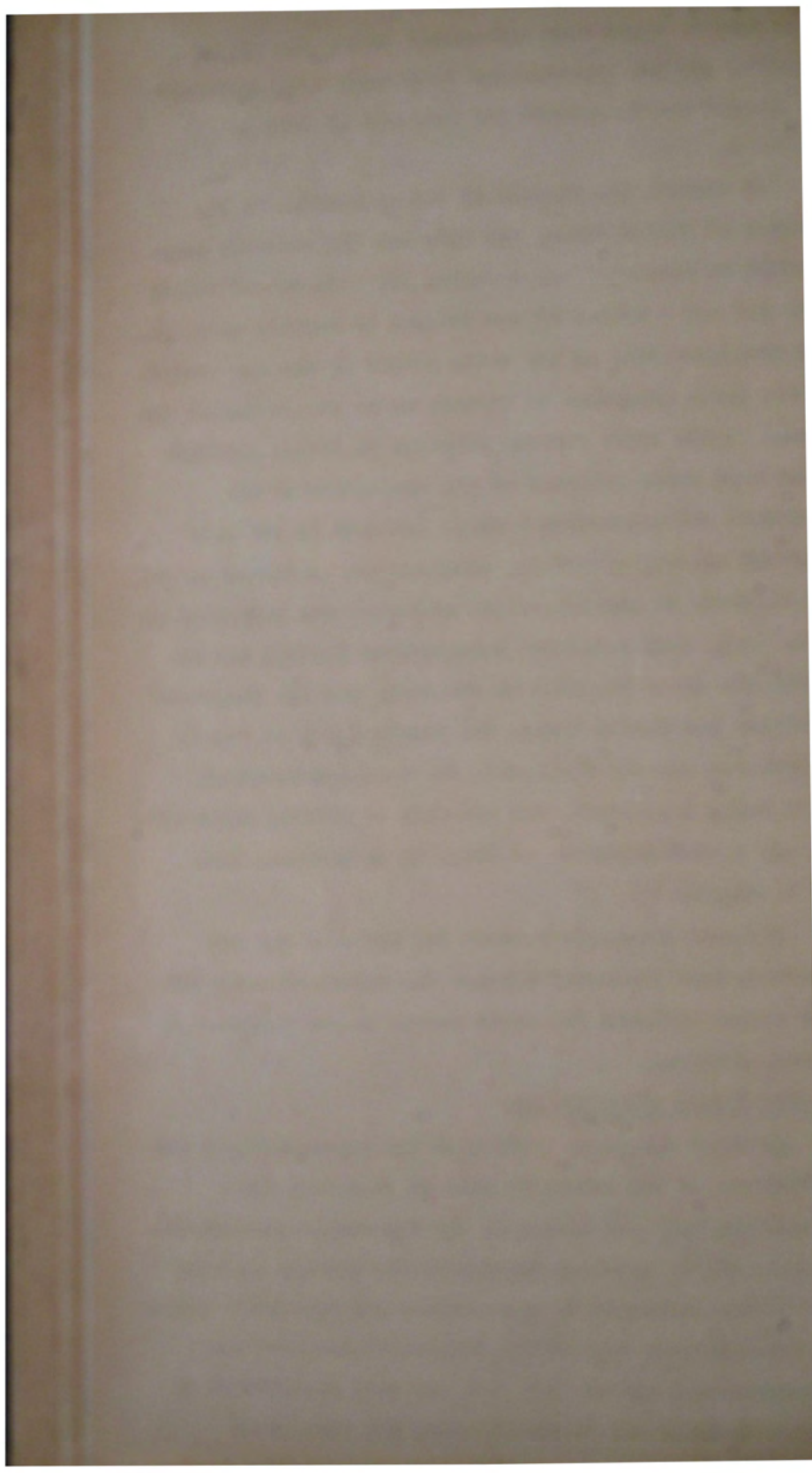
which defence works were authorised during the war of 1939-1945 and how instructions to proceed with construction reached the Department are outlined in part 1, chapter 2.

As stated, the Department was controlled by the Minister of Public Works, who was, and is, directly responsible to Cabinet. As, however, the Minister of Public Works was not a member of War Cabinet he carried no political responsibility in the early stages of the war regarding the large programme of defence works undertaken at the request of the Armed Forces, although in actual practice he was kept fully informed of all activities of his Department and maintained a close interest in the more important aspects of defence construction entrusted to it. This weakness in administrative procedure was rectified in March, 1942, when a Defence Construction Council was set up with the Prime Minister as chairman, and the Ministers of Defence and Public Works, the Commissioner of Defence Construction (deputy chairman), the Engineer-in-Chief, Public Works Department, the Director of Housing Construction, and a representative of Treasury as members. (See part 1, chapter 6).

Official relations between the Minister and the Department were conducted through the Permanent Head, but other senior officers had ready access to the Minister as occasion required.

2. HEAD OFFICE ORGANISATION.

As chief executive officer of the Department, it was the function of the Permanent Head to implement the instructions conveyed to him by the Government through his Minister, and to exercise administrative control over the whole of the Department's organisation and resources. Until 1920 the Permanent Head of the Department had been the Under-Secretary, but in that year the dual appointment of Engineer-in-Chief and Under-Secretary was made. This arrangement continued until 1943, when the separate posit-

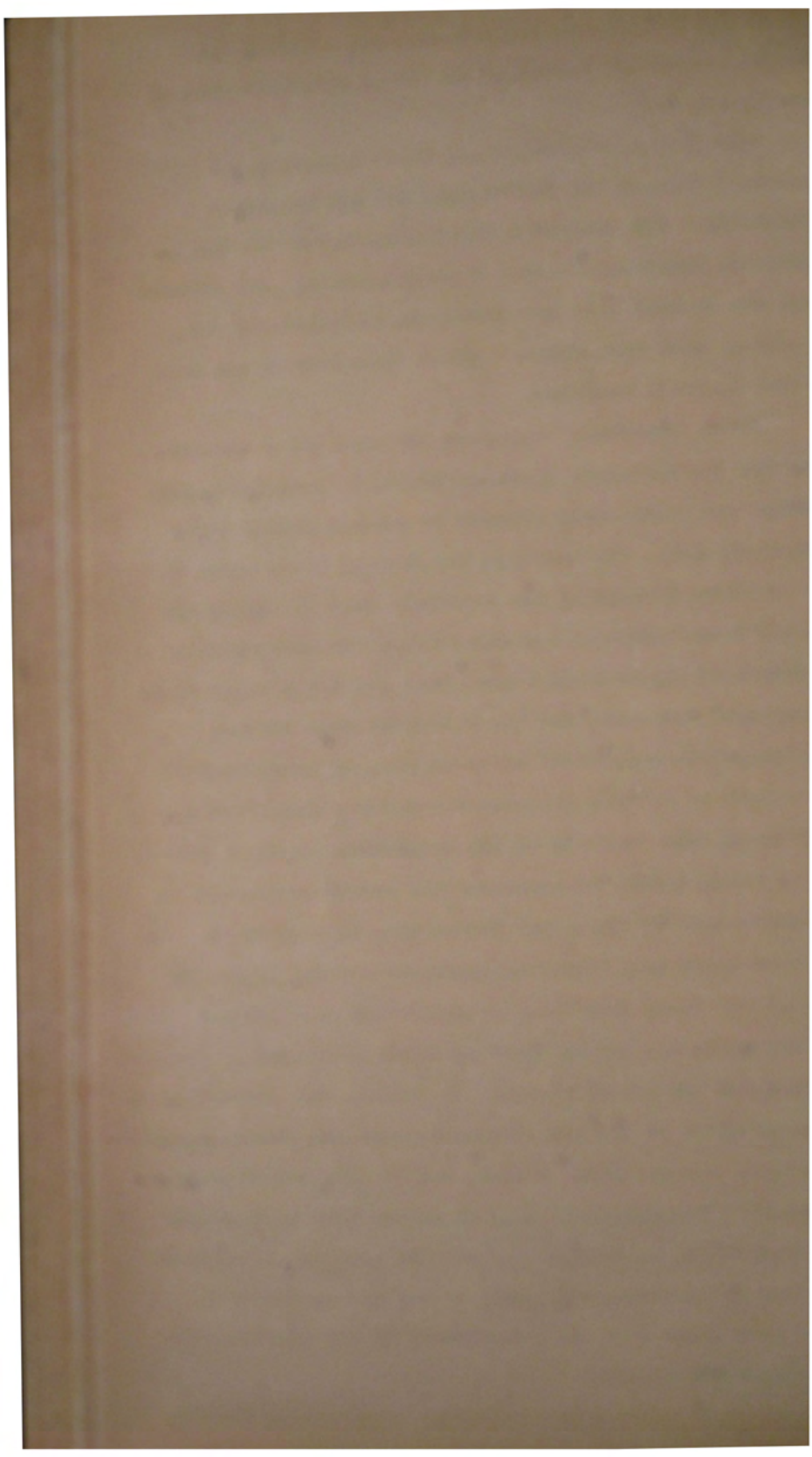


Secretary was reverted to, although the Engineer-in-Chief continued to act as Permanent Head of the Department.

The Engineer-in-Chief and Under-Secretary, as Permanent Head of the Department, had two principal assistants - the Assistant Engineer-in-Chief and the Assistant Under-Secretary. Broadly speaking, the Department was divided into two divisions, professional and clerical, with the Assistant Under-Secretary at the head of the clerical division.

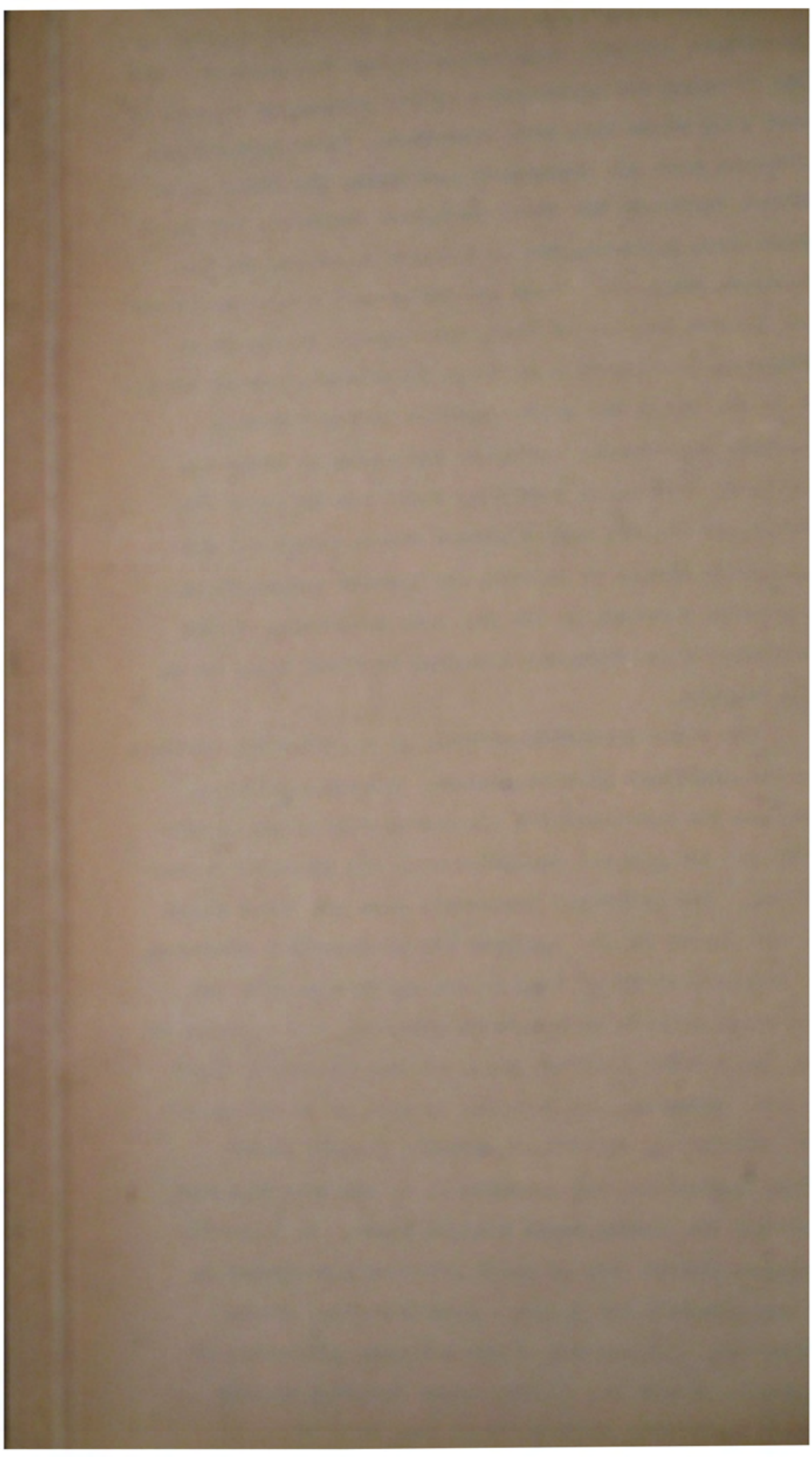
Three inspecting engineers assisted the Permanent Head and the Assistant Engineer-in-Chief, each being responsible for engineering matters in certain Public Works districts, i.e., the Dominion was divided among them. To one of these inspectors the Permanent Head delegated the overall responsibility for supervising the construction of defensive engineering works. This was not a water-tight arrangement, however, and the Permanent Head and his administrative assistants remained more or less directly in control of all the Department's defence construction activities, the function of the inspecting engineer concerned being mainly to implement the decisions conveyed to the Department by the Armed Forces and, by keeping in constant touch with District Engineers and the headquarters of the three Services, to smooth out difficulties as they arose and ensure that the works proceeded efficiently and expeditiously. In effect, the inspecting engineer acted as liaison officer between the Public Works Department and the Armed Forces, and in this capacity he represented the Permanent Head at innumerable conferences and discussions on defence engineering problems throughout the war, and particularly prior to the re-organisation which took place upon the appointment of the Commissioner of Defence Construction early in 1942.

Apart from the three inspecting engineers mentioned, the professional staff of Head Office fell generally into



each under the control of an officer directly responsible to the Permanent Head for the planning and supervision of the particular classes of work with which they were concerned. These controlling officers were the Government Architect, the Chief Electrical Engineer, the Chief Designing Engineer, the Chief Mechanical Engineer, the Aerodromes Engineer, and the Highways Engineer. When the Department was re-constituted towards the end of 1945, the Housing Construction Division, previously a separate Department, became attached to it, while the Hydro-electric Branch became a separate Department. With the exception of these two divisions (which are compiling their own Official War Histories) and the Main Highways Board, which had comparatively little to do with the defence construction programme, a review of the war-time activities of the Department's professional branches is given later on in this chapter.

The chief executive officer of the clerical division was the Assistant Under-Secretary, his responsibility covering the non-technical administration of the Department, and the general supervision of its clerical organisation. His principal assistants were the Chief Clerk and the Senior Clerk. As with the professional division, the clerical staff of Head Office had become more and more sectionalised in the years preceding the outbreak of war, the largest branches being stores, accounts, legal and land purchase, and records, as well as an accommodation officer, an employment officer, a staff clerk, office inspectors, and secretaries to the Main Highways Board and the Public Works Tenders Board. To a greater or lesser extent, all of these officers contributed to the Department's war effort - some directly, others indirectly. An account of the war-time activities of the Legal, Stores and Accommodation Branches appears further on in this chapter, while the part played by



Department's defence programme is touched on elsewhere in the Official War History.

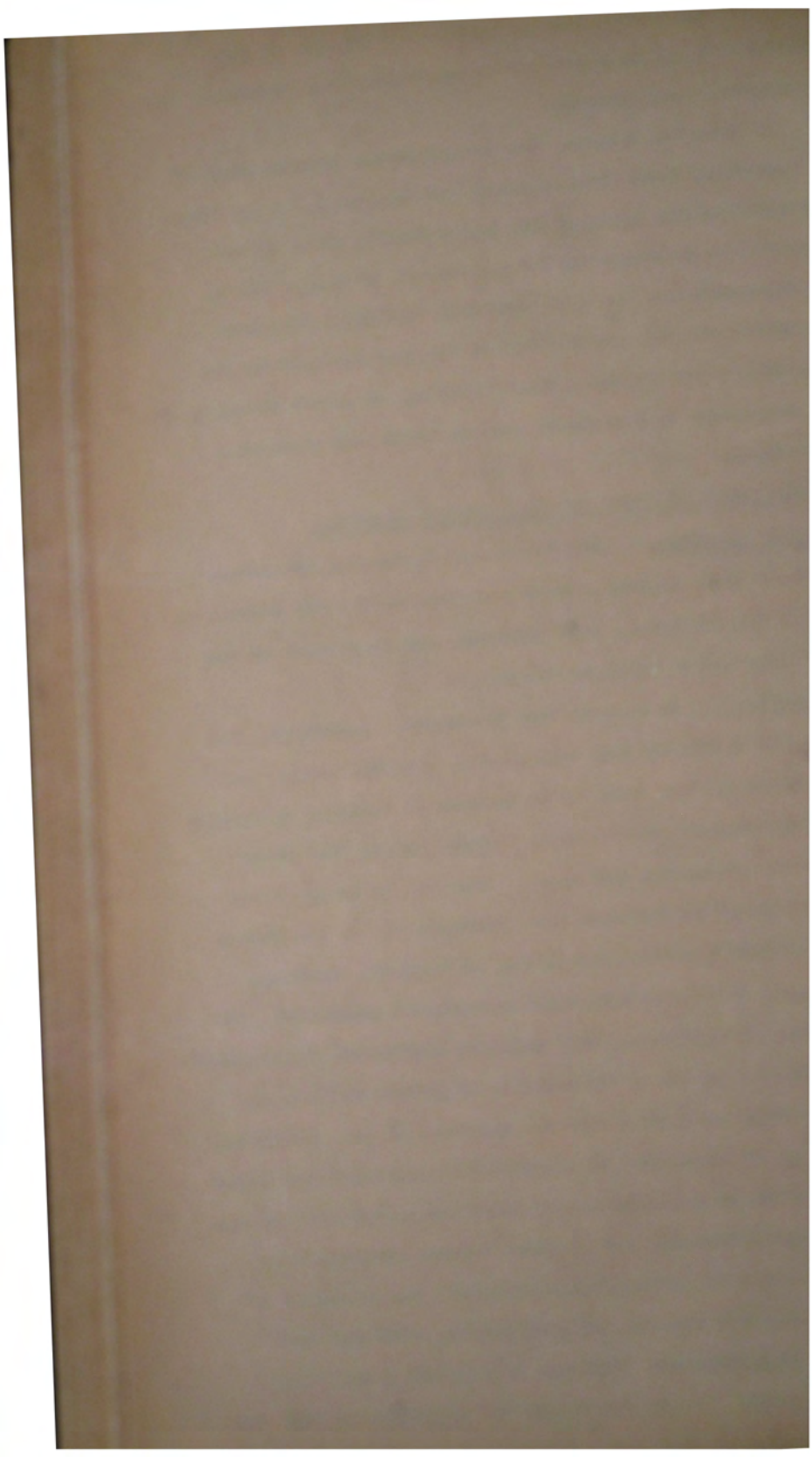
It was, of course, the co-ordinated functioning of all branches, both professional and clerical, as an integral whole while enabled the Department's Head Office organisation to stand up to the impact of war - and to meet successfully the many new and difficult problems of administration and control which the war brought in its train, while at the same time carrying on a not inconsiderable programme of important public works not connected with defence.

3. WAR-TIME FUNCTIONS OF HEAD OFFICE BRANCHES.

Technical Branches: The following technical branches, located in Head Office, were responsible to the Permanent Head for the planning, supervision, and execution of the work coming under their control:

Architectural. Headed by the Government Architect, the Architectural Branch was responsible for the design and construction of the tens of thousands of defence buildings erected throughout the country during and in the years immediately preceding the war. Experts in every field of the building profession were represented on the Government Architect's staff, including electrical, heating, ventilating, refrigerating, and structural engineers, and architects, draughtsmen, and quantity surveyors experienced in all aspects of the construction of public buildings.

As early as 1936 a special section of the Branch had been set up to undertake the design of buildings for RNZAF Stations then about to be established or enlarged. As New Zealand's preparedness for defence became accentuated, more and more work of this type required the services of the Architectural Branch, so that by the time war did break out in September, 1939, an organisation had been built up capable of dealing fully and effectively with the growing demands of the Armed Forces.





R.A. PATTERSON, F.N.Z.I.A.

Govt. Architect from February 1942.



J. T. MAIR, F.R.I.B.A.

Govt. Architect to Feb. 1942 (Ret'd)



G. F. PENLINGTON, F.N.Z.I.A.

Asst. Govt. Architect from Feb. 1942.



C. E. J. PRICE, F.N.Z.I.A.

Resident Architect, Auckland.

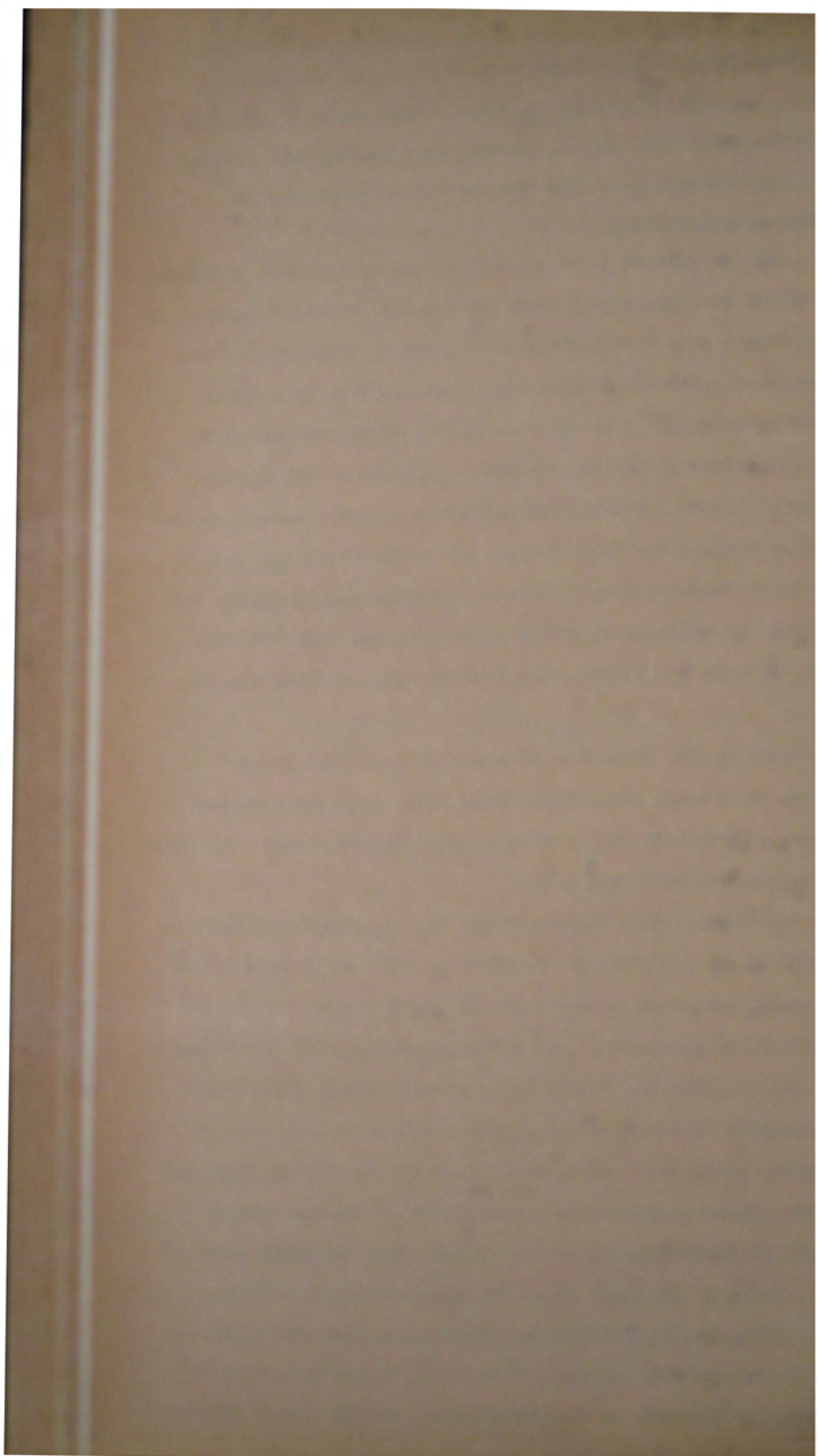


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The Government Architect's functions and responsibilities turned increasingly to defence in the ensuing years, reaching a climax in 1942 - 1943 when, following Japan's entry into the conflict, practically the entire building resources of the Dominion were concentrated on defence construction.

The prominent part played by the Government Architect and staff in connection with the master schedule system of contracting has been detailed in part 1, chapter 7. The system was administered by the Commissioner of Defence Construction, but most of the ground-work incidental to its introduction and successful application was carried out by officers of the Architectural Branch. Special contract forms had to be prepared and a whole new procedure devised to tie-in with existing departmental practice the services of private quantity surveyors and the 'allocation' of work to contractors without competitive tendering.

The speedy erection of more or less 'temporary' defence buildings (known as phase one) owed much to two factors evolved by the Architectural Branch, viz: standardisation and pre-fabrication.

Buildings were standardised as to general dimensions as well as to details, a 'module' or unit of 2 feet 2 inches being adopted as the most economical size to fit in with service equipment. Wherever possible, all buildings were, in dimensions, multiples of this unit. This meant that adaptations and changes could easily be effected on the site, while buildings could readily be joined together to make larger structures. Suppliers of lining boards adapted their machinery to the module and provided special sizes of their product, thus avoiding waste in cutting. Plans and specifications were given code numbers after being standardised, copies of the code being distributed to district offices of the Department, to the Armed Forces, and to building contractors and all others concerned.

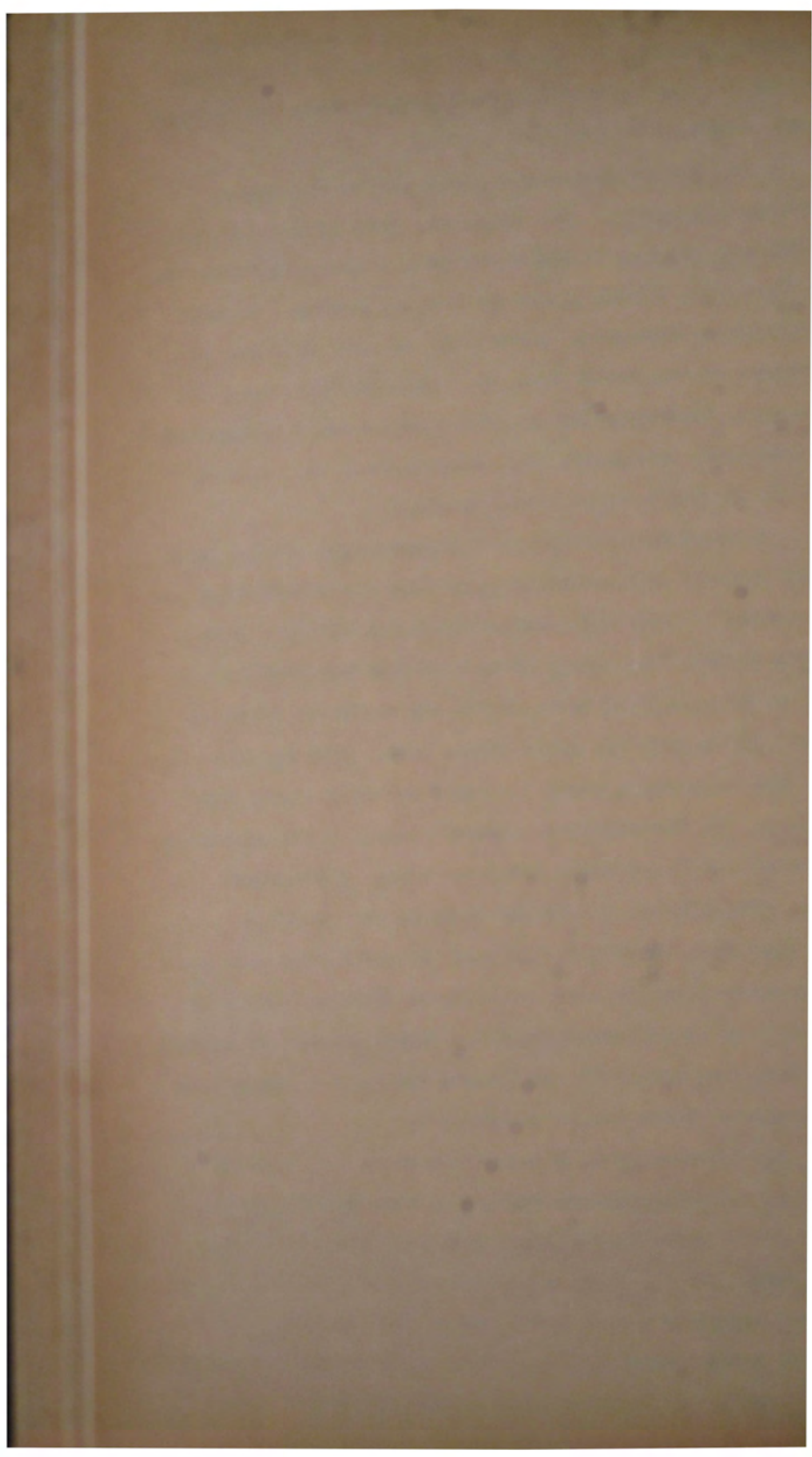


standardisation, and frequently all that was necessary to start a work was a telephone message from the Government Architect to the contractor.

Pre-fabrication was carried out to the utmost practicable limit. For instance, many of the defence buildings erected in the North Island were pre-fabricated in the South Island, since it was not feasible to move established factories, plant etc. as well as large proportions of the staff from one island to the other. In designing buildings for pre-fabrication the loading limit of available transport, e.g. tunnel gauge on railways, had at all times to be borne in mind.

Perhaps the most graphic illustration of the practical success of standardisation plus pre-fabrication was in respect of the large camps built for the U.S. Forces in the Paekakariki area. When word was received by the Government Architect that 20,000 men would be arriving within six weeks, the camps sites were, with the exception of a few buildings, empty paddocks on which sheep were grazing. To the surprised gratification of the Americans, their troops found three complete camps in readiness for them, with hot and cold water laid on and drainage installed, and cooking facilities all ready for use. This had largely been achieved through the various buildings having been pre-fabricated in the South Island and marked, numbered, and shipped to the North Island for assemblage by groups of North Island contractors.

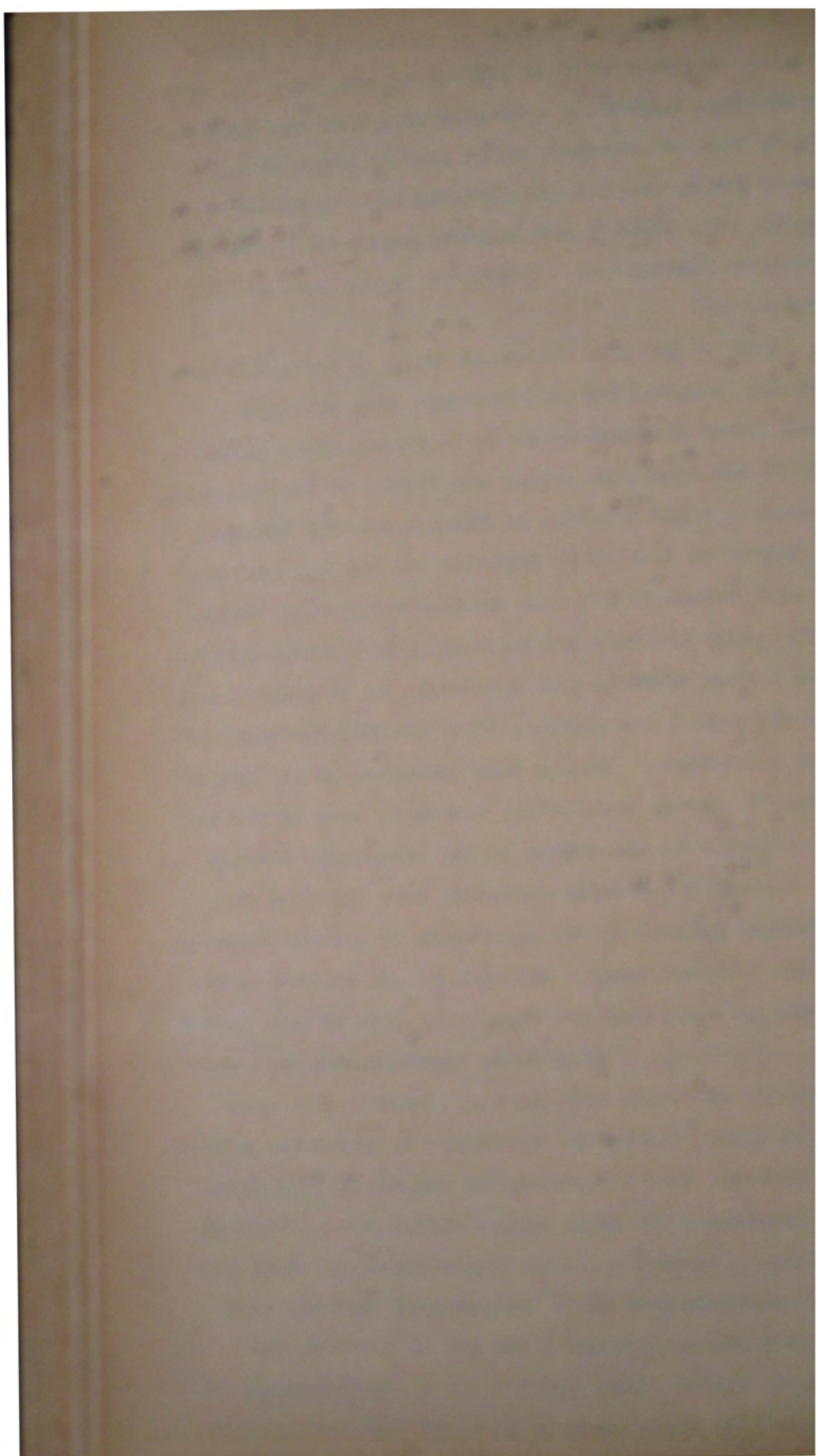
The substitution of materials in an endeavour to overcome hold-ups through shortages was also a factor which contributed to the rapid construction of defence buildings. In the Auckland district, for example, an impasse threatened to develop during the erection of brigade camps, owing to the total output of the customary roofing materials being required exclusively for more permanent establishments. It was therefore decided to



the plastered wall board and soft board, normally suitable only for interior wall or ceiling linings. This alternative, admittedly a drastic expedient and justified only by the comparatively short life expected of the brigade camps, enabled the buildings to be completed on schedule and, indeed, gave results much better than the architects anticipated. Later, the roofs were covered with malthoid.

Some of the more permanent types of buildings were specially designed for post-war use, this enabling a better class of structure to be provided, where required, while at the same time paying due regard to the economics involved. A new hospital at Middlemore, for instance, was planned as a military institution, but the need for it passed before it had even reached completion. Thanks to the design adopted, its conversion to a civil hospital became a comparatively simple matter. At Avondale a complete new school was planned, then diverted for war-time use as a hospital. Nurses were quartered in buildings destined to become residential houses as soon as the hospital reverted to the school it was originally intended to be. Hostels for service personnel were provided from multi-units erected by the Department of Housing Construction, the fittings being restricted to one kitchen in the meantime and temporary doorways being left in what later became party walls. In certain circumstances buildings constructed on rented land were so designed that they could be taken over by the land-owner to serve his private needs when the land was eventually vacated by the Crown.

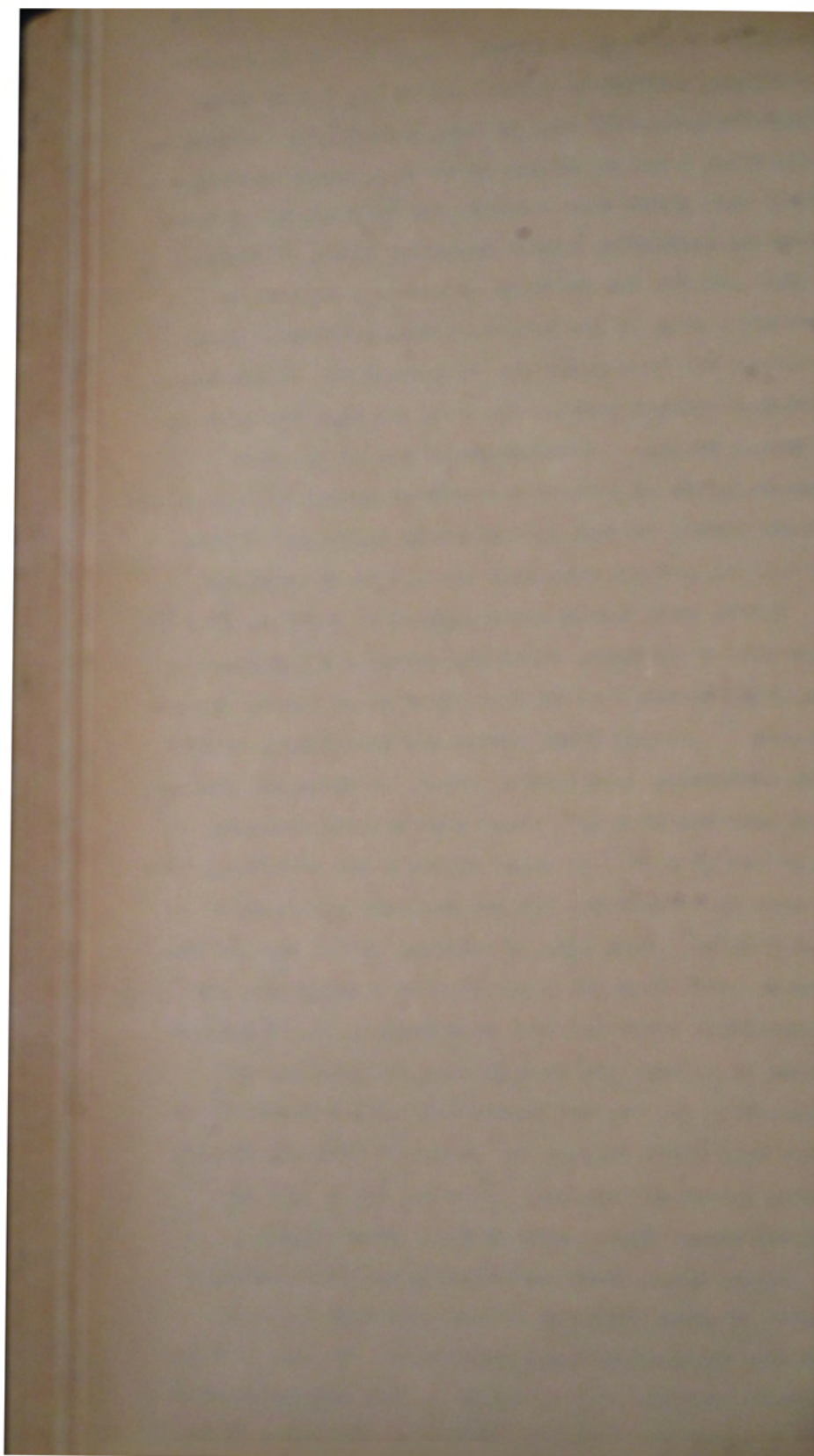
Magazines and large stores called for a different technique. Whereas speed in construction and availability of materials were still the dominant factors, such considerations as strength could not be ignored. The tremendous demand during the war for wooden buildings of all kinds with clear spans of up to 60 feet necessitated the most economical use being made of available timber



...difficulty began to be experienced in obtaining sufficient quantities of the larger sizes of timber customarily used in long span roof construction. Fortunately, a unique device known as a timber connector - a steel ring which made possible the building up of heavy members by laminating common scantling sizes of timber, and also enabled the strength of timber joints to be increased - came on the market at this juncture. These connectors had been developed in Germany and in the Scandinavian countries between the wars and improved upon in the United States. Manufacture of two of the most promising types of connector commenced in New Zealand in 1940 and during the war approximately 1,000,000 of them were used in defence buildings throughout the country.

Later, even timber sizes such as 8" x 2" and 6" x 3" became hard to procure, while the demand for buildings - principally stores - of 60 feet clear spans became greater than ever. A rigid frame design was accordingly evolved in the Government Architect's office, in which the largest timber used was 6" x $1\frac{1}{2}$ ", while most members consisted of 4" x 2" and 3" x 2". In these frames a few critical joints were made by connectors, but the majority were simple nailed joints. This type of building proved cheaper and easier to erect than its more orthodox counterpart, and was remarkably stiff and free from deflection, as well as standing up to wind pressure in even the most exposed localities. All the new stores buildings constructed at Seaview Road (Hutt Valley) and at Sylvia Park and Mangere Crossing (Auckland district) - a total floor area of 1,291,800 square feet - were of rigid frame design.

At one stage, when the Dominion was faced with the prospect of enemy invasion, accommodation of a mobile nature was required in large quantities. The use of tents would have been the obvious solution, but successive shipments of canvas had been lost at sea and the needs of the moment could not await replacements. A mobile hut was

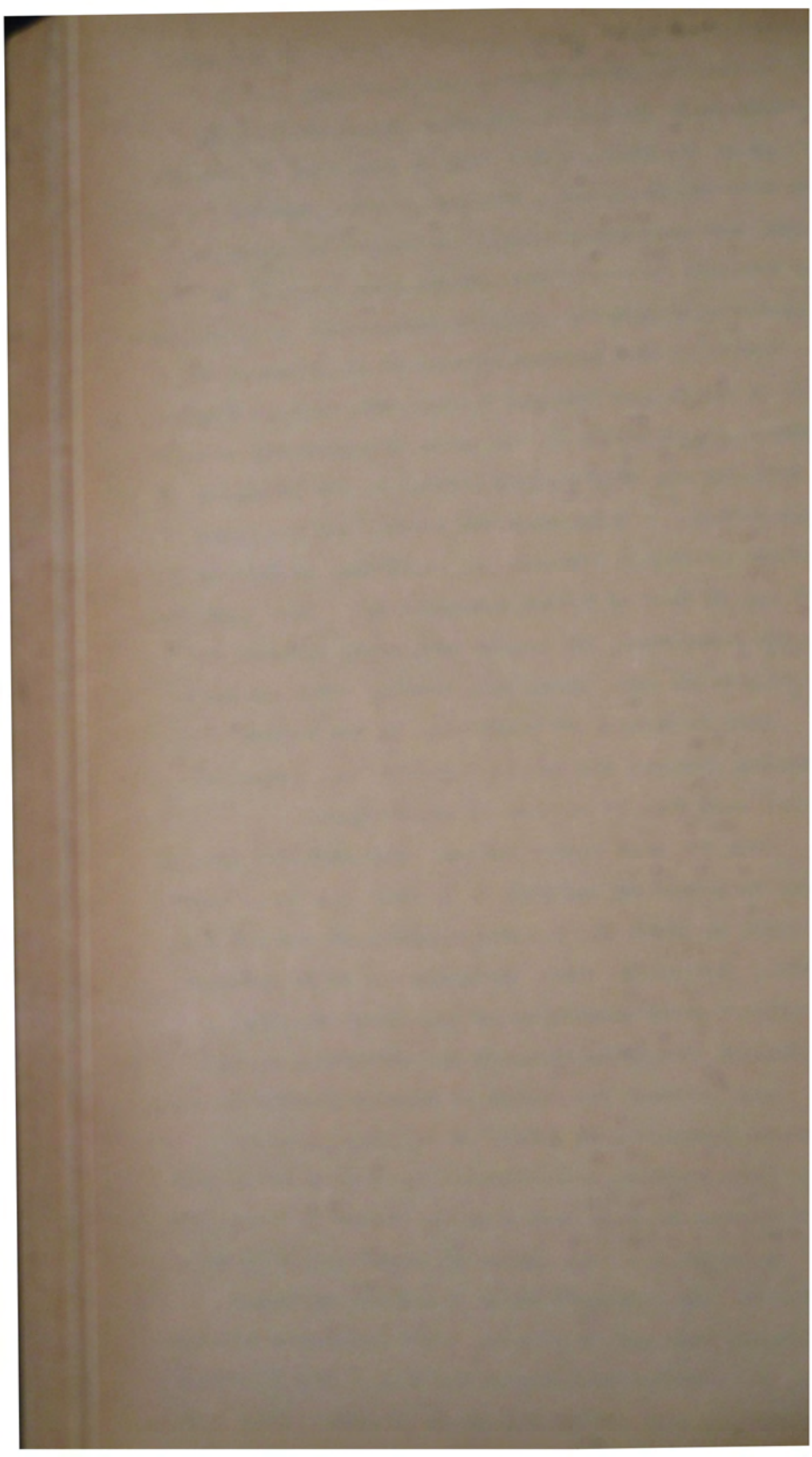


designed, somewhat on the lines of a tent. It was made of plywood and light timber, with specially designed connectors to facilitate erection and dismantling by troops in the field. Not many of this type of portable hut were supplied, but a similar pattern, assembled with bolts, was used extensively. Later, as the necessity for mobility lessened, new designs were prepared in collaboration with the military authorities. An interesting factor is that whereas economy in construction and ease of discipline demanded a large hut, medical requirements (e.g. isolation in the event of epidemics) as well as mobility and adaptability pointed to the provision of small units. A compromise was reached and two types of hutments evolved - four-men and eight-men, 10 feet by 8 feet and 20 feet by 8 feet respectively. Here again end-use was considered, the bigger huts being suitable for use as garages etc. (They sold readily after the war).

Many buildings pre-fabricated in New Zealand were specially designed for tropical conditions, taking into account such factors as ease of shipment, etc.

Even the most secret defence establishments usually needed buildings of one sort or another, and there were few cases in which the Government Architect was not consulted. Naturally, these buildings had to be designed and erected under conditions of the utmost secrecy. Concealment from enemy aircraft and protection against bomb blast governed the design of certain structures, e.g. for radar installations a type of building known as 'igloo' was evolved, semi-circular in cross-section, with quarter-spherical ends buried in the ground on completion.

In addition to the design and construction of the hundred and one different kinds of defence buildings required by the Armed Forces and other Government Departments, the Architectural Branch was called upon to assist in connection with the establishment of such special war-time industries as food dehydration and canning.

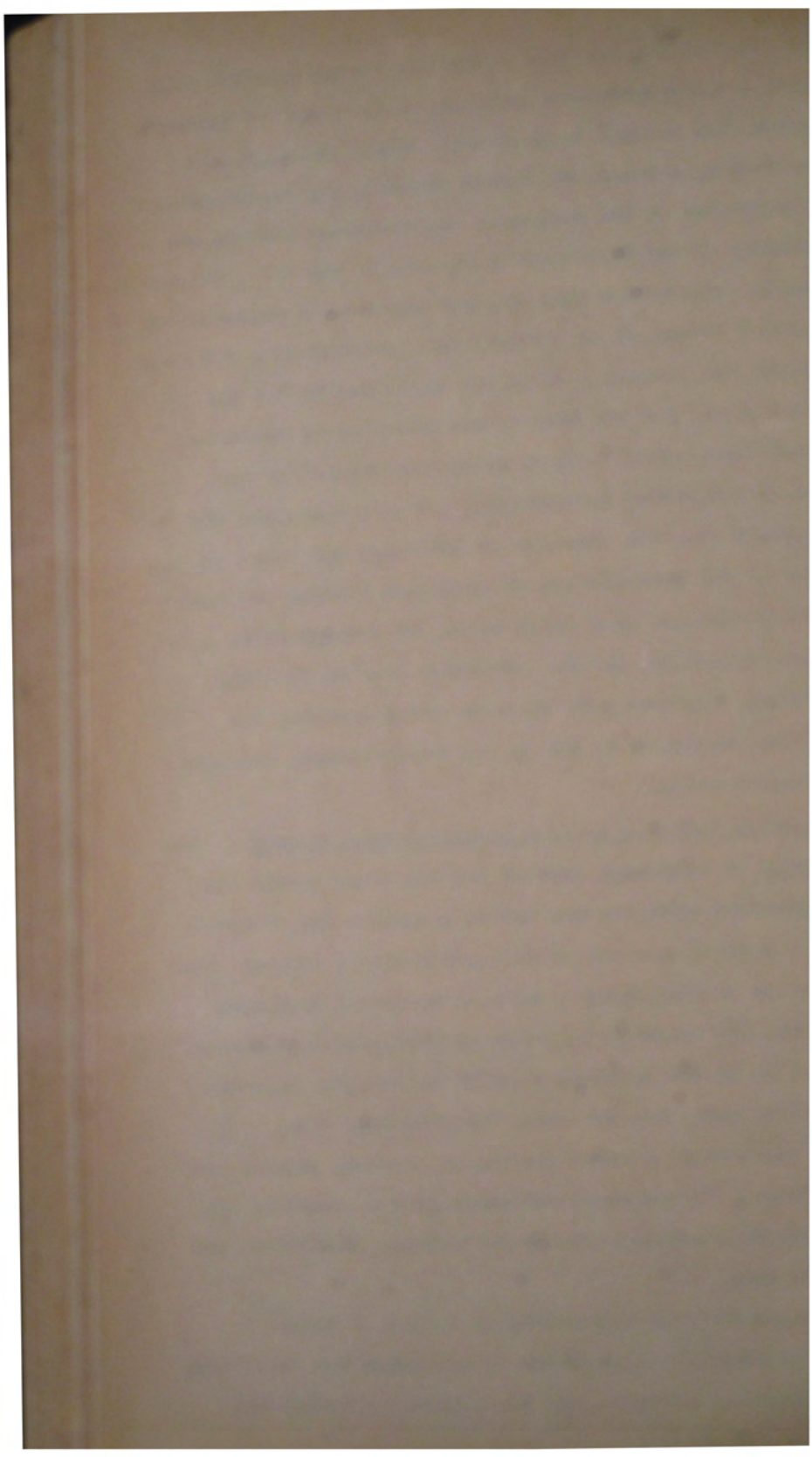


The processing of food for the Forces bristled with highly complex technical problems in the field of refrigeration, ice making, coal storage, fruit and vegetable dehydration, canning, and 'quick freeze', the installation and servicing of the machinery and equipment testing the ingenuity of the Department's experts to the full. For the Pukekohe dehydration factory, for instance, a steam-driven generator in use at an Invercargill power station for over 30 years was procured, while the steam supply for the generator and for the factory was provided by purchasing two Scottish marine boilers which had originally been intended for a Navy minesweeper. At military camps and on aerodromes etc. the erection of buildings had to be supplemented by the installation of plumbing, heating and ventilation facilities on a large scale, of comprehensive cooking equipment, and the provision of fire fighting apparatus, together with numerous other services and amenities necessary to render the establishment complete and ready for use.

Engineering Services Section (Architectural Branch): The servicing of buildings erected for the Armed Forces and in connection with the war effort generally was attended to by a special section of the Architectural Branch. The activities of this section were as varied as they were numerous, and extended to overseas defence establishments as well as in New Zealand, notably the Pacific Islands, the Middle East, the Far East, and even Cape Horn.

'Servicing' covered the layout, design, supply, and installation (or shipment, if intended for overseas) of:

- (1) Steam generating plants for heating, hot water, and cooking.
- (2) Generation of electricity by Diesel or steam.
- (3) Direct boiler generation of hot water for ablutions, domestic services, and the heating of individual buildings.



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generation of hot water, and cooking.

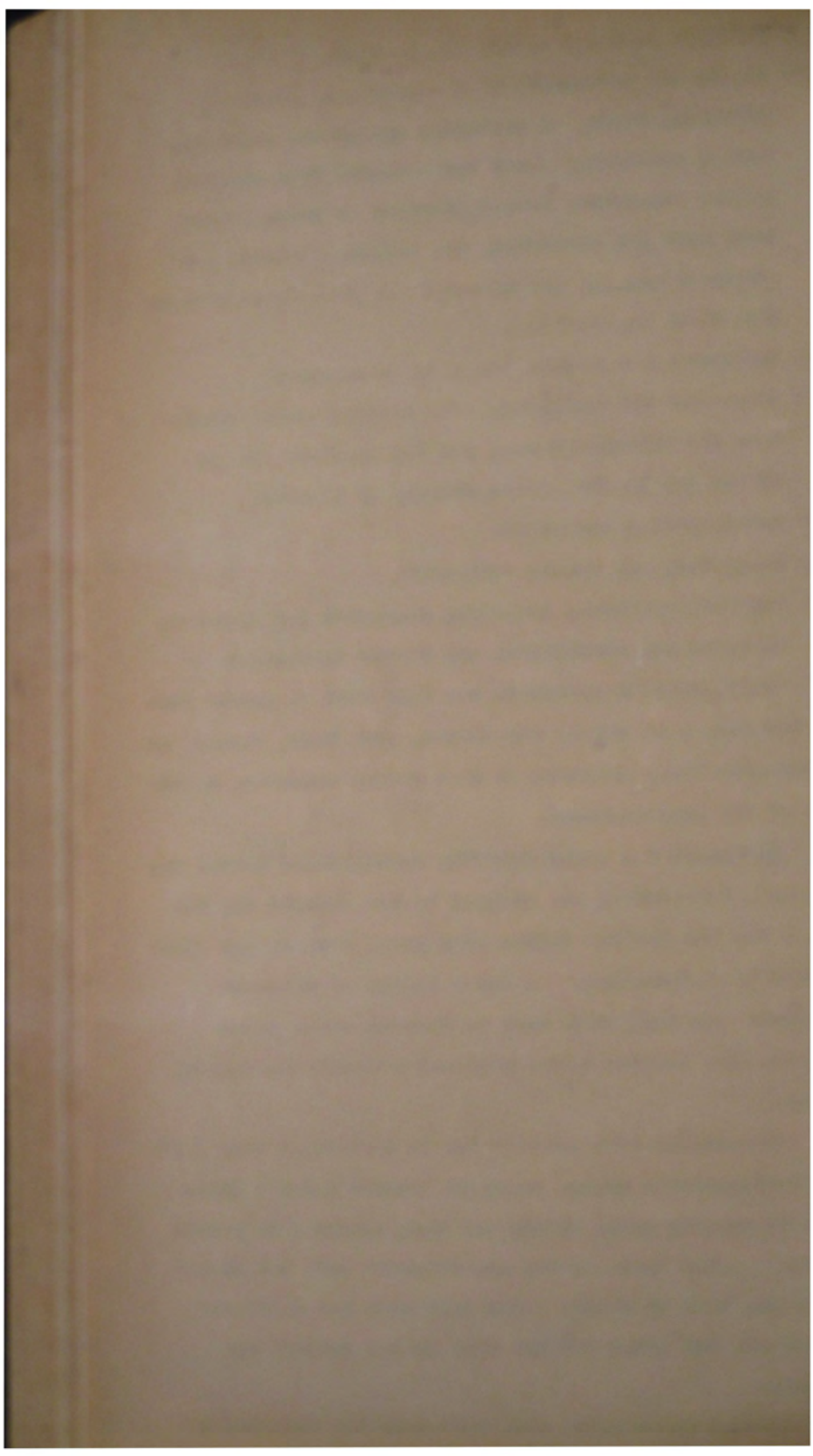
- (5) Supply and reticulation of electrical power, including wiring of buildings and ground lighting. (Where available, power was obtained from existing mains: otherwise, Diesel, electric or steam plants were used for generating the supply. Plants for overseas usually incorporated oil fuel fired boilers for steam generation.)
- (6) Equipment for cooking and food processing.
- (7) Laundries and equipment, also special drying equipment for advanced bases, for the personal use of troops and to facilitate washing of clothes.
- (8) Refrigeration equipment.
- (9) Bakehouses and baking equipment.
- (10) Hospital services, including equipment for operating theatres and sterilizing and X-rays appliances.

Refrigeration equipment was very much in demand during the war, most camps, aerodromes, etc. being fitted out either with large cabinets or cool rooms, according to the size of the establishment.

Equipment for three sizeable refrigerated stores was designed, fabricated, and shipped to the Pacific for the use of the New Zealand Forces (for meat, butter, and other perishable foodstuffs). A large number of cabinets (kerosene operated) were sent to forward areas in the tropics, also several stationary and portable ice-making plants.

Experiments were carried out in connection with portable refrigeration units, known as 'reefer boxes'. These could be readily moved about, and were operated by petrol motors. After tests of the experimental unit had proved its value, some 21 reefer boxes were made and delivered to Army and the RNZAF for use both in New Zealand and overseas.

Special air conditioning equipment was designed to



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in Pacific Islands, military hospitals, underground tunnels and chambers in fortification areas and operational centres, and air raid shelters.

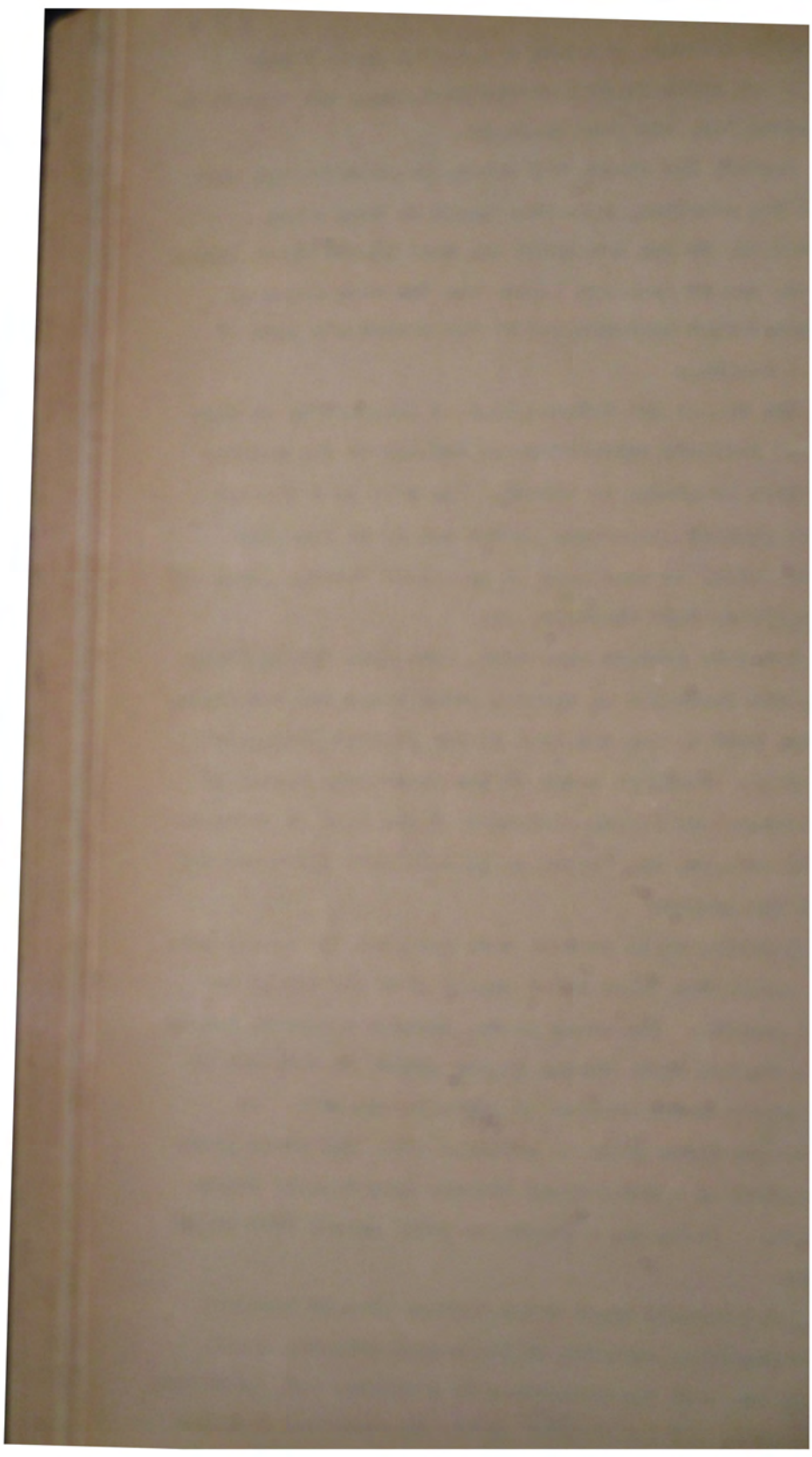
Heating (by steam, hot water, or electricity) also called for something more than usual in many cases - for example, in new hospitals and ward blocks built during the war, and in premises taken over for occupation by American forces unaccustomed to the Dominion's lack of central heating.

The supply and reticulation of electricity at hundreds of military establishments throughout the country was a huge programme in itself. As well as a regular supply, standby generating plants had to be installed for use during an emergency at important defence posts and at hospitals, raid shelters, etc.

Complete laundry equipment, including drying facilities, was installed in several large camps and hospitals, and also sent to one hospital in the Pacific (Noumea). Most of the principal camps in New Zealand were fitted up with laundry and drying equipment of one kind or another. Special wringing and drying appliances were assembled for use in the tropics.

Portable field showers were designed for mobile use. These could draw their water supply from any stream by manual pumping. The water passed through a heating boiler into a storage tank, whence it was pumped to some six or eight shower hoses erected on portable supports. In open spaces these could be screened off. The whole plant was mounted on a motor truck and was thus readily transportable. Using it, a battalion could shower bath in 20 minutes.

Practically every major defence project involved some engineering services of the nature outlined above. Most of the work was undertaken by contract, but, as stated, the planning and supervision of the multifarious requirements of all Departments and Armed Forces concerned -

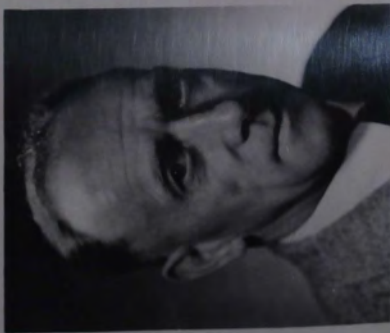




R. C. ADAMS, B.E.
Structural Engineer, N.O.



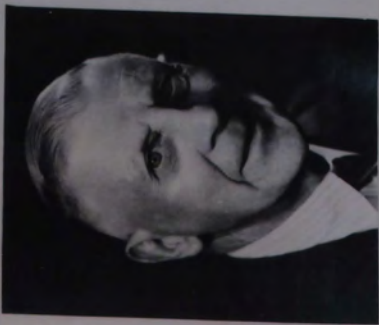
R. B. A. MACCURDY.
Building Services Engineer, N.O.



G. C. HALSE
Architectural Draftsman, N.O.



F. W. BARNICOTT
Inspector of Works, Wellington.



F. G. C. SCHWARTZ
Inspector of Works, Christchurch.

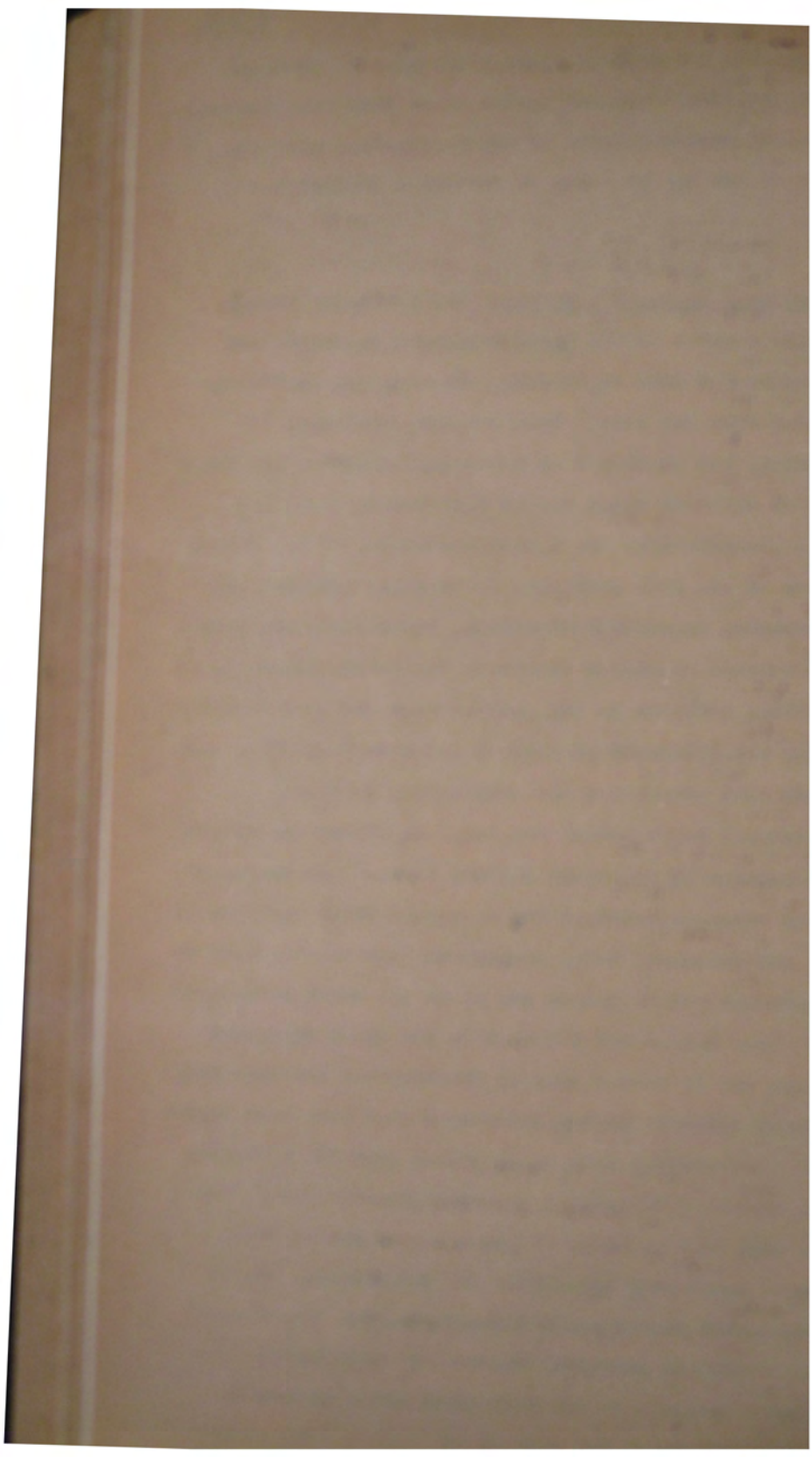


including the adoption of special measures to overcome special problems - and completion up to schedule, remained the overall responsibility of the engineering services section of the Public Works Department's Architectural Branch.

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The Designing Engineer's Office. The Designing Branch, under the control of the Chief Designing Engineer, was responsible for much engineering directly and indirectly connected with the war. This included designing and supervising the provision of sewerage, drainage, and water supply at military camps and on aerodromes; bulk fuel storage installation; the splinter-proofing of oil tanks; erection of air raid shelters; camouflage; hangars; gun emplacements; ammunition magazines; radar stations; underground control operation quarters; and acting generally as engineering advisors to the Armed Forces and in connection with the establishment of special war-time industries such as linen flax production and dehydration of food.

Several years before the outbreak of war the Branch became engaged on important defence work. Air Headquarters had requested that at its permanent RNZAF Stations at Ohakea and Whenuapai large hangars in durable materials be so constructed as to render the doors and walls splinter-proof. The matter was referred to the Chief Designing Engineer, who evolved a type of construction incorporating reinforced concrete arches carrying a roof slab four inches thick. The annexes were to be placed near the springing of the arches. To provide against outwards thrust, the arches were tied by means of pre-stressed rolled steel joists. Apart from simplicity and reliability, the splinter-proof requirements necessitated the adoption of sliding doors and precluded the use of other types. The doors were designed as ten inch thick slabs running on rails into pylons at the side of the hangar. The design



hangars were in hand when hostilities began.

It is interesting to note that the German Air Ministry and later the U.S. Air Corps adopted similar hangars at certain stations.

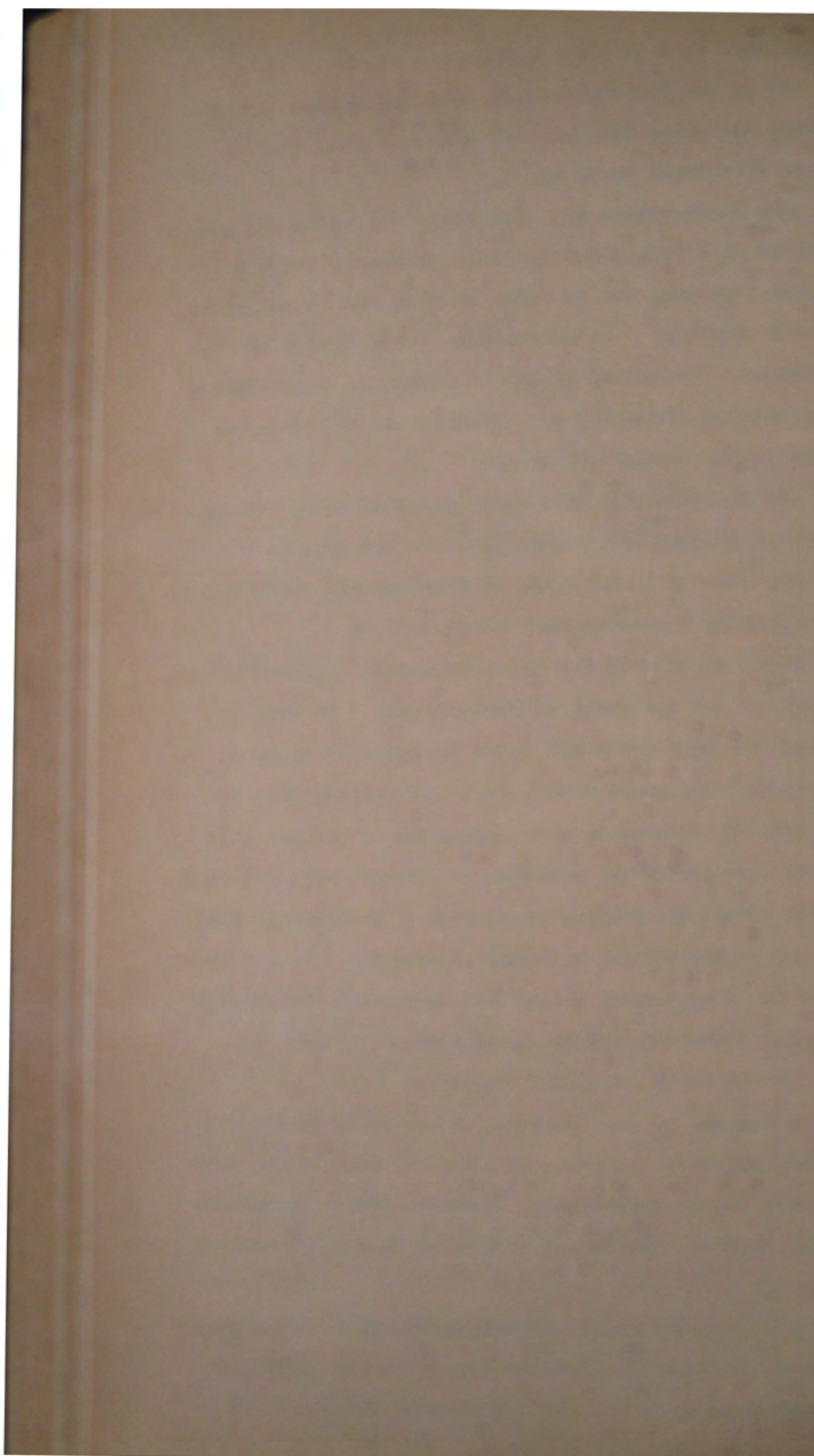
Air Headquarters had also asked for plans and specifications of a 'mobilisation' type of hangar which could be erected quickly and in large numbers out of materials available locally. A description of the design adopted and further particulars of the planning and construction of the hangars generally are given in the Official War History of the Aerodromes Branch.

Air Headquarters were later supplied with designs of further hangars and workshops buildings for their Stations, some of these being of considerable magnitude and frequently wanted at very short notice.

Other aspects of the Chief Designing Engineer's war-time activities are dealt with elsewhere. In 'Civil Defences and Miscellaneous' (part 6, chapters 1 and 2) are outlined the steps taken, in collaboration with the civil defence authorities, to design and construct raid shelters throughout the country, to protect bulk oil fuel supplies from bomb damage, to provide fire fighting equipment, and to camouflage military objectives. In all these matters the engineering advice and assistance rendered by the Public Works Department largely emanated from the office of the Chief Designing Engineer.

An account of the planning of gun emplacements and auxiliary services for the Army, ranging from light anti-motor boat and AA batteries to coastal defence batteries (6") and counter-bombardment batteries (9.2") appears in part 2.

Under conditions of extreme emergency a transportable anti-aircraft mounting platform was designed. This gave excellent service in the Pacific theatre and it is now recorded in the War Office Manual. For the Navy a complete

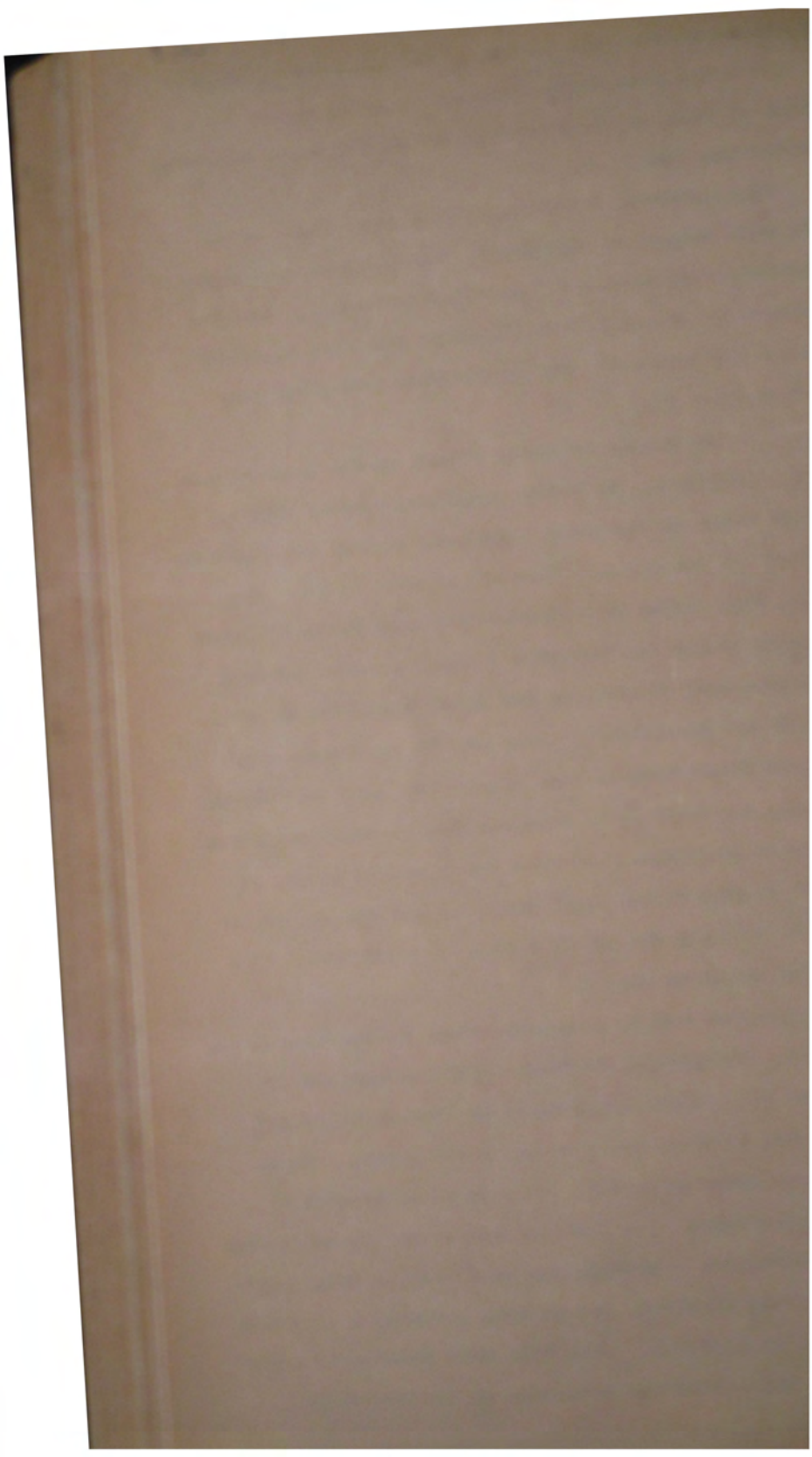


1), involving many engineering problems in regard to the design of bulk oil fuel storage tanks, slipways, wharves, breastworks, etc., etc.

The services of the Chief Designing Engineer and staff were called on relative to the planning and design of retting equipment for linen flax factories, also the provision of drainage, water supply, and fire fighting services for these and for dehydration factories (see part 6 chapter 3).

With the danger of enemy attack on New Zealand more than a possibility, it became necessary during 1942 to consider means of rendering explosive stores and magazines resistant to incendiary bombs and to bomb blast. Previously, this class of structure had been built of brick walls with timber and asbestos covered roofs. Several new designs were evolved by the Chief Designing Engineer and staff and submitted to Army and to the Commissioner of Defence Construction, one adopted and used at Pahiatua comprising splinter-proof construction in reinforced concrete, with provision for brick inner cavity walls, and also for outside brick panel walls should the labour and materials position favour that type of structure. This design was known as Type R. (1).

To prepare for an emergency which fortunately never eventuated, underground fighter control rooms were authorised at certain RNZAF Stations from Waipapakauri in the north to Woodbourne in the South Island. These differed slightly in design, but consisted chiefly of a large, high control room with galleries and accommodation for equipment etc. Heating and ventilation, sump pumping, emergency lighting, and standby generation of power had all to be provided. The fact that construction was curtailed and ultimately abandoned as the threat of





A. J. BAKER, M. INST. C. E.

*Asst. Engineer-in-Chief to Nov. 1940
(Ret'd)*



T. M. BALL, A. M. I. C. E.

*Asst. Engineer-in-Chief Mar. 1941
Aug. 1945 (Ret'd)*



T. G. G. BECK, A. M. I. C. E.

Chief from June 1945



F. LANGBEIN, M. INST. C. E.

*Inspecting Engineer from July 1943
Chief from*





H. H. SHARP, A.M.I.C.E., A.M.I.M.E.
Inspecting Engineer to June 1943 (Ret'd)



H. WATKINSON, A.M.I.C.E.
Inspecting Engineer, Mar. 1941 to Aug. 1945, (Ret'd.) (Previously D.E. Wellington)



E. A. GIBSON, O.B.E. A.M.I.C.E.
A.F.R.AeS. Aerodromes Engineer to Sept. 1943 (On leave to R.N.Z.A.F.)



D. O. HASKELL, A.M.I.C.E.
Aerodromes Engineer from April 1944. (Previously Acting A.E.)



N. J. M. McLEOD, M.I.M.E.
Chief Mechanical Engineer to Dec 1941 (Ret'd)



D. R. NEWSON, A.M.I.M.E.
Chief Mechanical Engineer from Dec. 1941



C. W. O. TURNER, B.Sc. (ENGR.)
Chief Designing Engineer to June 1944



H. L. HUME, B.E. B.Sc. A.M.I.C.E.
Chief Designing Engineer from Aug. 1945. (Previously Acting)



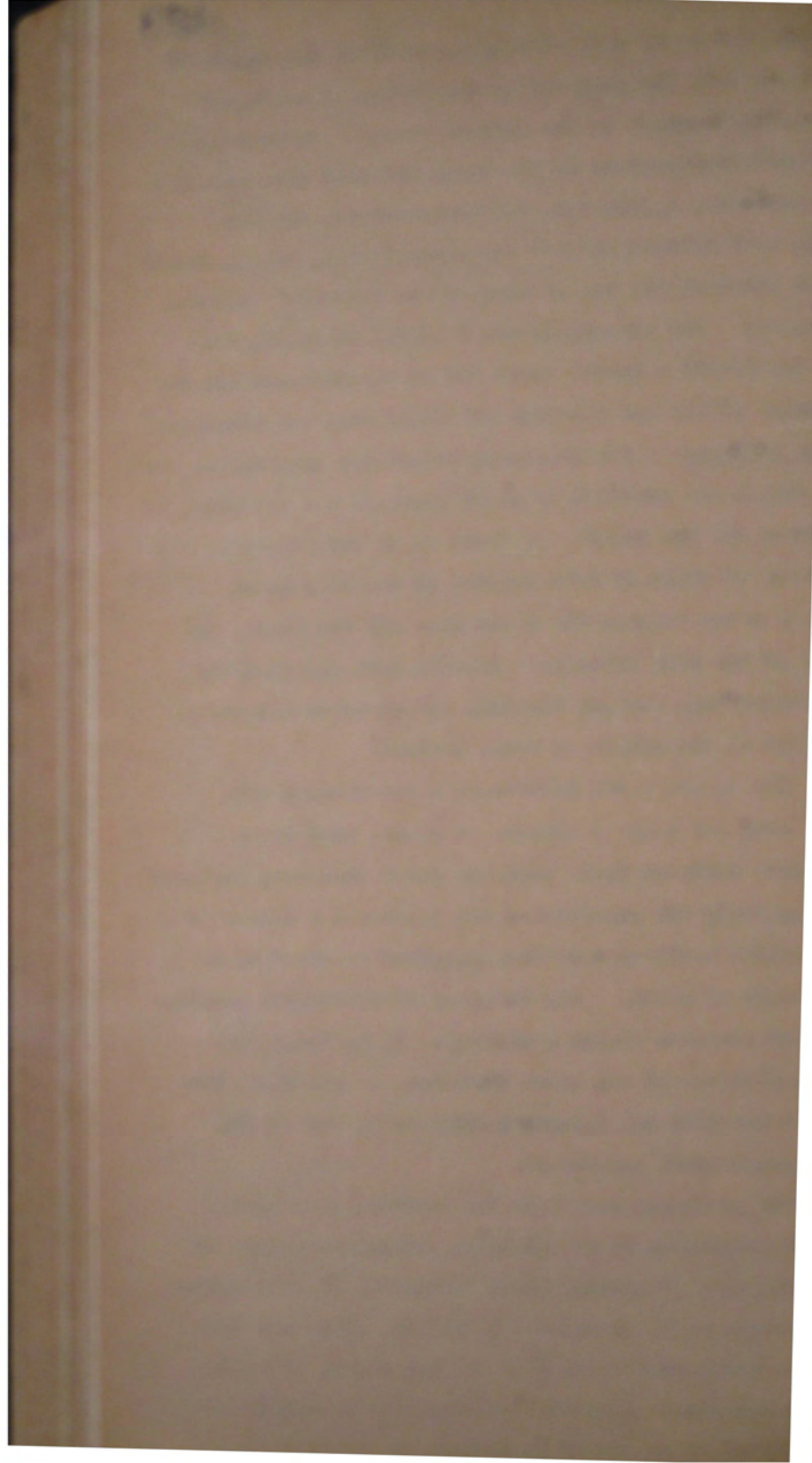
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attack passed did not, of course, diminish the amount of work put into the projects by the office of the Chief Designing Engineer in the initial stages. Underground combined headquarters of the three Services were designed for Auckland, Wellington, and Christchurch, and here again construction did not reach completion, though nearly so at Auckland (in the grounds of the Teachers' Training College). The tunnelling was finished at Wellington (in the Dominion Museum area) and at Christchurch (in the Cashmere Hills) but fittings and plant were not installed.

Radar Stations. The Designing Branch was responsible for the design and erection of radar stations for the Army, the Navy and the RNZAF. A total of 30 such stations was erected, of which 27 were located in New Zealand at various sites between the North Cape and the Bluff, and three in the Fiji Islands. Designs were supplied for coast-watching, big gun ranging, and aircraft direction, both ashore and afloat on Naval vessels.

The Public Works Department's association with radar work (or radio location, as it was then known) commenced early in 1941, when the Chief Designing Engineer (representing the Department) was appointed a member of a technical advisory committee responsible directly to the Chiefs of Staff. The Director of Scientific Development was chairman of the committee. It included also representatives of the three Services, of the Radio Section of the Post and Telegraph Department, and of the Radio Development Laboratory

The procedure was: (1) the Services made known their requirements as to location, nature, and range of stations, type of accommodation necessary, and the number of personnel to be provided for, (2) the Radio Development Laboratory (an adjunct of the Department of Scientific & Industrial Research) attended to the supply and installation of the radar apparatus, (3) the Radio

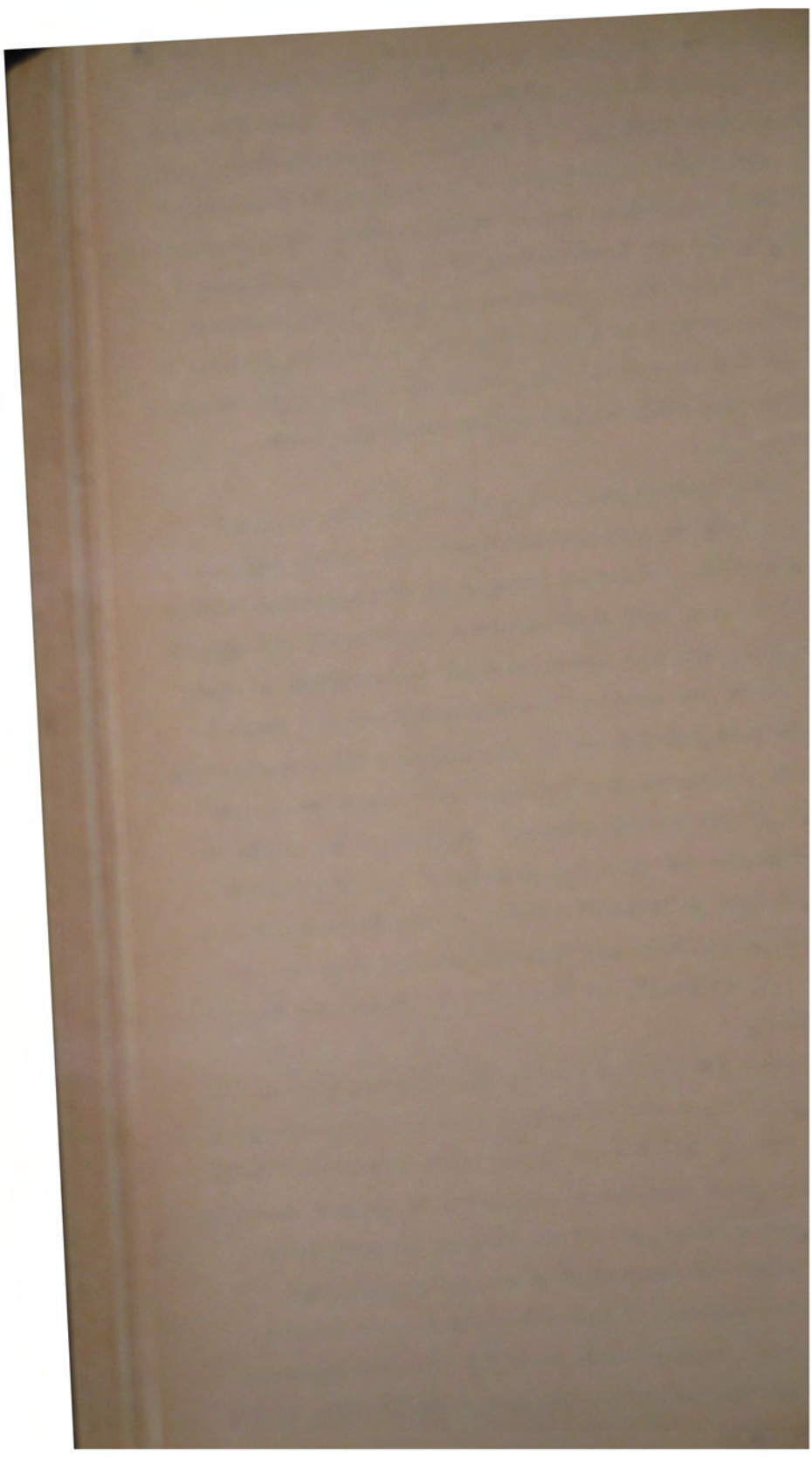


supply of parts for use by the Radio Development Laboratory, and (4) the Public Works Department carried out the design, construction, and erection of each station. This, (4), involved the provision of a building to house the technical apparatus, the erection of masts and rotating aerials, and the construction of special control gear boxes. Electrical generating sets had to be supplied and arrangements made regarding fuel. Access roading was usually required. Buildings were erected to accommodate the personnel, complete with water supply and sewerage.

Each Service required a different kind of radar station, both as to technical buildings, masts, and accommodation. Constant changes in the apparatus were ordered to keep pace with advances in research and experimental use, and this meant frequent re-designing of some or all parts for each new station established. Special problems were encountered by the Public Works Department's designing engineers in connection with the mounting and rotating of the aerial system. In some of the early RNZAF Stations the gear was mounted on top of a timber tower 100 feet in height. Owing to the exposed position, the force of the wind was a factor which had to be seriously considered both in regard to design and to erection.

Another problem of special significance was the production of high ratio 600 to 1 gear boxes for use in rotation and in oscillation of the aerial systems. These boxes, used with conspicuous success both on land installations in New Zealand and in the Pacific Islands, were designed under the direction of the Chief Designing Engineer and produced in several sizes to meet varying requirements. A small size gear box was also supplied in large numbers for service on ship installations in the Eastern Fleet.

Construction work was rendered extremely difficult

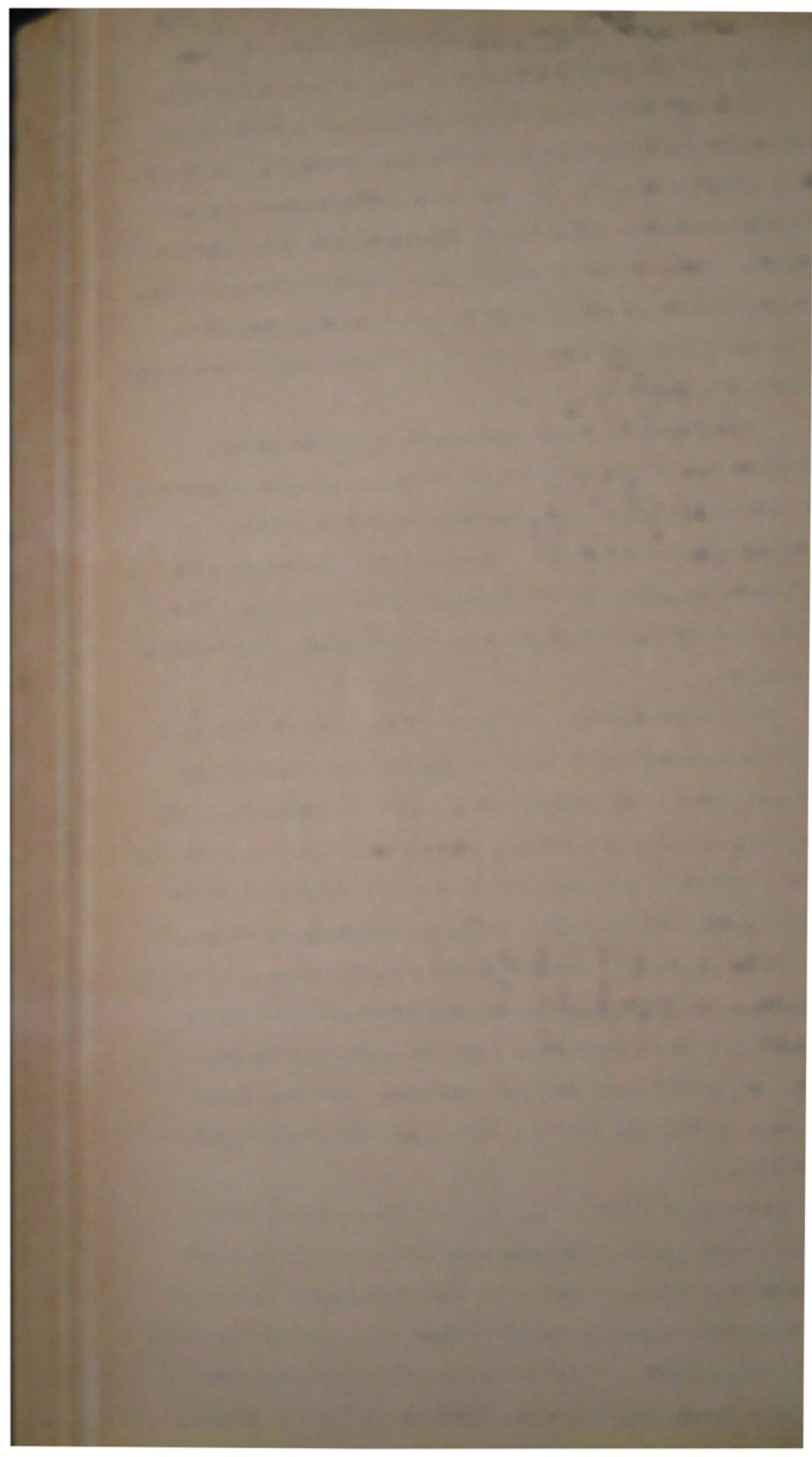


...the inaccessible sites selected for the majority of the radar stations, e.g., on the high parts of headlands such as North Cape, Maunganui, Bluff, Cape Brett, Bream Head, Cape Farewell, Cape Campbell, Sinclair Head, Baring Head, and Te Awaite. Others were on the elevated portions of outlying islands, including Cuvier, Stephens, Makohinau and Rangitoto. Without the services of bulldozers and the provision of temporary tramlines delivery of materials to some of the sites would have been virtually impossible.

Associated with the construction of the radar stations were a number of minor works, e.g., the erection of observation posts and observation towers. These usually called for special consideration in design, as, for instance, allowing for winds of gale force and, in Pacific Island projects, for the withstanding of hurricane conditions.

For actual service in the Pacific theatre, six long range air warning radar sets of special demountable type were designed. The structural portion of this equipment was formed of pipe or tubular sections welded into portable units - a fact which made for very rapid erection under active service conditions. It is significant that the LRAW sets operated at Noumea, Green Island, Palaw, Pelelieu, and Ulithi were the subject of most favourable comment by U.S. commanders. With the exception of the Noumea set, which was used for training purposes, these sets were giving air warnings shortly after each invasion operation.

The utmost secrecy which had to be accorded all stages of the design and construction of the whole radar station programme made it desirable to restrict knowledge of the work to only a few Head Office and district officers of the Department, on whom a heavy burden was thus thrown at a time when, between early 1941 and the end of 1943, the Department was passing through the perhaps most diffi-





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STAGES IN THE ERECTION OF A RADAR STATION

① Materials arrive by barge. ② Constructing the base and framework. ③ Base & Framework in position. ④ & ⑤ Hoisting sections of the radar array. ⑥ Sections assembled on the platform. ⑦ & ⑧ Start of lifting the array. ⑨ & ⑩ The array being placed in position. ⑪ Balancing the array to the lower section. ⑫ The completed job.



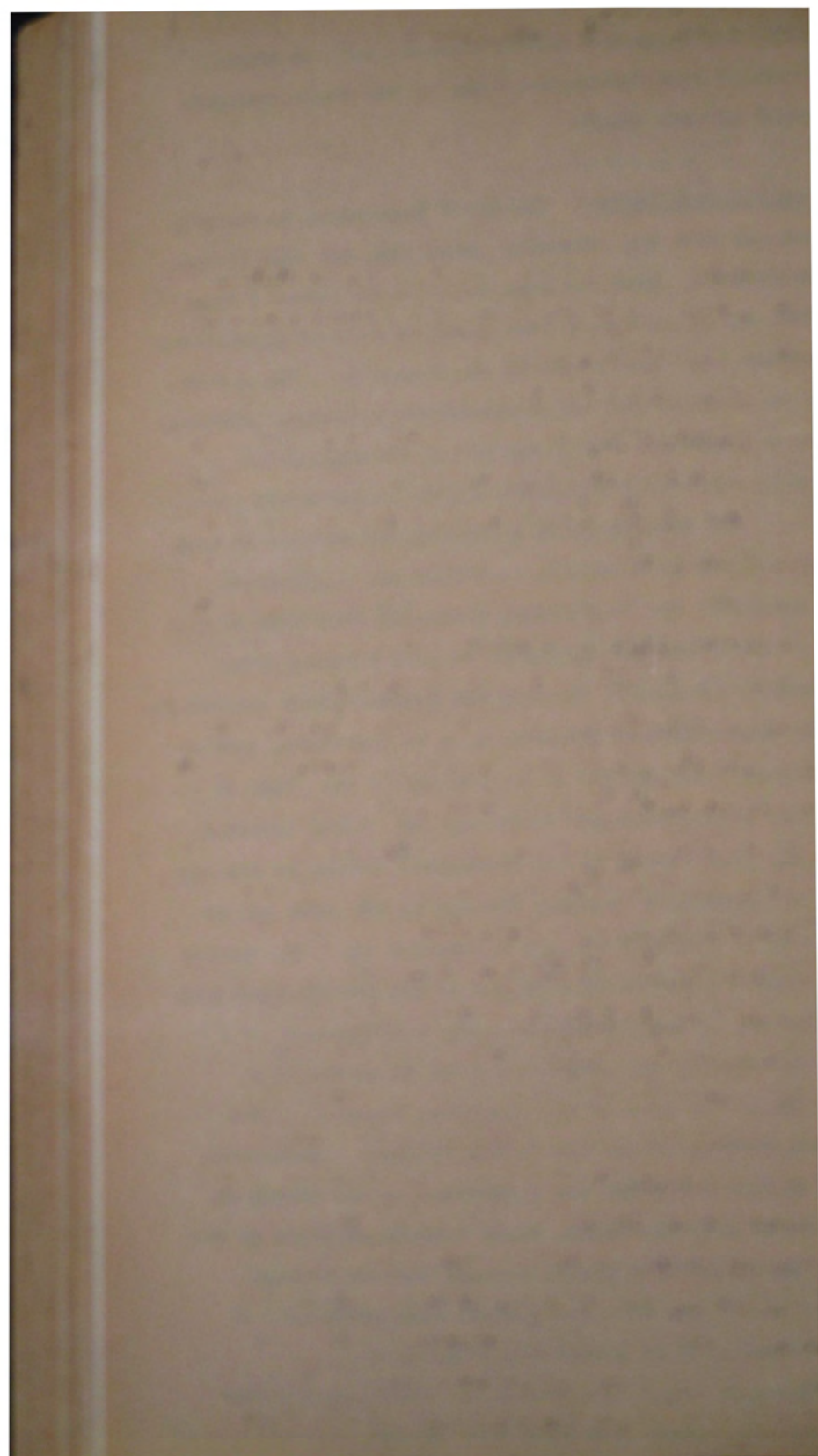
cult and trying period in its history, and, as stated, the bulk of this burden was borne by the Chief Designing Engineer and his staff.

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Mechanical Engineering: The Chief Mechanical Engineer's branch was occupied primarily during the war with procuring mechanical plant and equipment for the Armed Forces and keeping in operation such units as were being utilised on defence and other works in the Dominion. The modern types of earth-moving and construction machinery purchased by the Government a few years before the war proved eminently suitable for defence works, particularly aerodromes. But the strain of uninterrupted service at high pressure meant that careful operation and maintenance were essential and overhauling necessary from time to time to keep the plant and equipment in good running order. The Mechanical Branch, through its trained plant inspectors, and the high standard insisted upon in operators, enabled the fullest possible use to be got out of the plant at a time when replacement was virtually out of the question.

The part played by the Mechanical Branch in sending plant and equipment overseas for use by the Army and the Air Force is detailed in part 1, chapter 10. The Branch also figured conspicuously in one of the greatest war-time achievements of the Department - the construction of a large and vitally important aerodrome at Nandi, Fiji, almost under the eyes of the advancing Japanese. (See Official History of the Aerodromes Branch). Mechanical plant in Fiji and Tonga was maintained by the Branch in conjunction with the RNZAF, while vessels utilised by the Aerodromes Branch for plying between various Pacific Islands and to and from New Zealand were overhauled as required and kept in serviceable condition.

Military camps, aerodromes and other Armed Forces establishments where personnel were accommodated all had to be equipped with power-generating plants when electrical



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reticulation was not available; water had to be supplied, frequently by pumpage, and reticulated; lighting, refrigeration, heating, and cooking units installed; and various other engineering services provided as and when required by the Forces concerned. Most of these installations were attended to by the Mechanical Branch, which was often called on also to keep them in good running order. In peace-time this class of work would have presented no difficulty, but the demands of war had depleted stocks of much of the equipment required - generating sets, for example, and it became necessary to ransack supplies held by local bodies and private concerns throughout the country.

Included in the more noteworthy war-time jobs undertaken by the Mechanical Branch were the design, fabrication, and installation of:

Trailers for tanks and AA guns.

Ammunition hoists and trollies for coastal defence forts.

Overhead cranes for various military proposals.

Barge-mounted cranes for the RNZAF.

Power house installations.

Engine installations for searchlights.

Construction of two 34 foot launches for Army use in the Pacific, and alterations to launches owned by the RNZAF.

40 foot rescue launches for the RNZAF.

A refuelling launch for the RNZAF in the Pacific.

Control and hydraulic equipment for radar stations.

Tanker barges for the RNZAF.

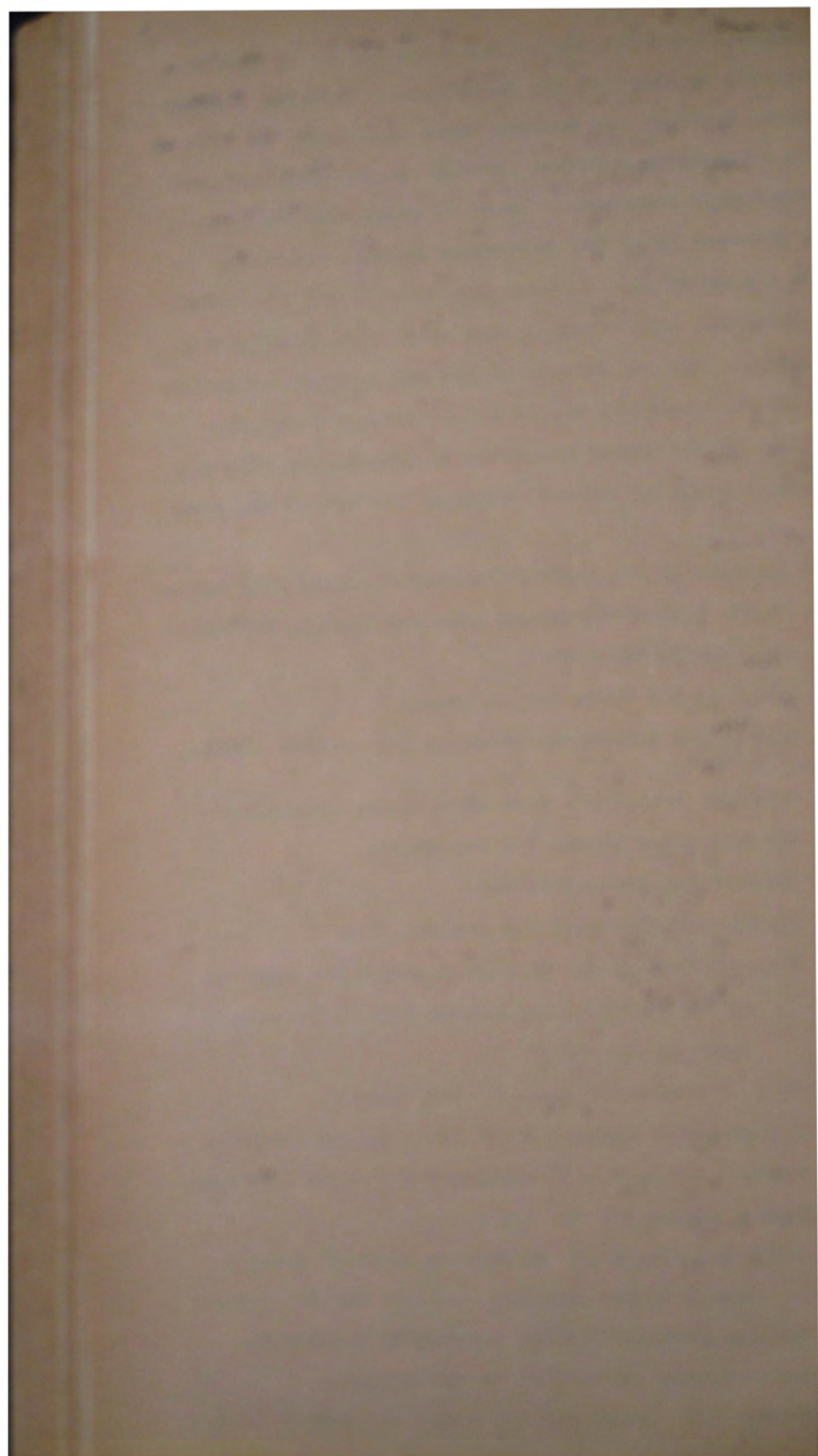
Sectional barges and amphibious trailers for U.S.

Forces in the Pacific, also for the N.Z. forces.

Whaling launches for the Australian Government.

Harpoon guns for whaling in New Zealand.

Moving tank target control range, Waiouru Military Camp.



Flare path dingies for the RNZAF.

Camouflage protection treatment depot.

Spare parts for tractors and machines.

Slipping facilities, Naval Base, Shelly Bay,
Wellington.

Hose reels in public buildings.

The refuelling system adopted by the RNZAF throughout New Zealand was inaugurated by the Mechanical Branch, which designed and built many of the tanker waggons first used.

When the establishment of radar stations was in progress, difficulties arose over the large number of generators required. These were wanted in certain sizes and had to be adjusted to close regulation. The Mechanical Branch joined with the Department of Scientific & Industrial Research and the Auckland University College in servicing and adjusting the many old generators which were located in different parts of the Dominion and adapted for use.

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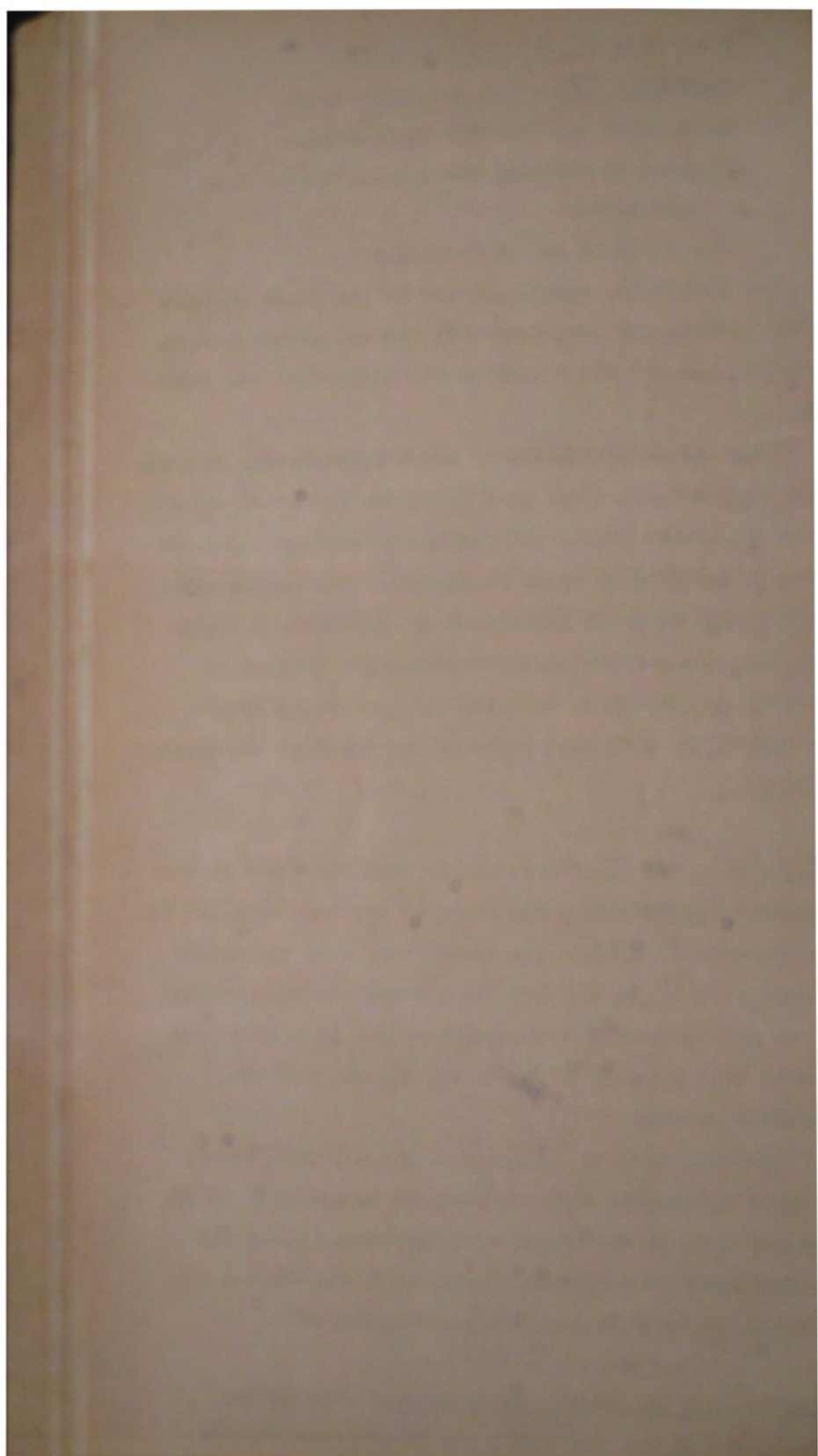
Aerodromes: The importance of the work entrusted to the Aerodromes Branch during and prior to the war could not be over-estimated. Indeed, its activities, from its establishment in 1936 and through the pre-war and war periods, were so widespread and comprehensive that they have been recorded in a separate Official War History (of the Aerodromes Branch).

Although closely allied with the Air Department, the Chief Aerodromes Engineer remained responsible to the Permanent Head of the Public Works Department, and the huge programme of aerodrome construction was carried out under the latter's over-riding supervision.

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Hydro-electric and Housing Construction: The Hydro-electric Branch was also under the jurisdiction of the

but it was later



SENIOR ADMINISTRATIVE OFFICERS, 1939-1945



G. W. KNAPP.

*Assist. Under-Secretary from Sept. 1943.
(Previously Chief Clerk)*



H. S. HILLS, M.G. J.P.

*Chief Clerk from Sept. 1943, (Previously
Senior Clerk & Accommodation Officer).*



J. W. SCOTT, A.R.A.N.Z.

Chief Accountant.



G. H. WAKELIN.

*Office Solicitor from Aug. 1945.
(Previously Legal Officer)*



J. D. BROSINAN, LL.B.

Chief Land Purchase Officer.



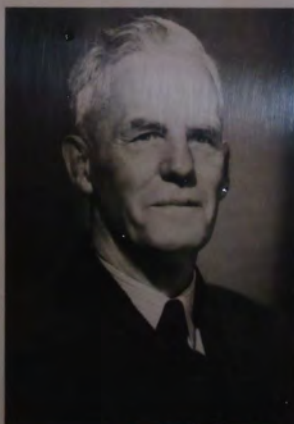
E. TRAVERS

Stores Manager.



J. G. HANNAH.

Senior Clerk from Jan. 1944.



J. THOMPSON.

Employment Officer



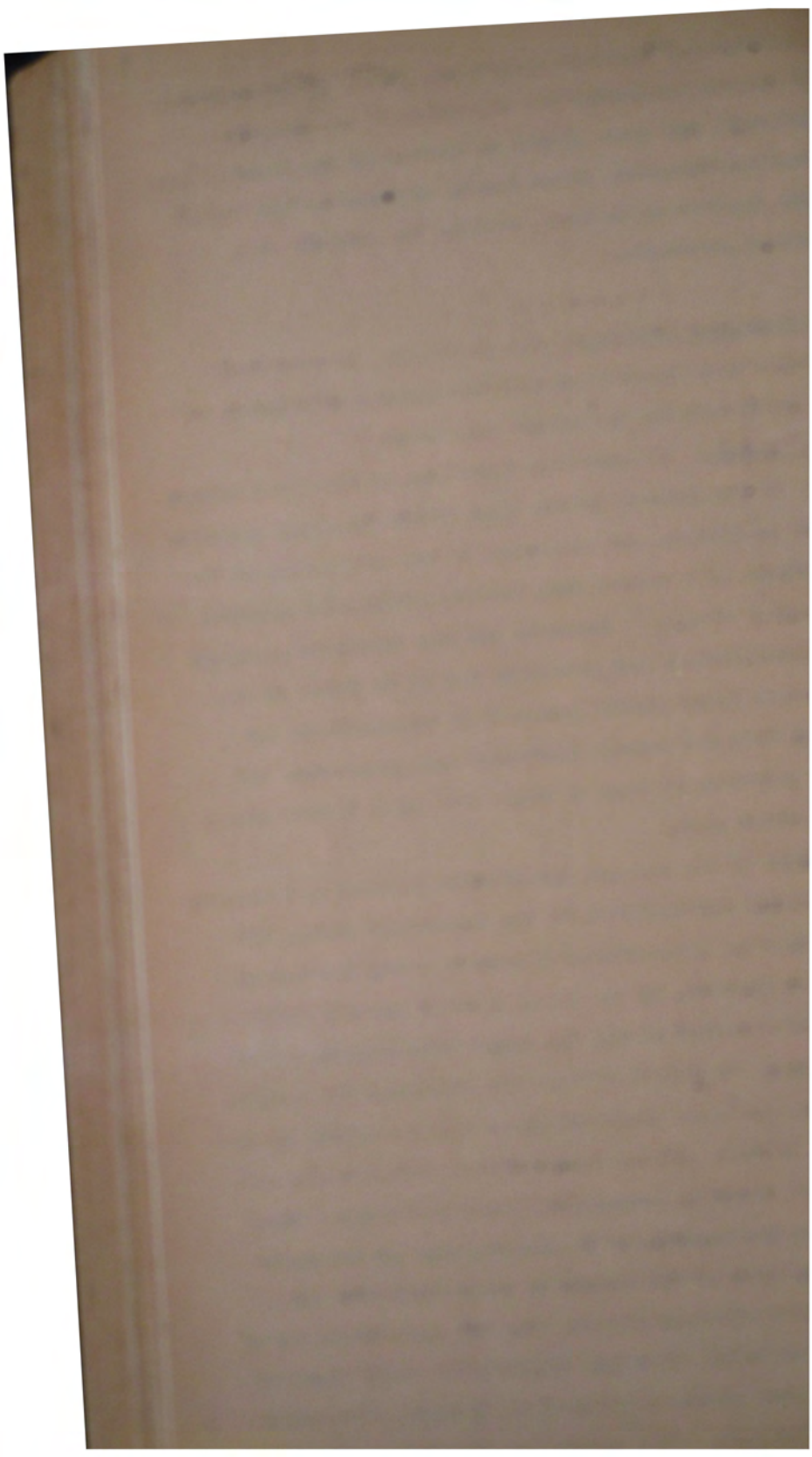
constituted a separate department (State Hydro-electric) and will be preparing its own Official War History. Similarly, the part played in the war by the Housing Construction Division, which became attached to the Public Works Department in 1945, will be the subject of a separate narrative.

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Non-Technical Branches: The following non-technical branches were associated with the defence activities of the Department to the extent indicated:

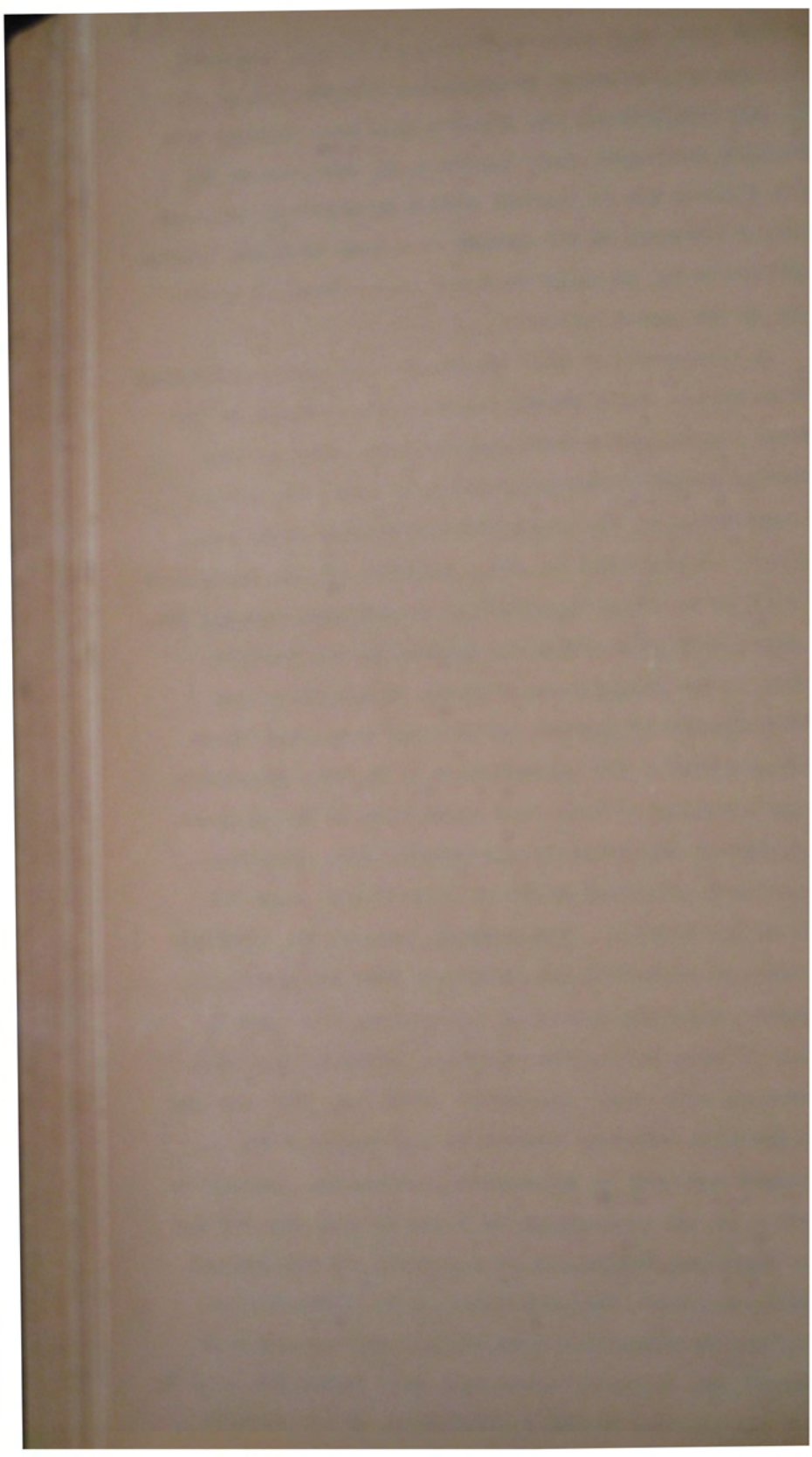
Legal Branch: The war-time functions of the Legal Branch - one of the largest in the Head Office clerical division - were as diverse and extensive as the activities of the Department as a whole, and, indeed, frequently extended into other fields. Numerous new and intricate problems of administration and procedure had to be faced as the Department found itself involved in transactions far removed from its normal constructional programme, and in the solution of many of these the Legal Branch played an important part.

Most of the defence legislation (including emergency regulations) administered in the Department during the war - and some administered elsewhere - was drafted in the first instance by the Legal Officer and his staff. They also attended to all the legal work arising out of the purchase or rental of land and buildings for defence purposes, including preparation of leases, arranging payment of purchase prices, compensation, and rentals, and, of course, securing possession, which was vital. These duties had necessarily to be superimposed on the usual peace-time work of the Branch in connection with the legislation of roads and streets, the administration of land already held, tramways, electricity, soil conservation and river erosion, irrigation, housing, Government tenancies and many other activities which to a greater or lesser extent demanded attention during the war.



any such work that could wait was, of course, deferred until the more pressing requirements arising out of the war, and particularly the Department's huge defence construction programme, were disposed of, but even so the Legal Officer had to contend with a substantial increase in the calls made on his Branch at a time when his trained staff was being steadily depleted as a result of enlistments in the Armed Forces.

A review of the more important emergency regulations with which the Legal Branch was concerned either in the initial stages and/or administration is given in the following pages. But in addition to this, the advice and assistance of the Legal Officer and his staff were available at all times to other branches of the Department (as well as to other Departments) on subjects ranging from the chartering of vessels for service in the Pacific Islands to the preparation of forms of contracts for special classes of defence works (e.g. construction of aerodromes within the jurisdiction of another Government and the erection of bulk fuel tanks both in New Zealand and overseas) and devising and putting into operation variations to standard contract procedure to meet the needs of the moment. For example, many of the circular instructions issued by the Permanent Head to implement the master schedule system of contracting (see part 1, chapter 7) were drafted by the Legal Officer after full discussions with other interested officers. Nor were the Legal Branch's services limited to the Public Works Department nor even to Government Departments. Assistance was given in the preparation of forms of contract for use by the Munitions Controller in regard to the manufacture of munitions, while the protection of the interests of all parties in connection with the splinter-proofing of Government and privately-owned bulk fuel tanks (see part 6, chapter 2), as well as the construction, at the Crown's expense, of extra storage tanks, opened fresh fields of



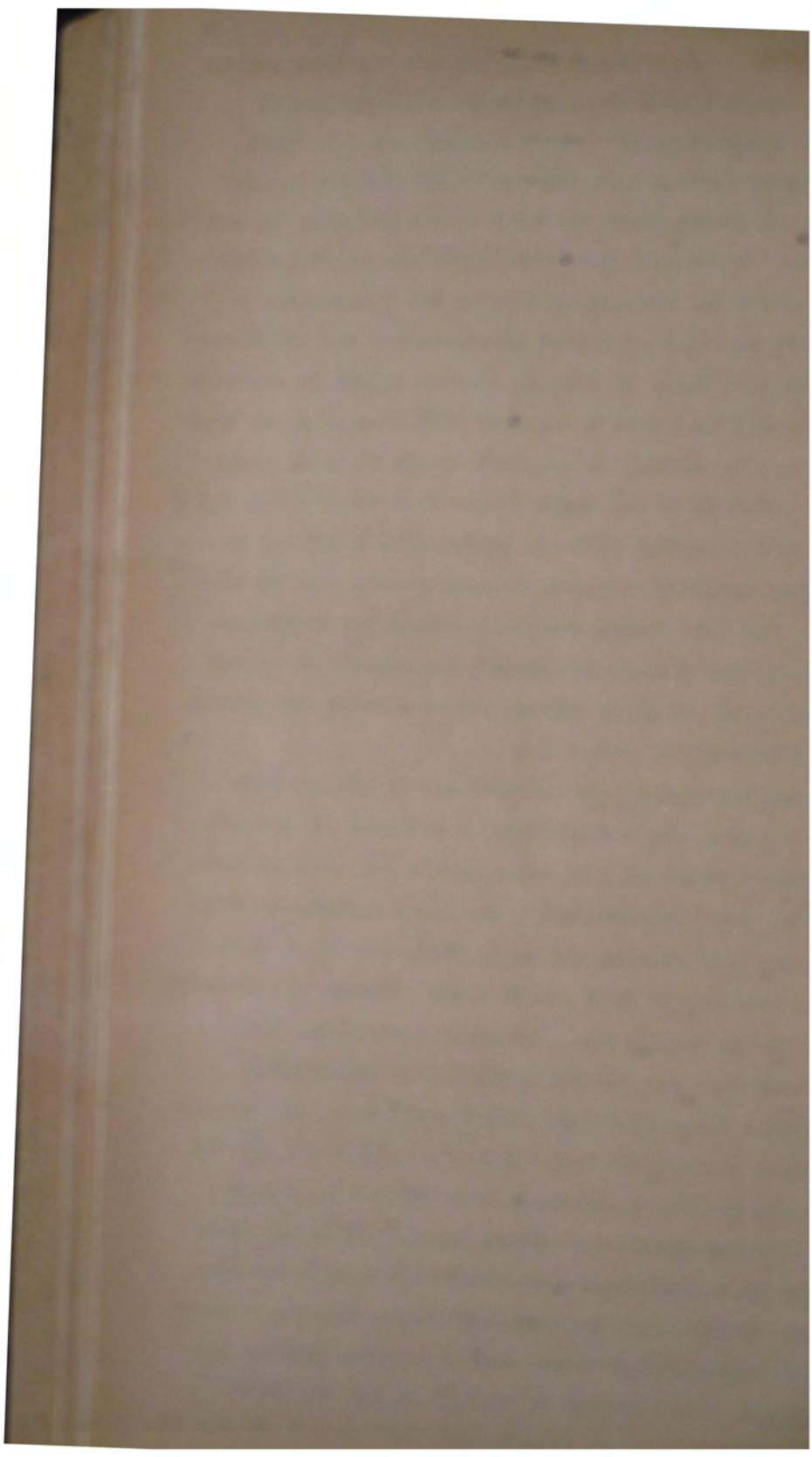
contracting. Another new departure was the need for drawing up contracts relating to the construction of defence works overseas - under circumstances in which New Zealand workmen were engaged on New Zealand undertakings in places where the laws of the Dominion did not operate. Great care had to be exercised in such cases to safeguard the workmen as well as the Government.

The question of rented accommodation for the Forces is dealt with fully in part 5, chapter 1, but it may here be mentioned that when a critical situation arose in 1942 following the arrival of American troops in Wellington, senior officers of the Legal Branch left their desks and actively co-operated with the Accommodation Officer in obtaining vacant possession of large hotels etc. in the city. The U.S. Forces and the American Red Cross were treated as New Zealand Government Departments in regard to legal work affecting accommodation matters and settlement of claims for damage done.

The Department's constructional activities were dependent upon the availability of material and labour, supplies of which in most cases were controlled or regulated by other Departments. The Legal Branch was often called upon to examine and apply emergency regulations having some effect upon public works although not administered by the Department. Of these perhaps the most important were the Defence Works Labour Legislation Suspension Order 1942 (see part 1 chapter 8), the Defence Emergency Regulations 1939 (Serial No. 1939/123), and the Emergency Shelter Regulations, 1942 (Serial No. 1942/1).

The Department had always carried insurance risks on its own construction activities (the work being controlled by the Legal Branch), but during the war, following the introduction of the master schedule system, the same risks were accepted in respect of all employees, whether contractors or departmental (see part 1 chapter 7).

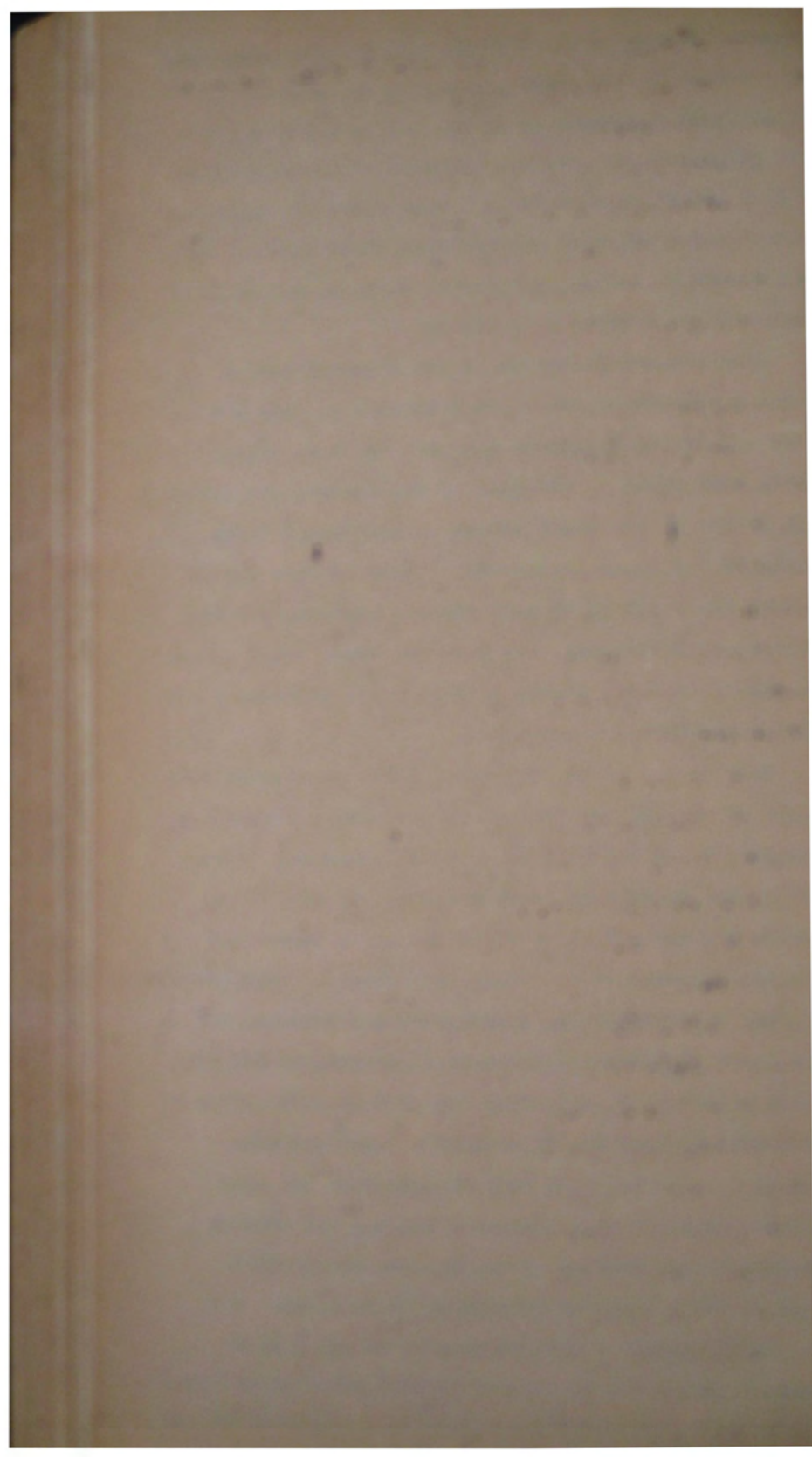
The implementation of this principle meant a com-



...view of the Department's standing instructions relative to insurance generally, and careful and most explicit instructions in the matter had to be prepared and issued to district officers of the Department and to contractors concerned. Many years of experience in the complex business of insurance risks enabled the Legal Branch to handle this far-reaching change in procedure without confusion or delay.

With the establishment of the Commissioner of Defence Construction (see part 1 chapter 6) and, later, of the War Assets Realisation Board, two more organisations were added to the list of Departments and Services which looked to the Legal Branch of the Public Works Department for legal assistance. Much of this was of the kind the legal staff were already handling for the Public Works Department, but here and there novel questions were raised or novel twists to well-known problems would demand concentrated attention.

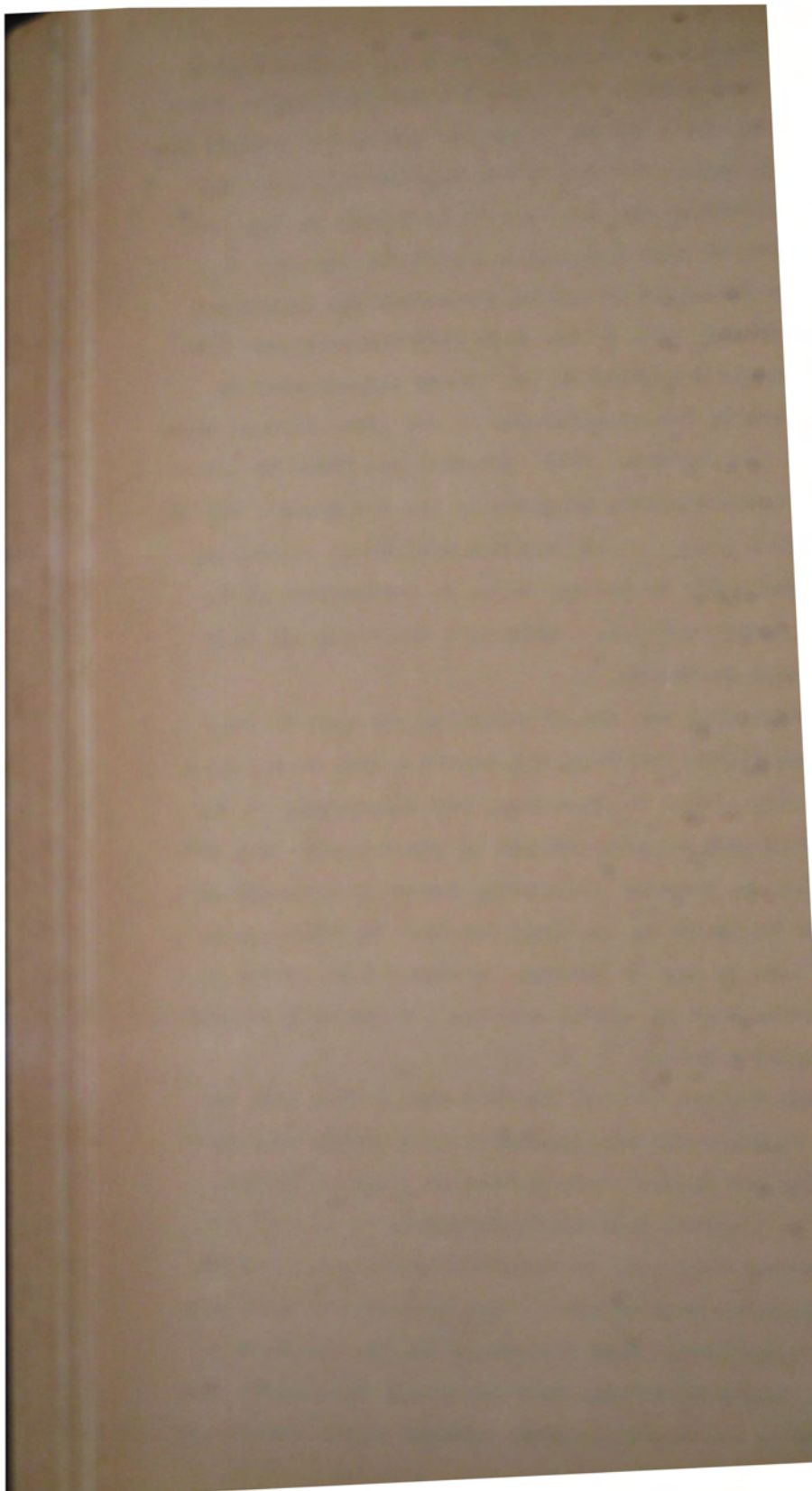
Just as one or two branches of the Department were hardly, if at all, involved in the defence construction programme, so it may be said - at the other end of the scale - that there were practically no aspects of the Department's war effort in which the Legal Branch was not actively concerned at one stage or another. With urgency the prime and over-riding consideration dominating almost every class of defence construction project, it was frequently a matter of proceeding immediately with each work authorised, leaving the Department's administrative officers to dispose of as they thought best the many problems - some of them extremely complex and without precedent in the history of the Department - which the impact of war conditions brought in their train. That these problems were solved as they arose and left no legacy of disruption or disorganisation was without doubt due largely to the existence within the Department of its own Legal Branch.



Land Purchase. The acquisition of land, whether temporarily or permanently, for sites for military camps, aerodromes, and other defence works throughout the country was to a large degree handled by the Department's Land Purchase Officers. The land had to be valued and the purchase price or rental negotiated with the owners - a procedure difficult enough in peace-time but aggravated during the war owing to the fact that inconvenience (and in some cases hardship) to the owners was necessarily subordinate to the requirements of the Armed Forces. Where possible, the purchase price or rental was fixed by agreement (and subsequently approved by the Government) but if negotiation failed to produce a satisfactory settlement the matter would be allowed to go to arbitration or to the Compensation Court. Only in a few cases did this step become necessary.

Throughout the war an endeavour was made to keep all transactions involving compensation etc. to a common basis, with a view to preventing any possibility of the inevitable inflationary effects of war carrying over into the peace and thereby prejudicing future settlements as between the Crown and the land owners. In other words, prices paid by way of purchase or rental were as far as practicable kept in accord with the Government's general stabilisation policy.

War Cabinet adopted the view that bodies such as racing clubs, which were dependent upon public support and could not in any event operate in times of crisis, should be prepared to allow their assets to be used for war purposes with only sufficient compensation to enable them to emerge without loss. The implementation of this policy necessitated much discussion and the examination of many claims upon bases that had little precedent. The officers of the legal and land purchase staffs found their task in this connection required the constant exercise of



bodies concerned were inclined to be generous.

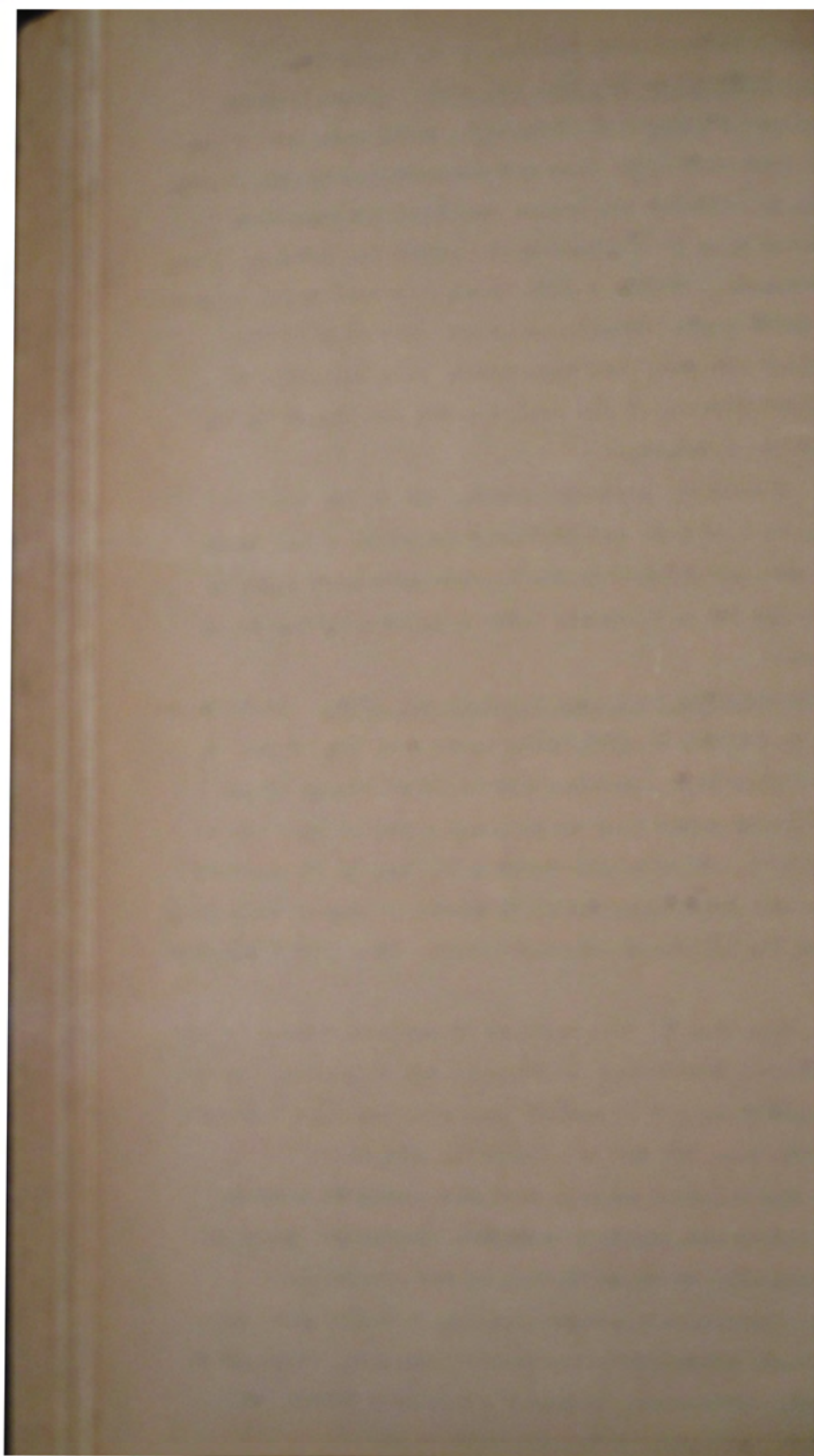
Defence Emergency Regulations, 1939. Although these regulations (Serial No. 1939/123), which came into force on 1 September 1939, were not administered by the Public Works Department, the powers available therein were operated upon to a considerable extent by officers of the Department. Entry on land at short notice could be made by public works officers under the authority of the regulations, such authority having been delegated to certain officers of the Public Works Department by the Minister of Defence.

Compensation claims arising out of the use and occupation of land and buildings in terms of the regulations were settled by the Department's Land Purchase Officers, the settlements being completed by the Legal Branch.

The Electricity Emergency Regulations, 1939. These regulations (Serial No. 1939/146), which came into force on 4 September 1939, provided for the appointment of an Electricity Controller whose general functions would be to promote, organize and control the supply of electric power and other industries and trades so far as they might affect the supply of electric power. (See part 1 chapter 4).

From time to time various orders were issued by the Electricity Controller prohibiting and regulating the use of electricity for different purposes, and also controlling the sale and use of electrical equipment.

The regulations were designed partly to conserve electricity and partly to conserve electrical equipment and fittings, of which the supply was precarious. Restrictions upon new installations, compulsion to give preference of supply to particular purposes, and control to avoid over-loading remained a familiar feature of post-war life for some considerable time.



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enacted in February 1941, the Lighting Restriction
Emergency Regulations (serial No. 1941/18) established the
then Chief Electrical Engineer of the Public Works
Department (later the General Manager of the State Hydro-
electric Department) as the Dominion Lighting Controller.
They became popularly (or unpopularly) known as the
'black out' regulations, and as such probably touched
the lives and convenience of individual members of the
public more intimately and more universally than any
other war-time legislation.

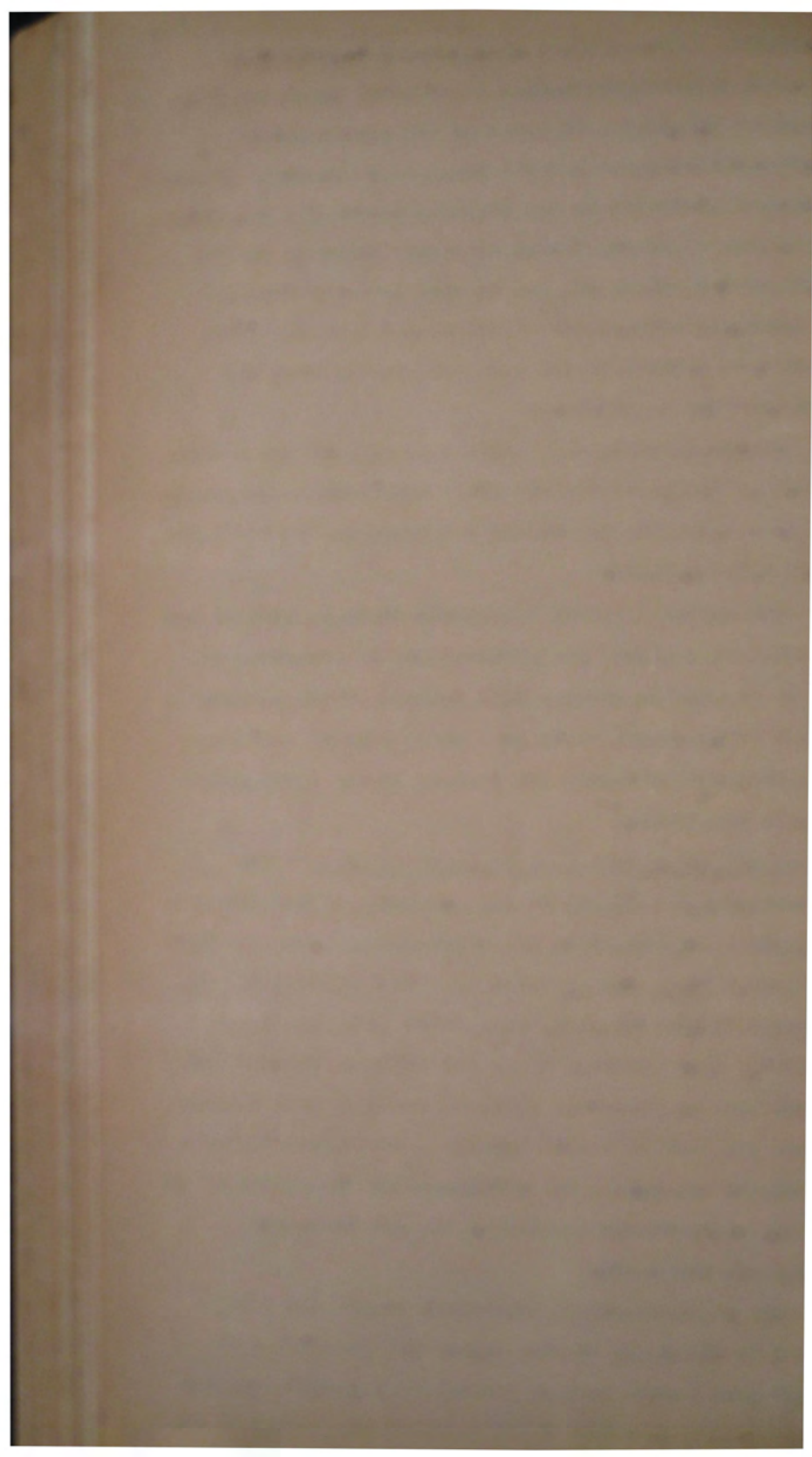
The regulations were drafted by or with the collab-
oration of the Legal Branch, which also critically examin-
ed before issue the orders through which the Controller's
powers were exercised.

The extent to which the Public Works Department was
concerned in applying the restrictions is described in
part 6, chapter 2, while a full account of the adminis-
tration of the regulations as a whole will no doubt be
included in the Official War History of the State Hydro-
electric Department.

The Accommodation Emergency Regulations 1941. The
circumstances leading up to the gazetting of the Accommo-
dation Emergency Regulations, which became effective from
18 December 1941, are outlined in part 5 chapter 1. As
indicated in that chapter, the powers given the Crown to
acquire by expropriation space for offices, storage etc.
for any purpose connected with the war were used sparing-
ly, but the fact that such drastic powers were available
undoubtedly influenced the settlement by 'negotiation' of
the many transactions handled by the Accommodation
Officer and his staff.

The regulations and subsequent amendments were
drafted in the Legal Branch, which also prepared for
service (and served in some cases) the comparatively few
notices issued in terms of the regulations. Many of the

... accommodation lodged by occupiers of space



which had been requisitioned by the Crown were dealt with in their entirety by the legal staff.

The Emergency Shelter Regulations 1942. Gazetted in January 1942 (Serial No. 1942/1) these regulations were administered by the National Service Department, but the Public Works Department was extensively involved in the whole raid shelter programme (See part 6 chapter 1).

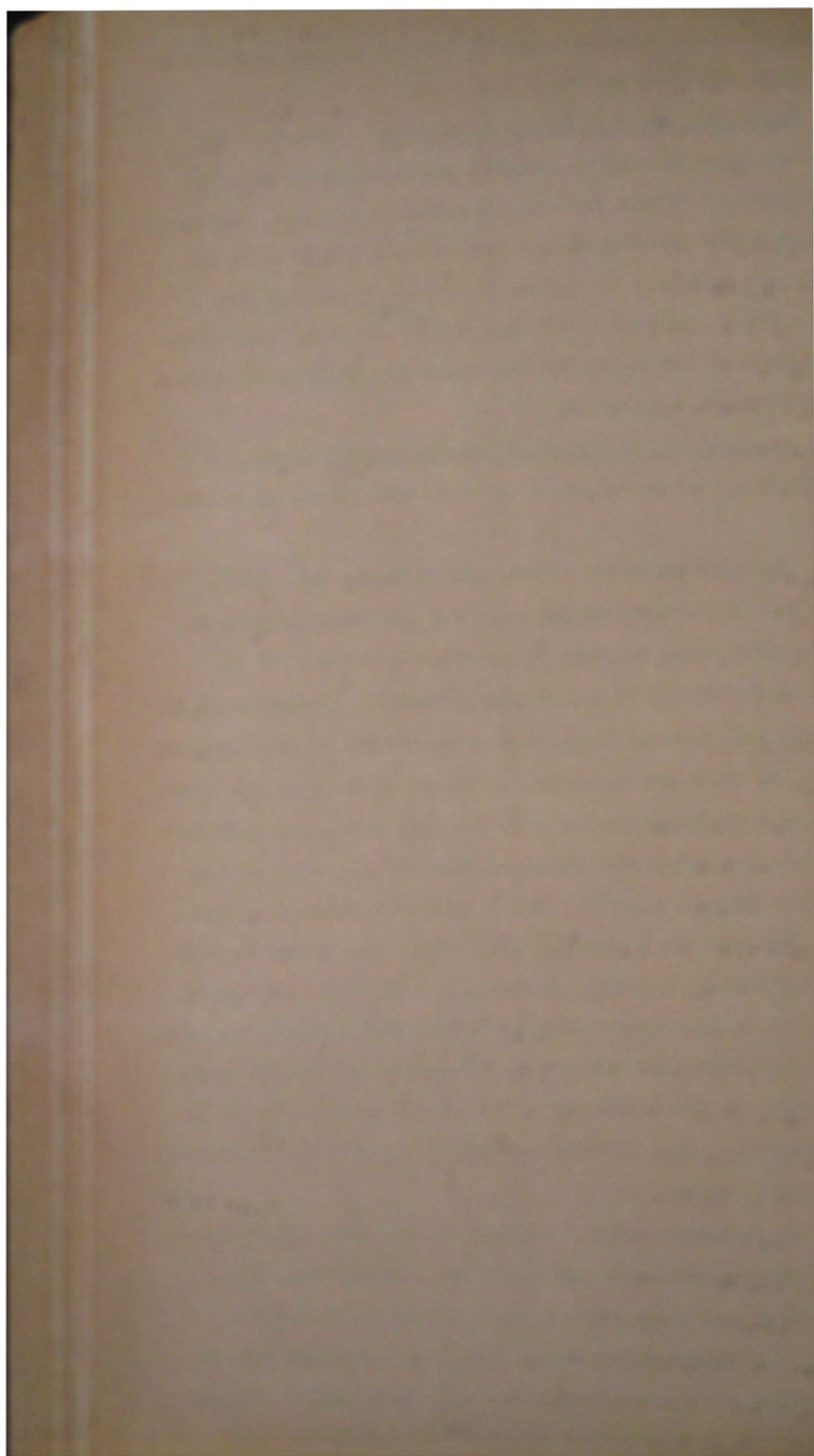
The legal staff assisted in the drafting and administration of the regulations, including their application to Government tenancies.

Land Acquisition Emergency Regulations 1942 (Serial No. 1942/164). These regulations came into force on 4 June 1942.

Several sections of the Public Works Act, 1928, required that, when taking land for the various purposes of the Act, full details of the land taken and of the purpose for which it was required must be published in the Gazette and also in newspapers circulating in the district where the land was situated. Information as to the location of land required for defence purposes might well have been of great value to enemy agents and the idea of the regulations was to enable the reason for which land was being taken to be concealed (and thus prevent any really vital information being published). Had the purpose of taking been suppressed only in taking for defence purposes, those proclamations would have attracted notice and consequently it was necessary to treat all proclamations in the same way, thus leaving defence takings indistinguishable from others.

In December, 1945, pursuant to the Land Acquisition Emergency Regulations, 1945, the Under-Secretary of the Department was authorised to publish in the Gazette a notice specifying the various purposes for which land had been taken where the purpose had not previously been disclosed. This notice was published in December, 1945.

Public Works Emergency Regulations 1944 (Serial No. 1944/1).



which came into force on the 13 January 1944, were an illustration of the lengths to which the Government was prepared to extend assistance to private organisations to meet the needs of the Armed Forces and the public.

In the course of endeavours to increase the output of leather, arrangements were made for the Green Island Tanneries to be extended. An agreement was reached whereby the Crown acquired from the company the property on which these extensions were constructed; the Crown constructed the extensions; and finally the Crown was to lease the extensions back to the company, which might at some later date re-purchase the property from the Crown.

It was considered that special authority was required to enable the Crown to lease the property back to the company and regulations authorising this in general terms were accordingly enacted.

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Stores Branch. In peace-time the Stores Branch, controlled by the Stores Manager, was responsible for procuring all supplies and materials required by the Department, and these, ranging from bolts and nuts to tractors and other heavy machinery, had to be taken on stock and properly accounted for. The services of the Branch proved extremely valuable during the war, and were extensively availed of by the Armed Forces as well as by the Public Works Department itself in connection with its defence construction programme.

Fortunately, the outbreak of the war found the Department with its stocks of such 'key' supplies as steel, galvanised iron, tools, water piping, wire ropes, gum boots, tents and flies, large size tyres, and linoleum, etc at a comparatively high level, and by careful conservation and the strict observance of priorities the more essential works were able to proceed with a minimum of hold-ups on account of shortages of materials.

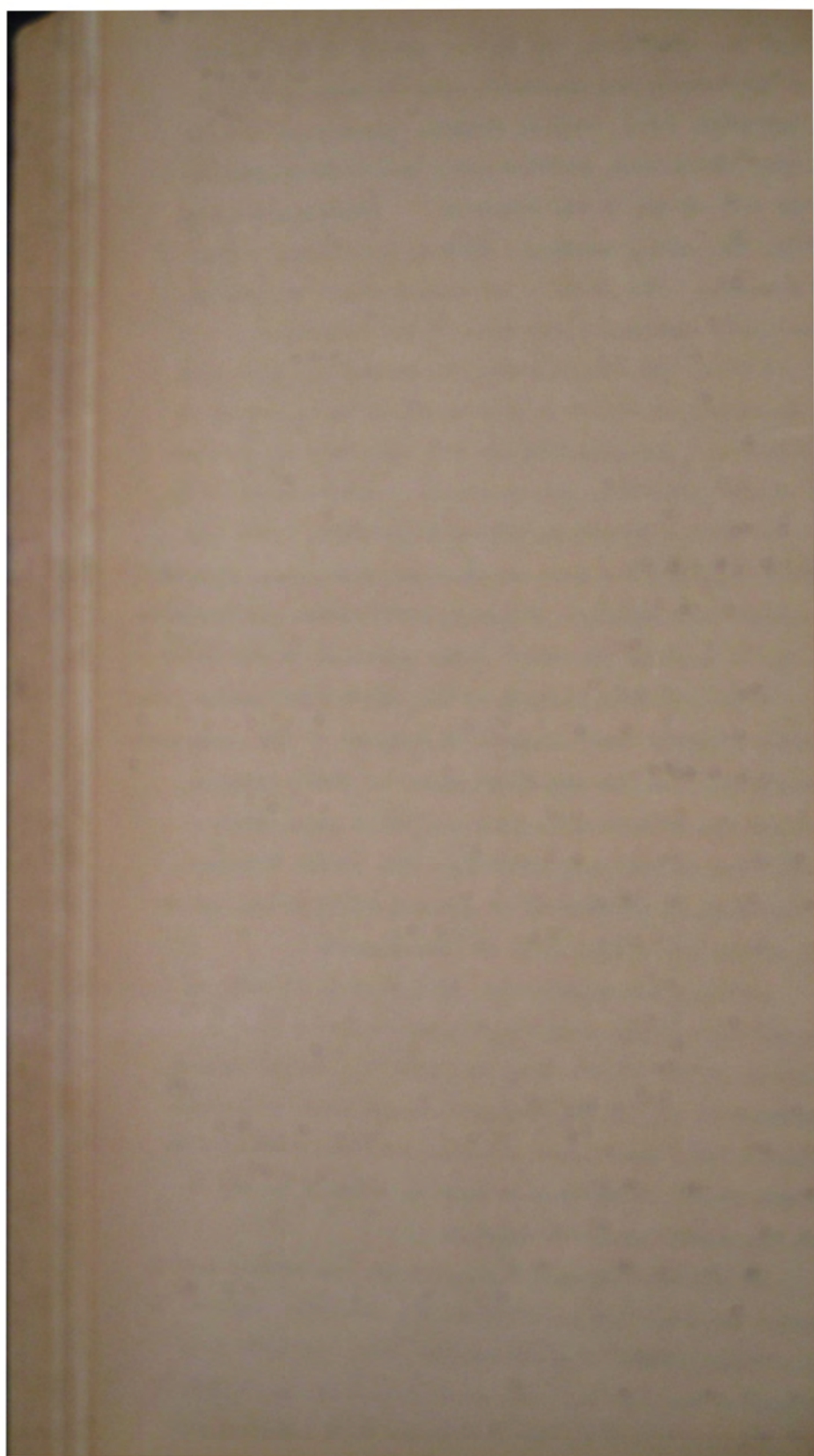


of the situation, the Stores Branch of the Public Works Department was entrusted with the responsibility for importing from overseas markets, which were already becoming restricted, certain vital materials essential to the war effort of the Dominion - notably non-ferrous metals, tin plate, insulated cables, nail wire, cork, and conduit. The storage and distribution of many of these goods remained a function of the Branch.

Keeping the Public Works Department supplied with its multifarious stores requirements during a period of unprecedented activities would have strained the resources of any purchasing organisation. But in addition to this the Stores Branch undertook to procure, pack, and consign supplies for Army engineering units also engaged in defence construction projects, both within the Dominion and in the Pacific theatre. This arrangement was entered into at the specific request of the Quartermaster-General. A similar service was extended in respect of the equipment, victualling, and general maintenance of coast-watching stations and of meteorological and other expeditions established on outlying islands. The latter involved the purchase or chartering of several small ships, which were manned and operated by the Department.

Although the maintenance of aerodrome buildings, landing strips, and emergency flying fields became a function of the RNZAF during the war, the Stores Branch continued to supply the requisite maintenance materials, including huge quantities of grass seed and fertilisers, reserve stocks of which were held at central depots in both the North and South Islands.

As detailed in part 1 chapter 10, the Stores Branch handled smoothly and efficiently the despatch overseas of large consignments of construction plant and machinery for use by the Forces. The part played by the Branch in the purchase, storage, and distribution of material and equipment for the Public Works Department is outlined



Close liaison was necessarily maintained by the Stores Branch with New Zealand overseas purchasing missions and agencies, with local suppliers and manufacturers, and with the technical staff of the Department's Head Office. Its long experience in purchasing all kinds of goods in the world's markets was of inestimable value at such a critical period, and at no time did the organisation built up over many years threaten to break down under the impact of war conditions. On the contrary, the Branch rose to the occasion in a manner which undoubtedly reflected great credit on the Department as a whole.

.....

Accommodation. The Government Accommodation Board comprised the Permanent Head, Public Works Department, (chairman), the Secretary to the Treasury, the Under-Secretary, Department of Internal Affairs, the Public Service Commissioner, the Director-General, Post & Telegraph Department, and the Railway Land Officer. Its executive officer and secretary, the Accommodation Officer, was a member of the staff of the Public Works Head Office. It was a task of no mean proportions in normal times to attend to the office and storage accommodation requirements of civilian Departments both in Wellington and (with the assistance of district offices) in other towns throughout the Dominion. With the expansion of the Service Departments immediately prior to the war, additional space had to be provided, especially in Wellington, and as several civilian Departments had already increased in size as a result of the social legislation passed by the new Labour Government, office and storage accommodation in the main centres was at a premium, and it became more and more difficult to meet the needs of the Army, Navy, Air, and other Departments whose work was directly or indirectly connected with the war. The position became even

more difficult in the early years of the war, with the rapid

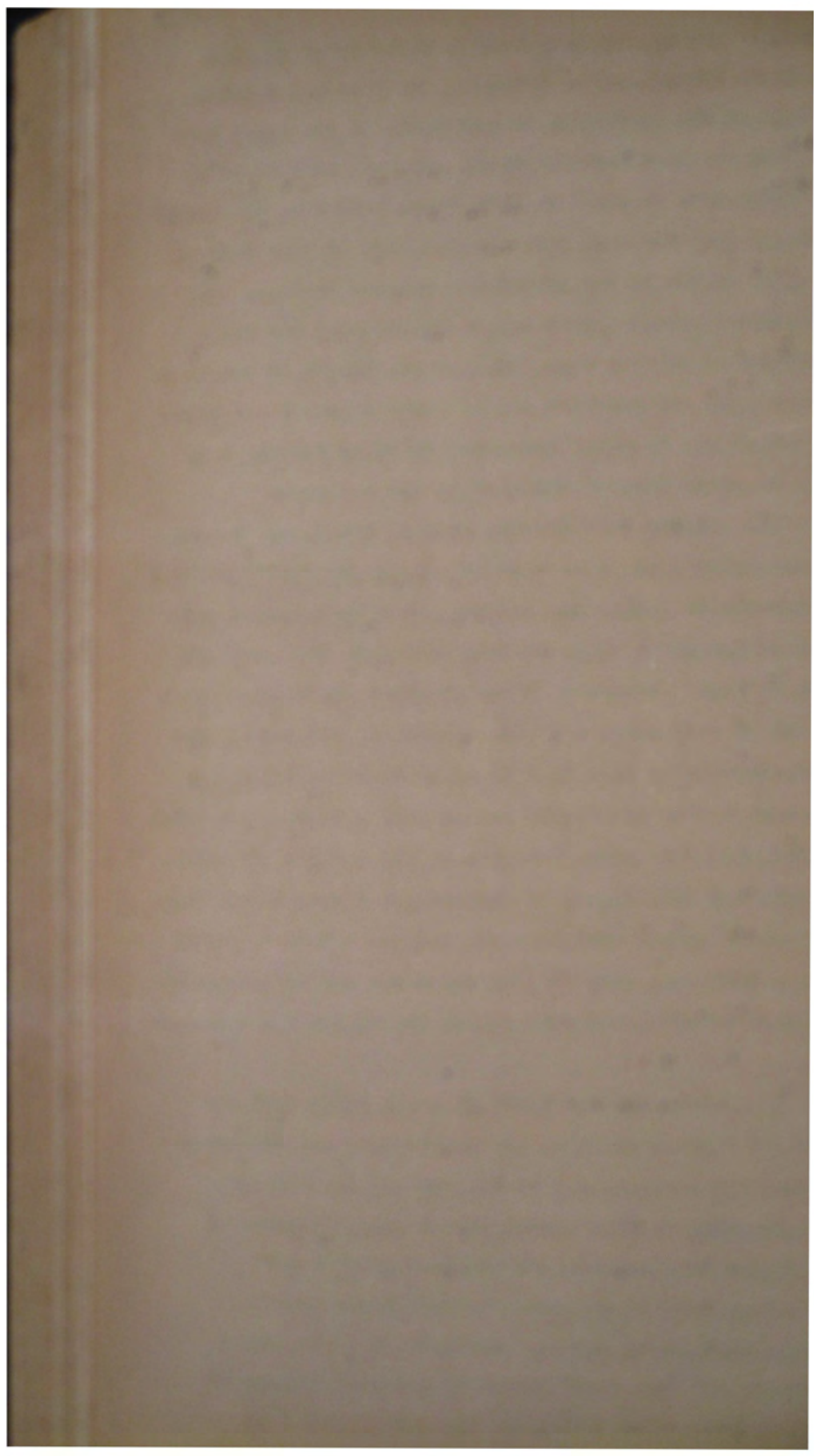
The first part of the paper is devoted to a general
discussion of the problem. It is shown that the
problem is of great importance in the theory of
the differential equations of the second order.
The second part of the paper is devoted to a
detailed study of the problem. It is shown that
the problem is of great importance in the theory
of the differential equations of the second order.
The third part of the paper is devoted to a
detailed study of the problem. It is shown that
the problem is of great importance in the theory
of the differential equations of the second order.
The fourth part of the paper is devoted to a
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The tenth part of the paper is devoted to a
detailed study of the problem. It is shown that
the problem is of great importance in the theory
of the differential equations of the second order.

growth of new Departments such as Ministry of Supply, the Price Investigation Tribunal, and National Service, as well as the increasing requirements of the Armed Forces, but the peak demands on the Accommodation Board's resources were reached in 1942, when, following the entry of Japan into the war, large contingents of U.S. Forces began to arrive in New Zealand. Office, storage, and residential accommodation had to be procured for the Americans at short notice, and, as the threat of invasion mounted, our own Services needed extra space of all kinds throughout the country, including quarters for the Home Guard in every town of any size in the Dominion.

The demands for offices, stores, hotel, and housing accommodation would have been impossible to fulfil had not the Government passed the Accommodation Emergency Regulations in December, 1941, whereby authority was given the Crown to take possession of any premises whatsoever, upon payment of compensation to the owners or occupiers. The administration of this type of regulations - peculiarly repugnant to the democratic way of life - required careful handling to avoid undue hardship to the parties affected, but although all classes of accommodation were taken over, from entire office buildings and leading hotels to small seaside cottages, only in very few cases was it necessary to resort to arbitration to settle the claims for compensation.

A separate chapter (part 5) deals fully with the extent of office, storage, and residential accommodation acquired for war purposes by the Accommodation Board.

Other Branches. To a lesser extent other branches of Head Office were involved in the Department's war activities, such as accounts, Tenders Board, staff, records, employment, roads, and highways. The Chief Accountant and his staff issued to district offices the official authorities to expend the sums allocated to specific defence works, and recorded all such expendi-



(1) the Tenders Board (an advisory body of which the Chairman was the Minister of Public Works, the deputy chairman the Permanent Head, and members the controlling officers of the architectural, stores, accounts, and hydro-electric branches) reviewed tenders received for defence works until early in 1941, when the practice of inviting tenders publicly was suspended in favour of the master schedule system; (2) the Staff Clerk's branch had many problems to meet in connection with the staffing of important defence works at a time when the number of experienced officers available had been heavily reduced through enlistments in the Armed Forces; (3) the Employment Officer was faced with similar difficulties in regard to manning defence projects and applying to public works the special war time legislation issued governing rates of pay and conditions of employment, etc; (4) the records staff handled an enormous volume of correspondence, much of it secret and confidential and requiring to be indexed and filed carefully and accurately; while the roads and highways branches dealt as required with the provision or improvement of access to strategic defence areas (5) and to farm lands - with a view to facilitating increased primary production.

4. DISTRICT OFFICES.

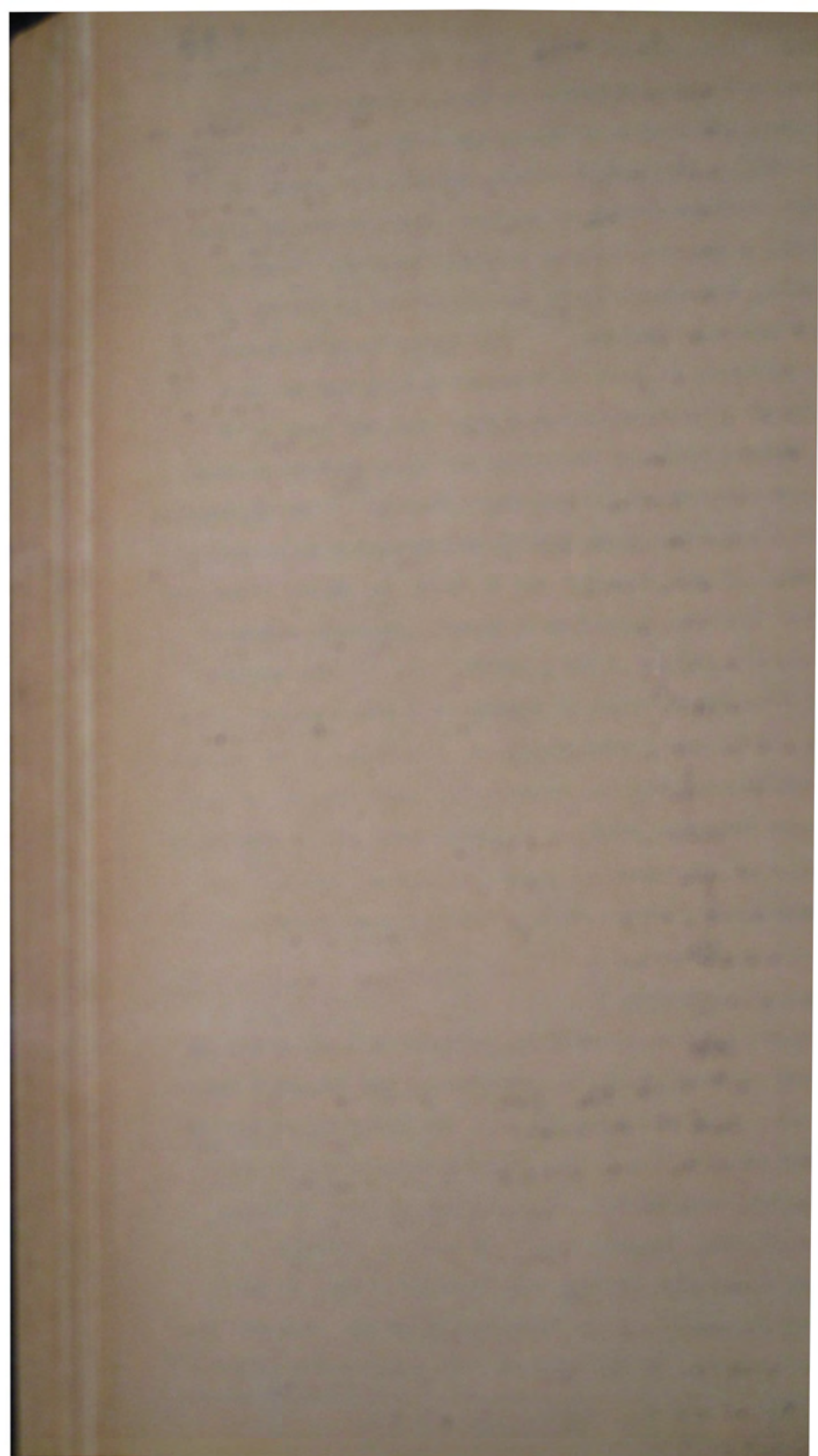
Constitution. The controlling officer at each of the 12 district offices of the Department was the District Engineer, and associated with him were the Chief Clerk and the District Storekeeper. The staff comprised engineers, architects, draughtsmen, clerical and stores officers, also overseers, foremen etc. It was the practice to address all correspondence for district office to the District Engineer, and replies were sent out over his signature, even though the subject matter related to other

(1) Pt. 1 Chapter 2.

(2) Pt. 1 Chapter 7.

(3) Pt. 1 Chapter 8.

(4) Ibid.

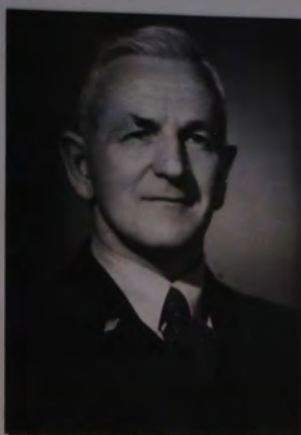


WHANGAREI



J. K. JACKWOOD, O.B.E. M. INST. C.E.

*(On Mil Leave from Mar. 1940. Resumed as
Kilgobbin, Aug. 1945.)*



R. T. SMITH, O.B.E. A.M.I.C.E.

*(On Mil Leave from July 1940) Resumed
as Inspecting Engineer, Christchurch,
Nov. 1943. (Previously D.E. Greymouth)*



W. L. BELL, A.M.I.C.E.

*(Acting) also Asst. Engineer-
in-Charge, C.C.U. Fiji.*

KILGOBBIN



F. S. DYSON, A.M.I.C.E.

To April 1943 (Ref'd)



T. G. RABONE

*Asst. D.E. from April 1944
(Also acted as D.E.)*



O. G. THORNTON, A.M.I.C.E.

*April 1943 to Oct. 1945
(Previously D.E. Gisborne)*

TAURANGA



GISBORNE



NAPIER



A. DINNIE, M. INST. C.E.





MAY, A.M.I.C.E.

WELLINGTON



F. W. LINDUP, A.M.I.C.E.
*D.E. Stratford to Mar. 1941
then D.E. Nelson*
GREYMOUTH



G. W. SAMPSON, A.M.I.C.E.
*Acting D.E. Wanganui
from Mar. 1944*
CHRISTCHURCH



JOHNSTON, B.E. A.M.I.C.E.
*from Mar. 1941
Previously D.E. Nelson*

UNION



E. F. EVANS, A.M.I.C.E.
From Mar. 1940



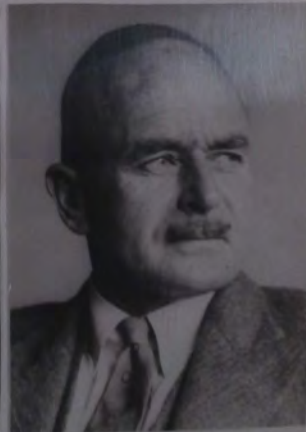
F. D. GRANT, A.M.I.C.E.
Acting Oct. 1942 to July 1945



KELLER, A.M.I.C.E.
to July 1943 (Per'd)



E. J. GARLICK, A.M.I.C.E.
Acted, July to Oct 1943



C. LANGBEIN, A.M.I.C.E.
From Oct 1943



...engineering. An exception to this was that the Stores Manager communicated direct with the District Storekeeper, and vice versa.

Each District had, as well as the district office, one or more sub-offices, from which local control over works in that portion of the district (known as a sub-district) was exercised. The sub-office was also controlled by an engineer, usually with the designation of Resident Engineer. Sub-offices were staffed similarly to district offices. Only in special circumstances did sub-offices communicate direct with Head Office, or vice versa, the standard procedure being for their correspondence to be addressed to the District Engineer, the controlling officer of the whole district.

As illustrated on the accompanying maps, the counties falling within the boundaries of each Public Works District were as follows:-

Whangarei District.

Counties of MANGONUI
BAY OF ISLANDS
HOKIANGA
WHANGAROA
WHANGAREI
HOBSON
OTAMATEA

Auckland District.

| | | |
|-------------|--------------------|----------------|
| Counties of | RODNEY | Hauraki Plains |
| | WAIKATO | THAMES |
| | EDEN | COROMANDEL |
| | MANUKAU | OHINEMURI |
| | FRANKLIN | PIAKO |
| | GT. BARRIER ISLAND | WAIPIA |
| | RAGLAN | MATAMATA |
| | WAIKATO | OTOROHANGA |

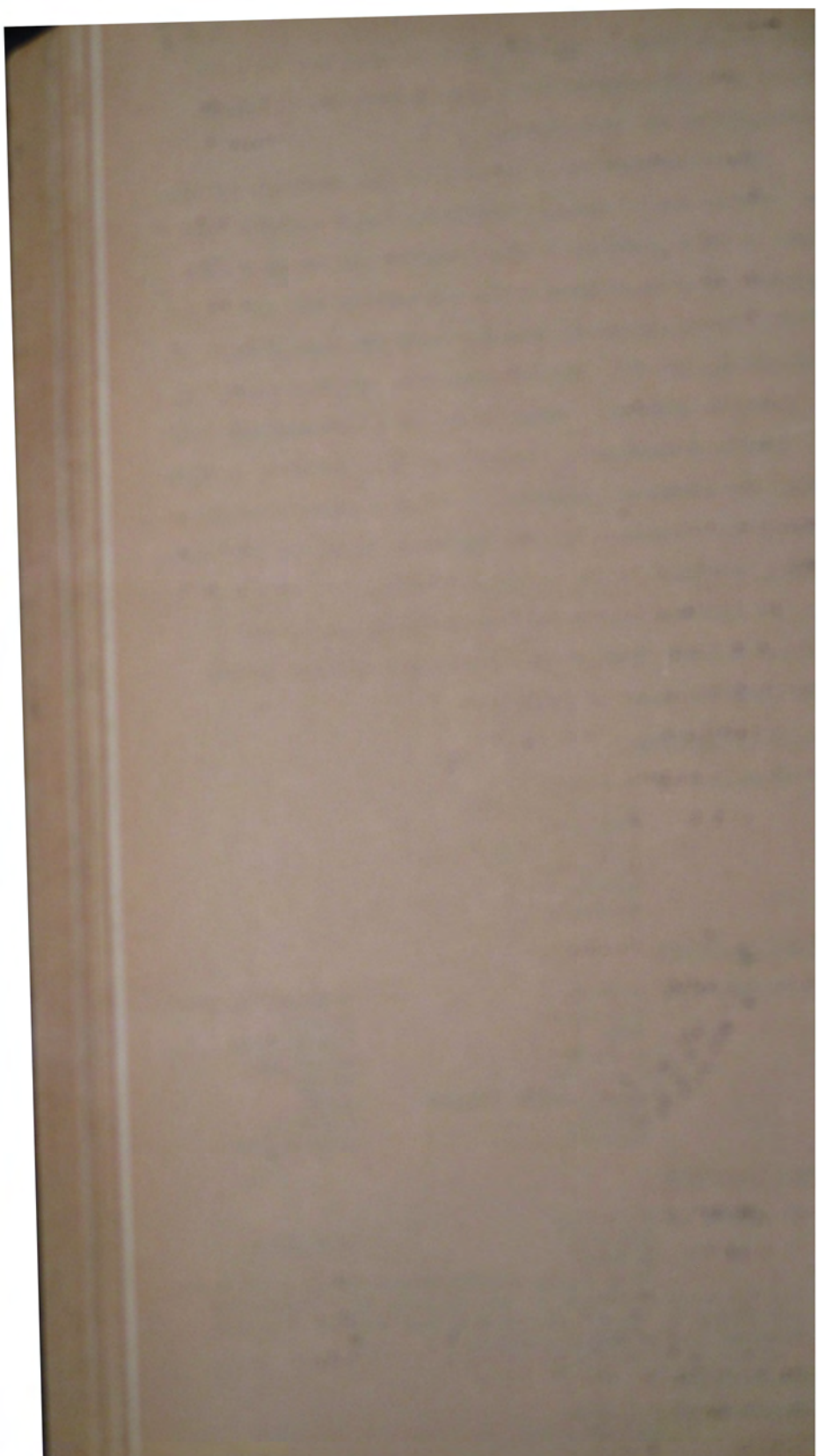
Tauranga District.

Counties of TAURANGA
ROTORUA
OPOTIKI
From TAUPU COUNTY BOUNDARY to LAKE TAUPU
and by approximately a direct line in a southerly
direction to where the Hawkes Bay county boundary
crosses the Ngaruroro River.

Gisborne District.

Counties of MATAKOA
WAIAPU
UAWA
COOK

WHAKATANE





— CHIEF CLERKS' CONFERENCE, WELLINGTON, 1940. —

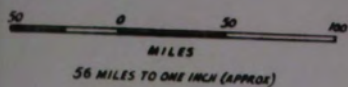
FRONT ROW: G.W. KNAPP, J. WOOD, HON. R. SEMPLE, N.E. HUTCHINGS, J.W. SCOTT, H.S. HILLS.
2ND. ROW: O.L.G. DUNNET, C. HALLIDAY, V.C. CURTIS, L.E. ATTEWELL, J.G. HANNAH, F.H.S. IBBETSON, E. TRAVERS.
AT REAR: O. CONIBEAR, F.L. LATTA, G.H. WAKELIN, F.G. JEFFERSON, J.A. SHANNON, W.R. POLAND, W.C. SMITH,
 RAGNEW, J.R. MOODY, H.J. HARTLEY, J. THOMPSON, A.B. ROBSON, A.A. WILLIAMSON,
 C.S.M^c GALLUM, F.C. STEWART, C. CAMPBELL, H.M. O'DONNELL, J.W. NISSEN, J.D. STACK.

MAP SHOWING PUBLIC WORKS DISTRICTS
AS AT OUTBREAK OF WAR 1939





YOUTH ISLAND • NEW ZEALAND
SHOWING PUBLIC WORKS DISTRICTS
AS AT OUTBREAK OF WAR 1939





Napier District.

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Counties of WAIROA
HAWKES BAY
PITANGATA
WAIPAWA
WAIPUKURAU
DANNEVIRKE
WOODVILLE
WEBER

Taumarunui District.

Counties of WAITOMO
KAWHIA
OHURA
TAUMARUNUI
KAITIIEKE
TAUPO

Stratford District.

Counties of CLIFTON
TARANAKI
INGLEWOOD
EGMONT
STRATFORD
WHANGAMONGA
WAIMATE WEST
ELTHAM

HAWERA
PATEA
WAITOTARA
WAIMARINO
WANGANUI
RANGITIKEI

Wellington District.

Counties of KIWITEA
POHANGINA
OROUA
MANAWATU
KAIRANGA
PAHIATUA
AKITIO
HOROWHENUA

MAURICEVILLE
BKETAHUNA
CASTLE POINT
MASTERTON
WAIRARAPA SOUTH
FEATHERSTON
HUAT
MARA

Nelson District.

Counties of COLLINGWOOD
TAKAKA
WAIMEA
MURCHISON

MARLBOROUGH
AWATERE
SOUNDS

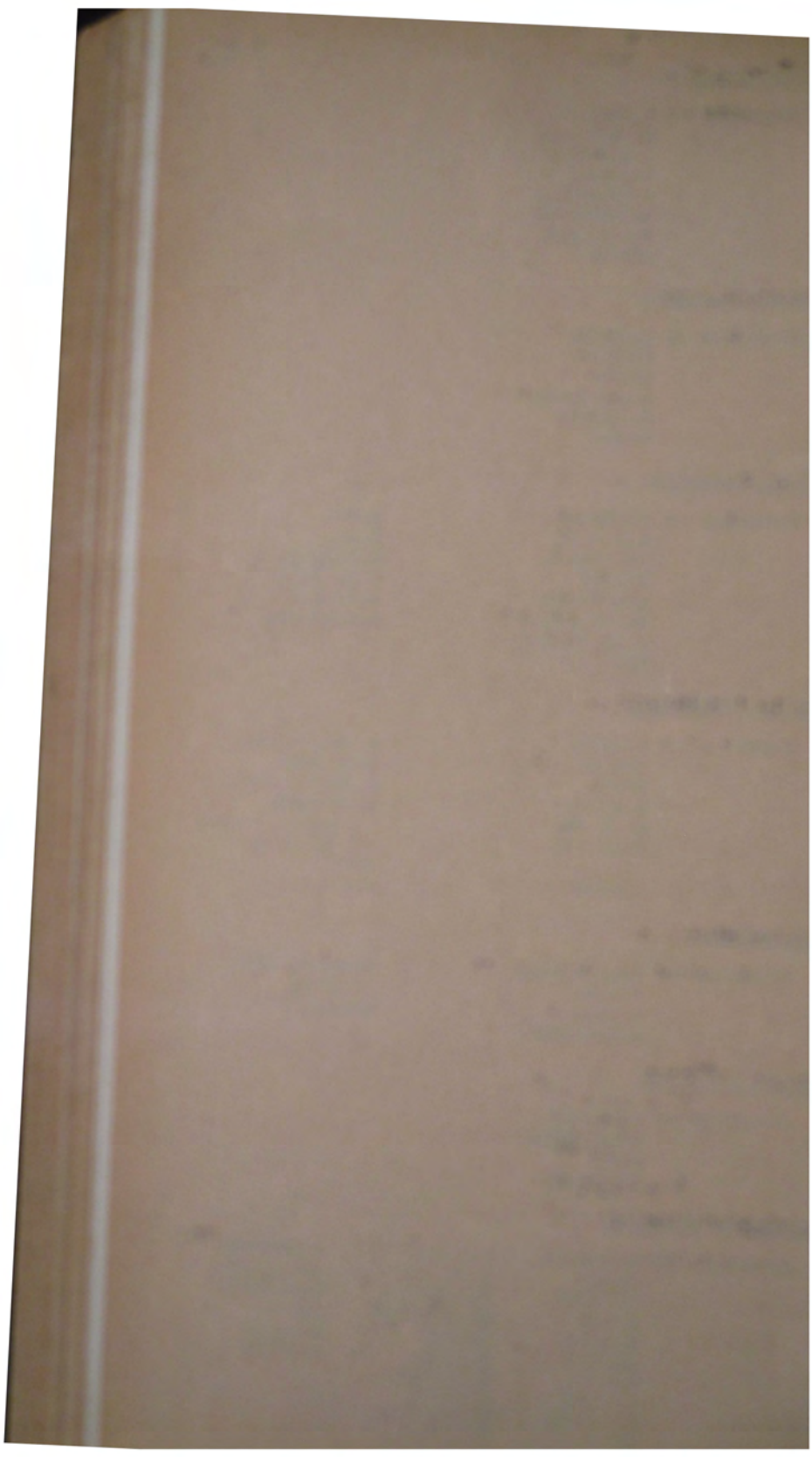
Greymouth District.

Counties of BULLER
INANGAHUA
GREY
WESTLAND

Christchurch District.

Counties of KAIKOURA
AMURI
CHEVIOT
KOWAI
WAIPARA
ASHLEY
TAIARA
OXFORD
RANGIORA
EYRE
PAPARUA
WAIMAIRI
HEATHCOTE
MT. HERBERT
AKAROA
WAIREWA
HALSWELL
SPRINGS
ELLESMERE
SELWYN

ASHBURTON
GERALDINE
MACKENZIE
LEVELS
WAIMATE
MALVERN



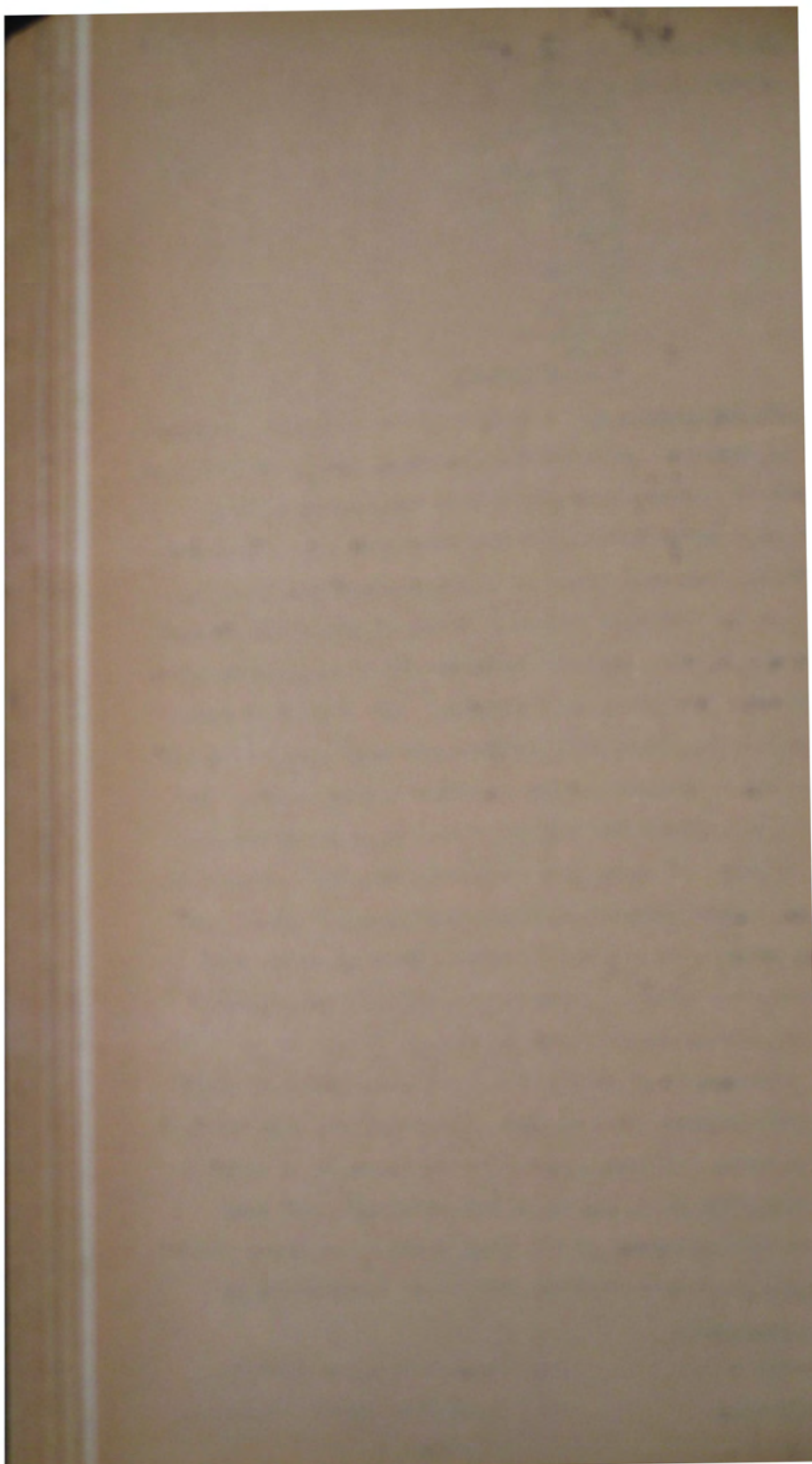
Counties of
 WAIKAKI
 VINCENT
 MANLATOFO
 WAIHEMO
 WAIKOUKITI
 PENINSULA
 TAIERI
 BRUCE
 LAKE
 TUAPEKA
 CLUTHA
 WALLACE
 SOUTHLAND
 FIORD
 STEWART ISLAND

War-Time Organisation. A review of the war-time organisation in Auckland public works district, one of the biggest centres of defence construction in the Dominion, will serve as a cross-section of the functions and activities of the Department's district offices generally.

At the outbreak of war a total of 372 officers were stationed in the Auckland district (84 of these subsequently enlisted for overseas service). The number of men employed aggregated 2933, of whom 424 were engaged on aerodromes and a similar number on other defence works. By the middle of 1942 the number of men employed reached a peak of 3874, of whom 3065 or nearly 80%, were engaged on defence works (aerodromes 672; other 2393). Staff personnel climbed to a total of 455. Many of these were temporary war-time appointments to replace experienced officers absent on military leave.

A description of the major works carried out in the Auckland district for the Army, the Navy, the U.S. Forces, and for civil defence, etc. is given elsewhere in this History (parts 2, 3, 4, and 6 respectively), but some idea of the magnitude of the £14½ million programme undertaken may be gained from the following particulars of materials used:

| | | |
|-----------|---|-------------------------|
| Timber | : | 60,000,000 super feet. |
| Fibrolite | : | 3,726,800 square yards. |
| Tiles | : | 1,121,764 |

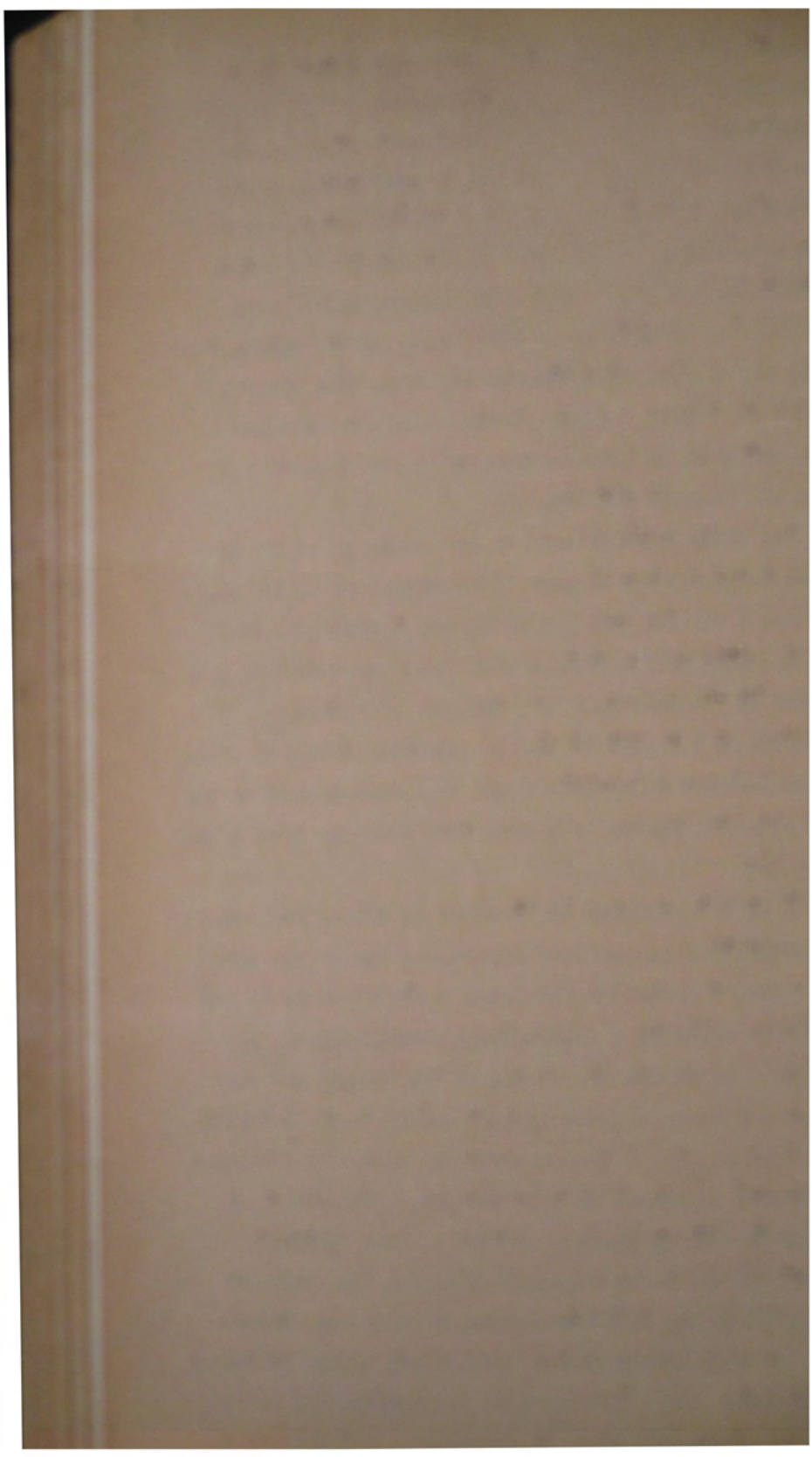


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|---------------------|---|-------------------------|
| Plaster-cored board | : | 9,000,000 square feet. |
| Bricks | : | 18,000,000 |
| Concrete | : | 1,221,000 cubic yards. |
| Soft-board | : | 17,300,000 square feet. |
| Fibrous plaster | : | 95,656 square yards. |
| Cement board | : | 82,194 square yards |
| Malthoid | : | 21,600,000 square feet |

A total of 3970 plans were drawn by the architectural and engineering draughtsmen, and from them 135,270 prints were taken. These prints would have covered 21 acres, equal to an area bounded by Queen, Victoria, Albert and Customs Streets.

The first rush of work in the early years of the war was handled without much difficulty, but as the tempo increased following the spread of the conflict to the Pacific, Auckland, in common with other districts, became involved in the wide-sweeping changes in procedure instituted as a result of the appointment of the Commissioner of Defence Construction and the introduction of the master schedule system of contracting (See chapters 6 and 7, part 1).

It is not proposed to traverse in detail the internal organisation of Auckland district office. The District Engineer naturally delegated certain powers to his subordinate officers - engineering, architectural, and clerical, both in the office and in the field, and just as naturally there existed amongst all of these officers the fullest degree of co-operation and mutual assistance. The Resident Architect in turn delegated one member of his staff to act as liaison officer to Army district headquarters and to be responsible to him (the Resident Architect) for all military defence work in the Auckland area. Another architectural officer was placed in charge of Naval work, and a third became responsible for all stores and heavy construction projects. Similar arrange-



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ments were made in regard to the engineering side of the programme, and so on down through the ranks of overseers, foremen, etc.

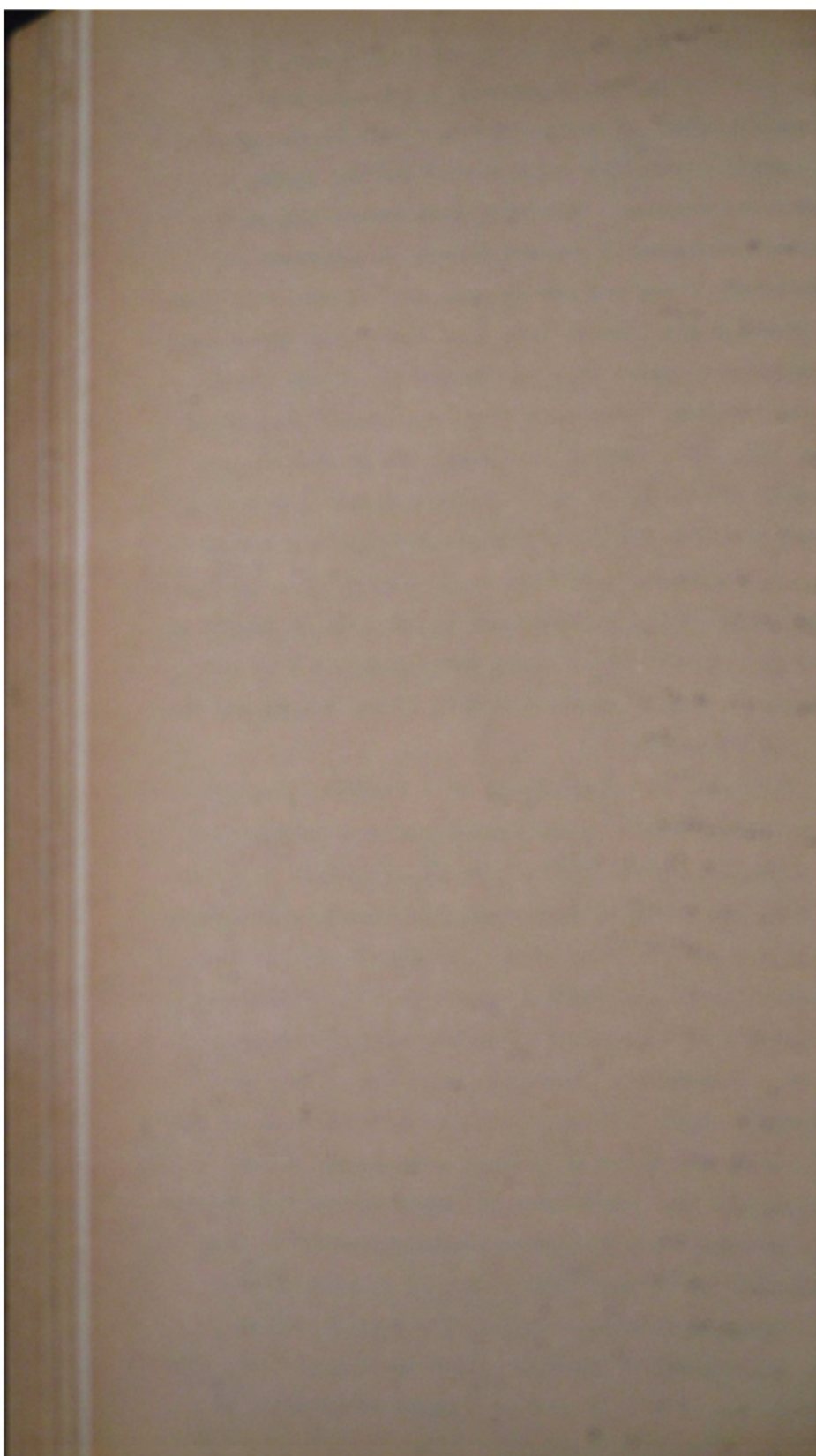
While by far the greater part of the defence construction programme was carried out by contract, the part played by the Department's own workshops organisation and the manner in which the services of the electrical, plumbing, and associated trades were integrated are perhaps worthy of special mention. The public works workshops were placed on a non-stop duty basis throughout the war, open for service day and night. No large project was handled in its entirety by the workshops personnel, but every section - joinery, electrical, plumbing, or mechanical, was at the disposal of the Forces continuously.

Arising out of the necessity for shifting heavy earth-moving machinery from one part of the district to another approachable only by water (there were many island defence posts in and around Auckland) a small but capable marine transport section was built up by the Department. This section, with the aid of launches and barges, and supplemented at times by assistance from private contractors, successfully carried some thousands of tons of valuable equipment to their various destinations. Similarly, a road transport division capable of handling the heaviest machines ever landed in the country came into being.

Electrical Work. At the outbreak of war the bulk of the electrical work in and around Auckland was being carried out by the 50 odd electricians employed in the public works workshops. It was realised, however, that to cope with the immense programme of work which lay ahead it would be necessary to secure the closest possible co-operation of the supply authorities and of electrical contractors in the district. The supply authorities were accordingly approached and an assurance obtained that

times. This promise was kept, with the result that throughout the war the Department's requests were invariably given priority, both in regard to the provision of overhead power line reticulation and the laying of underground cables. Moreover, authorities willingly denuded themselves of reserve stocks of materials in furtherance of the war effort and, indeed, accepted without question all demands made upon them - and these were virtually continuous from the beginning of 1940 until the end of 1944. One authority, for example, supplied transport, pole planting equipment, and sufficient men to handle the whole of the overhead reticulation work at Waiouru Military Camp, and completed within two months what would normally have been a six months' job. Another, to facilitate cable jointing and laying work at Whenuapai Aerodrome, placed two of their cable jointers with all requisite equipment at the disposal of the Department for well over 12 months.

Following the abandonment of competitive tendering and the introduction of the master schedule system (see part 1 chapter 7) the District Engineer reached an agreement with the Auckland Electrical Contractors Association whereby a committee comprising a representative cross-section of large and small contractors would 'allocate' electrical work to various firms according to their ability to handle it: payment to be arranged on a schedule basis. This procedure operated much the same as the principal master schedule system, eliminating delays occasioned by the preparation of plans etc. and the obtaining of quotes. The committee itself undertook to discipline members of its organisation in respect of rate of progress, quality of work, or other complaints made by the Department, so that in effect departmental officers were relieved of a good deal of routine supervision of work under construction and were able to devote more time



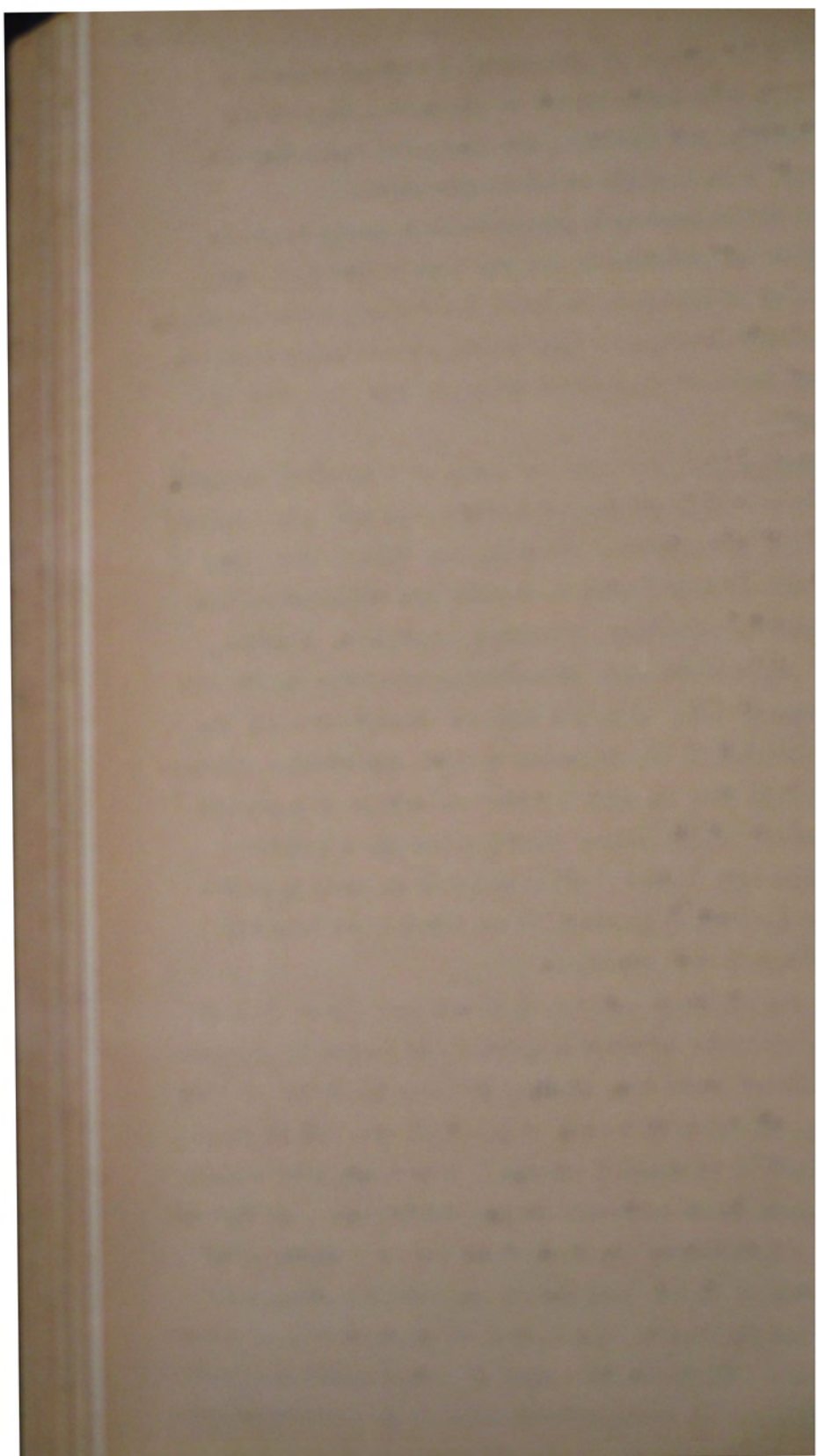
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This system of allocating electrical work on a schedule rate basis proved so successful that it was extended to the Tauranga, Hamilton, and Whangarei districts, with equally satisfactory results.

The Department's own electrical staff, however, carried out practically all the work required at radio stations in extremely isolated localities, while - largely for security reasons - electrical work at RNZAF Stations in the Auckland area was confined to the one party of workmen.

Plumbing Work. The plumbing section of Auckland District Office was responsible for control over not only plumbing work but all drainage, water supply, well boring, fire protection, refrigeration, heating and ventilation, and the general servicing of defence buildings. Plumbing staff and workmen were increased considerably as the war progressed, but, as in the case of electrical work, the co-operation of the trade was sought, and similar arrangements were made in 1942 for the allocation of contracts to members of the Master Plumbers Association under a schedule rate basis. All work of an especially secret nature continued, however, to be carried out with the Department's own personnel.

The drainage work accomplished on defence projects in the Auckland district comprised the laying of 32 miles 4 chains of field tile drains, 19 miles 41 chains of open drains, 45 miles 40 chains of sewer drains, and 21 miles 79 chains of stormwater drains. Long hours were worked, frequently under extremely trying conditions. At Victoria Park, for instance, the main drain was at a depth of 20 feet and, as it was laid during the winter months, constant pumping had to be resorted to in order to keep water in check. On occasions a rush of work necessitated all available labour being concentrated in one particular area. In connection with the laying of drains at Hobson Park

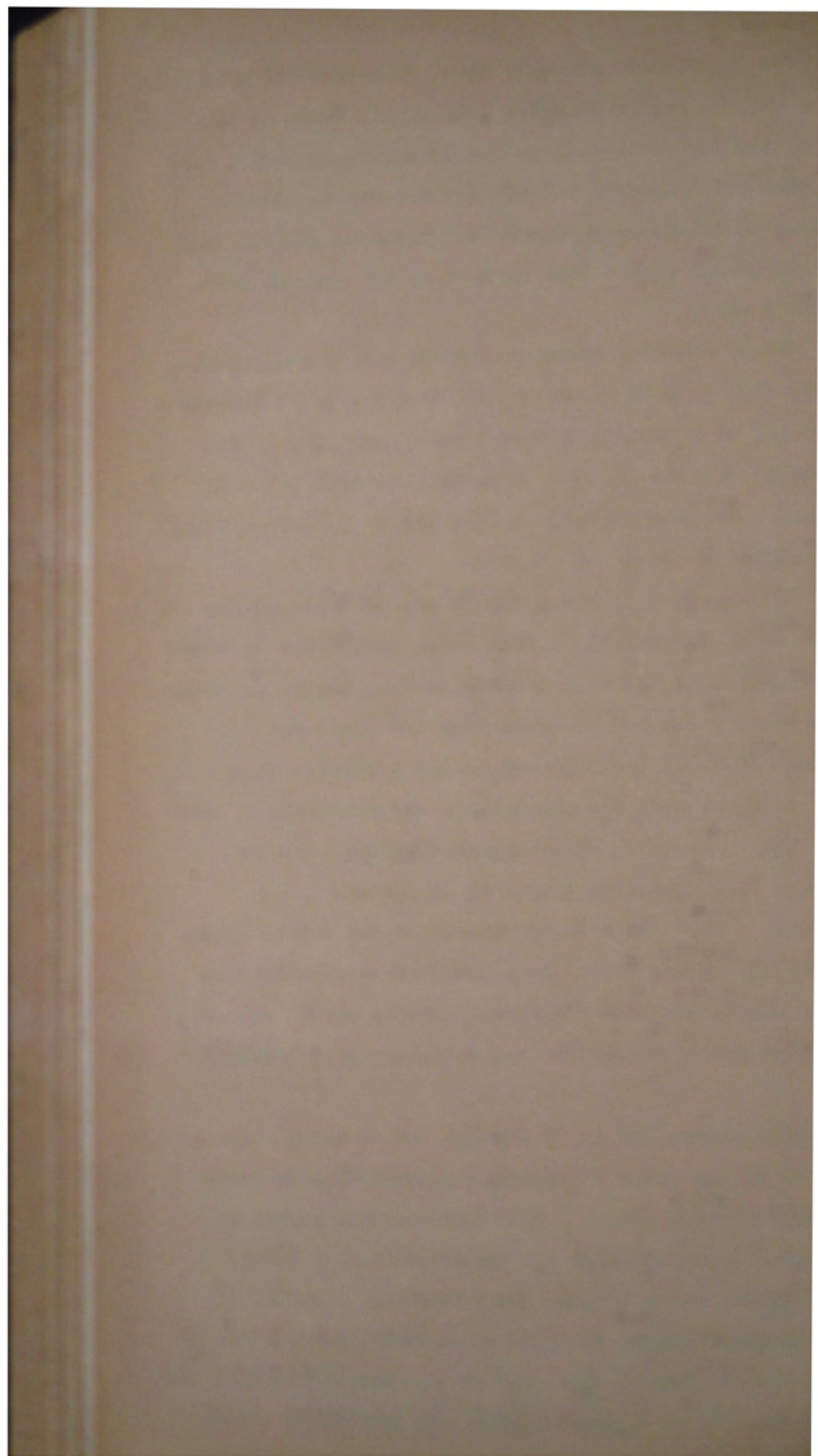


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Hospital and Mangere Crossing Camp, in anticipation of the early arrival of American forces, the ranks of the local plumbing organisations had been depleted and a call was made for volunteer labour from Government offices: clerks, storemen, draughtsmen and overseers and, in fact, all and sundry lent a hand in meeting the crucial need of the hour.

Where existing sewerage systems were not available, alternative methods of sewage disposal had to be devised - a problem of no mean magnitude when a camp or hospital involving from two to five thousand personnel was concerned. The usual course adopted was to provide holding or digester tanks in such cases.

The question of water supply was another problem not always easy of solution. Very large quantities of water were required in the bigger camps and hospitals, and sometimes these could not be drawn from the local supply. Papakura Military Camp was originally connected to the local main but when the strength of the camp grew to over 5,000 its population became larger than the adjoining township and a separate source of supply had to be arranged. This was done by building a new dam at Hunua, thereby impounding 1,000,000 gallons of water, complete with a pump-house with a main and standby units, filters, a 500,000 gallon reservoir, and seven miles of concrete main.

Well boring had to be carried out on quite a large scale to supply water to widely dispersed brigade camps and anti-aircraft posts. This entailed the laying of many miles of water pipes and the installation of automatic pumping units to pump the water into a series of tanks on high stands, in order to provide pressure and to give a gravity flow to the various services. Over 40 bores were driven in the Warkworth area, all but one of which (sunk to a depth of 550 feet) were successful. Very hard

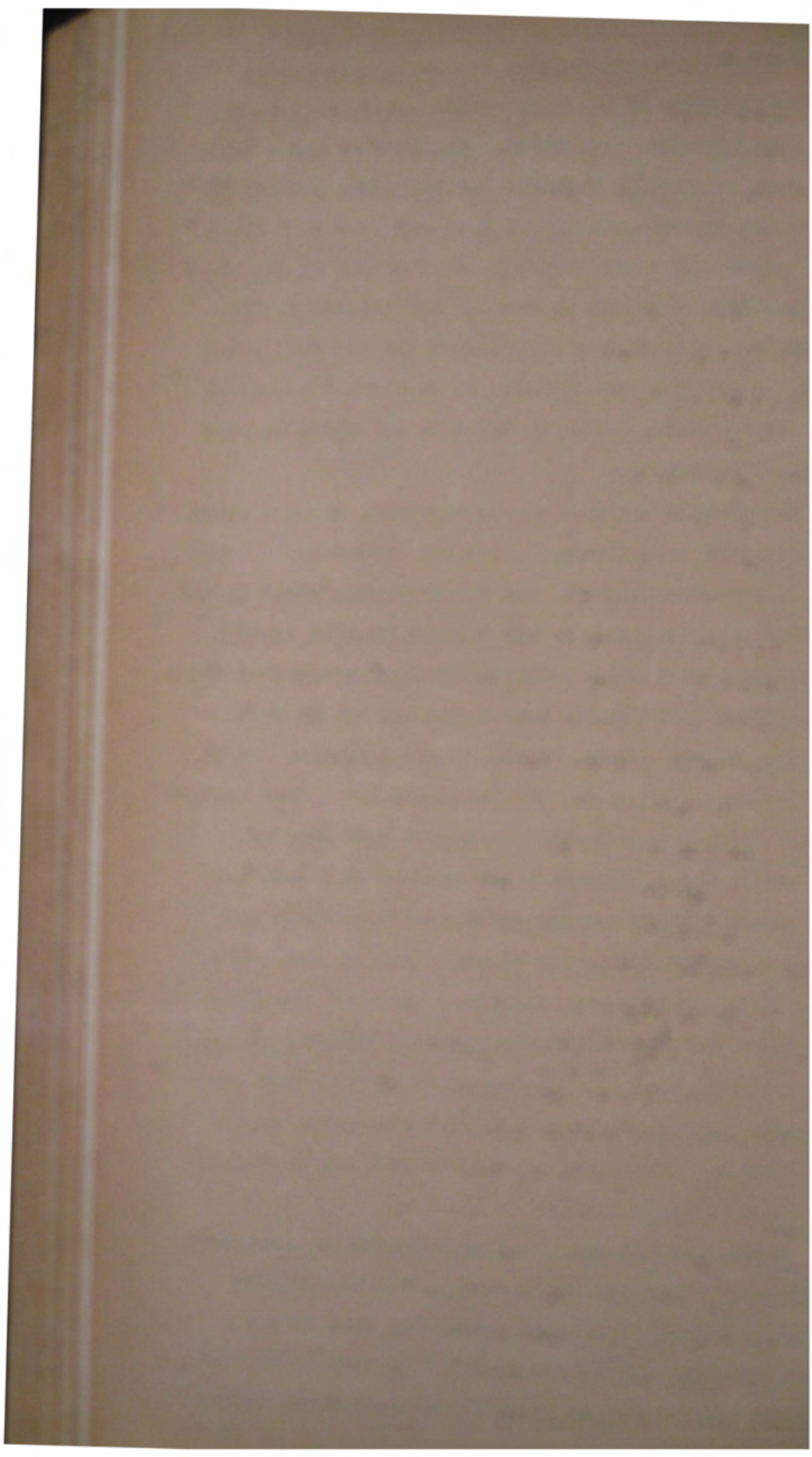


rock formation was encountered on some occasions, in one case the rate of progress being reduced to 2 feet daily through solid blue stone. The flow of water from the bores, boosted by electric pumping gear, frequently reached 700 to 800 gallons per hour and even as high as 1000 gallons per hour. Usually, the quality of the water was excellent, although on some of the islands in the Hauraki Gulf trouble was experienced through salt water seeping in after a few months. On one island bores had to be driven three different times in an effort to overcome this difficulty.

Measures to protect camps, barracks, and hospitals etc. from fire hazard ranged from the provision of bucket pumps, fire extinguishers, and water storage drums in the scattered brigade camps to the construction of 10,000 gallon concrete storage tanks in the larger establishments. Fire fighting water mains were installed in the more important defence areas, together with hydrants, and in some instances, e.g., Papakura Military Camp, fire engines were supplied. All defence buildings were equipped with bucket pumps and hose reels as soon as completed.

Refrigeration for the storage of foodstuffs was another amenity provided by or under the supervision of the Department's plumbing section. Some of the installations were elaborate and comprehensive, but in outlying camps a refrigeration appliance known as a 'reefer box' and consisting of an insulated, self-contained, mobile unit, gave cool storage for meat, butter, and vegetables etc. for up to 1000 men.

Heating was an essential requirement in practically all classes of defence works designed to accommodate personnel, varying from small stoves in huts to large steam boiler systems in hospitals. In some of the smaller posts hot water was made available from ordinary runicce coppers, the buildings being heated by 'hot dogge' stoves.



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For hospitals and big camps heating on a large scale was arranged by steam and hot water installation. Boilers of all descriptions were in demand, many second-hand ones being put to use, even locomotive boilers. For one large project no less than four 82 horse power boilers were needed to provide sufficient steam for cooking and heating. Ventilation also figured in the services necessary to make defence buildings ready for occupation.

5. POST-WAR RE-ORGANISATION.

Although by the very nature of its functions (see part 1, chapter 6) the establishment of the Ministry of Works in March, 1943, foreshadowed wide-sweeping changes in the constitution of the Public Works Department, these were not actually brought into effect until after the war had ended.

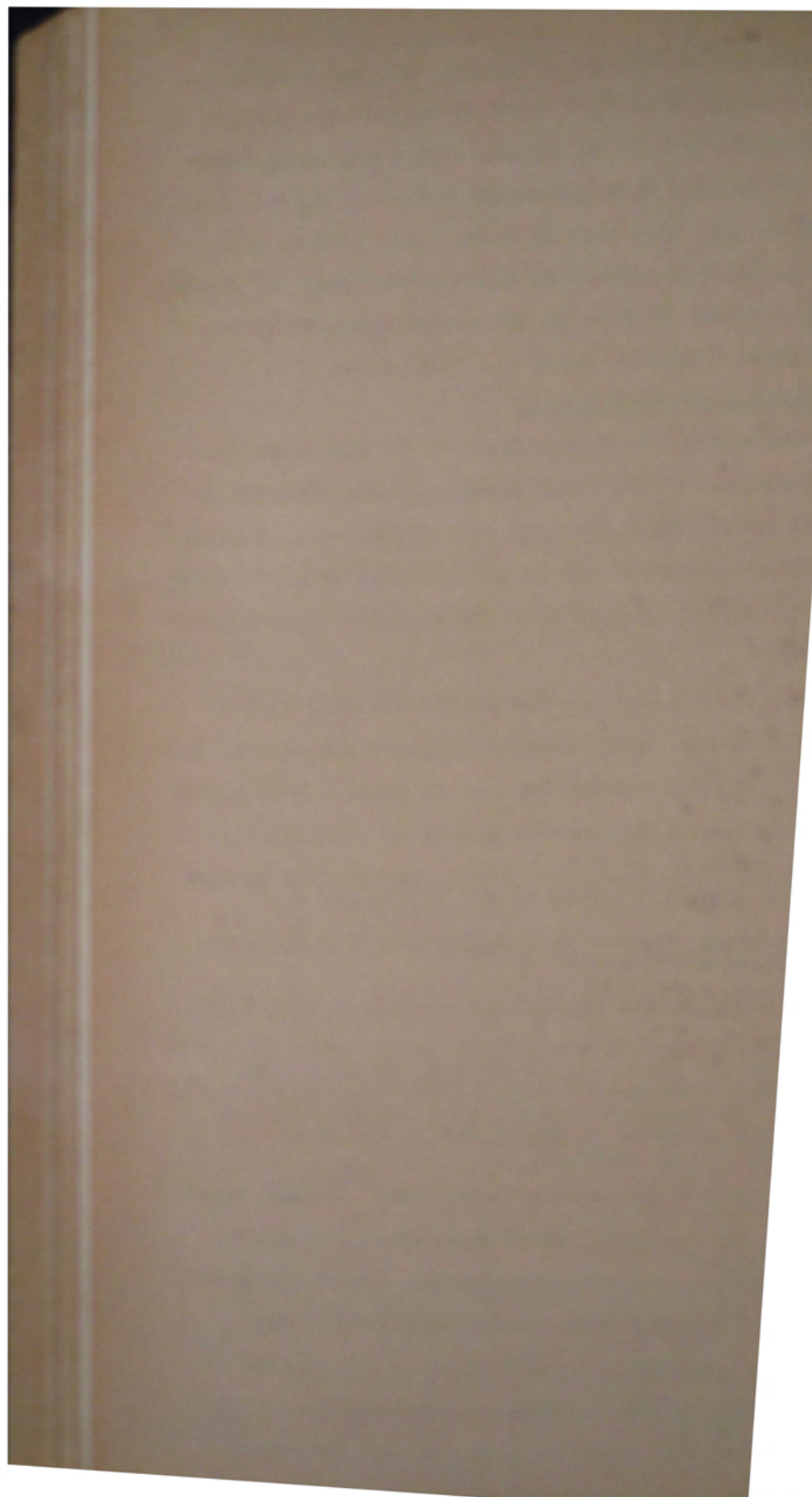
As a first step, a joint report was made to the Government by the Public Service Commissioner and the Commissioner of Works towards the end of 1944. This report contained recommendations with a view to obtaining:

- (a) A clearer definition of responsibilities amongst the senior officers of the Department.
- (b) Decentralisation from Wellington of much of the Department's work.
- (c) Specialisation in senior technical appointments.
- and (d) Amalgamation of some of the public works districts with the object of eliminating those in which large construction projects had practically ceased and in which there appeared to be no prospects of major works being undertaken in the years immediately ahead. (1)

(2)

In a memorandum dated 21 April 1945 to the Permanent Head, the newly appointed Commissioner of Works, Mr. E.R. McKillop, who had succeeded Mr. (later Sir James) Fletcher on 1 January 1945, stated that Cabinet had approved the proposed re-organisation of the Department along the lines of the recommendations contained in the joint report of his predecessor and the Public Service

(1) Ministry of Works Report 1946.



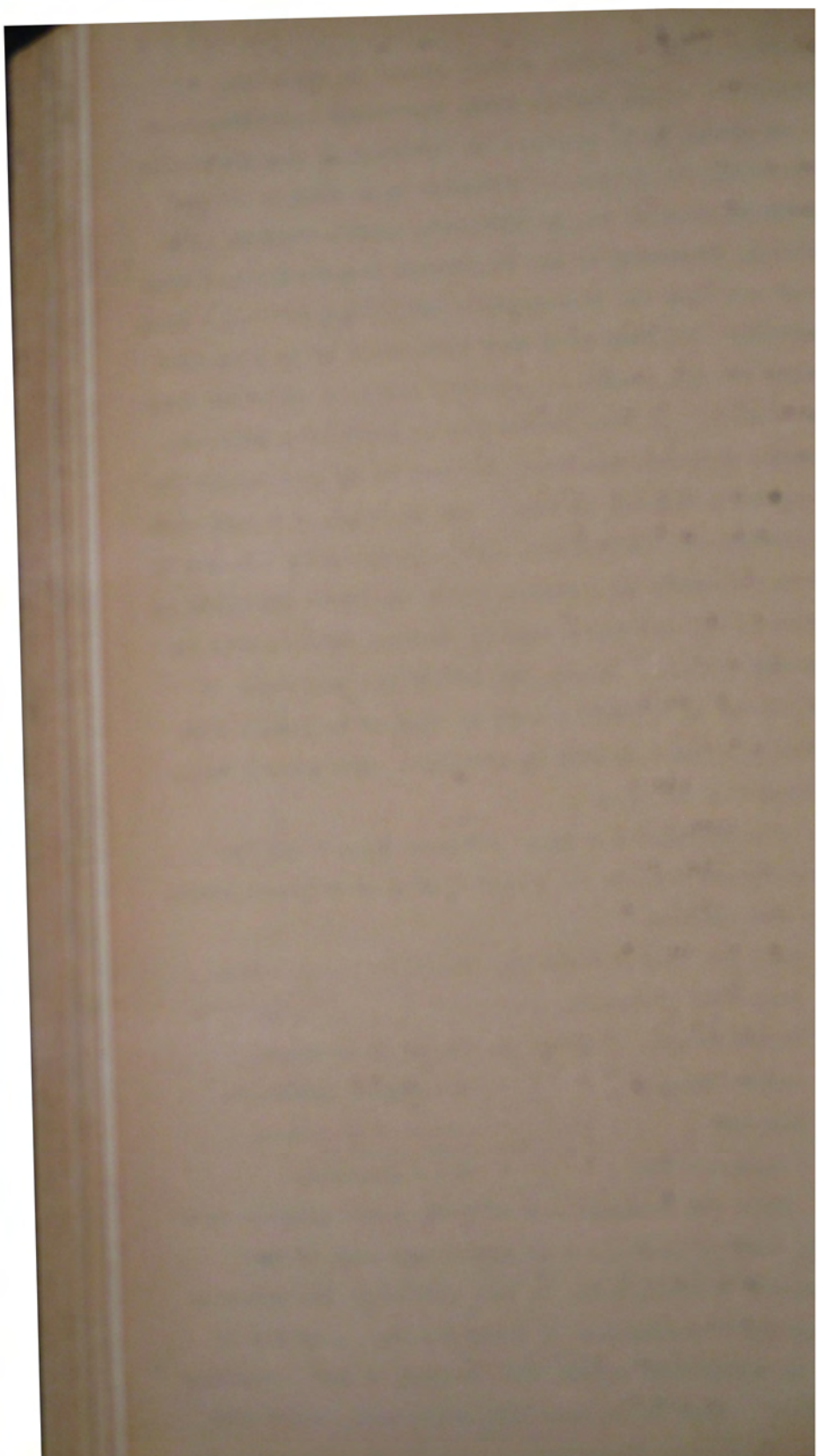
Commissioner. 'During recent years' he said 'the activities of the Public Works Department have increased to an extent as to render some division of responsibility necessary, and to render advisable some measure of de-centralisation of the Department's administration. The existing framework of the Department was established many years ago when the Department's activities covered a field radically different from that with which it is concerned today, and its annual expenditure has been increased many times over. It can, therefore, be considered that the measure of re-organisation proposed is to some extent the out-come of natural growth. The question of territorial inspection and control has also been radically altered by the improvements in communications and transport which are now available and which will be further increased in the post-war period. Again, the nature and magnitude of some of the Department's work is such as to render some degree of specialisation imperative - particularly among professional officers'.

The Commissioner then proceeded to set out the changes which were to be effected as soon as practicable. These comprised:-

- (a) That the Public Works Department be divided into four main divisions, viz:

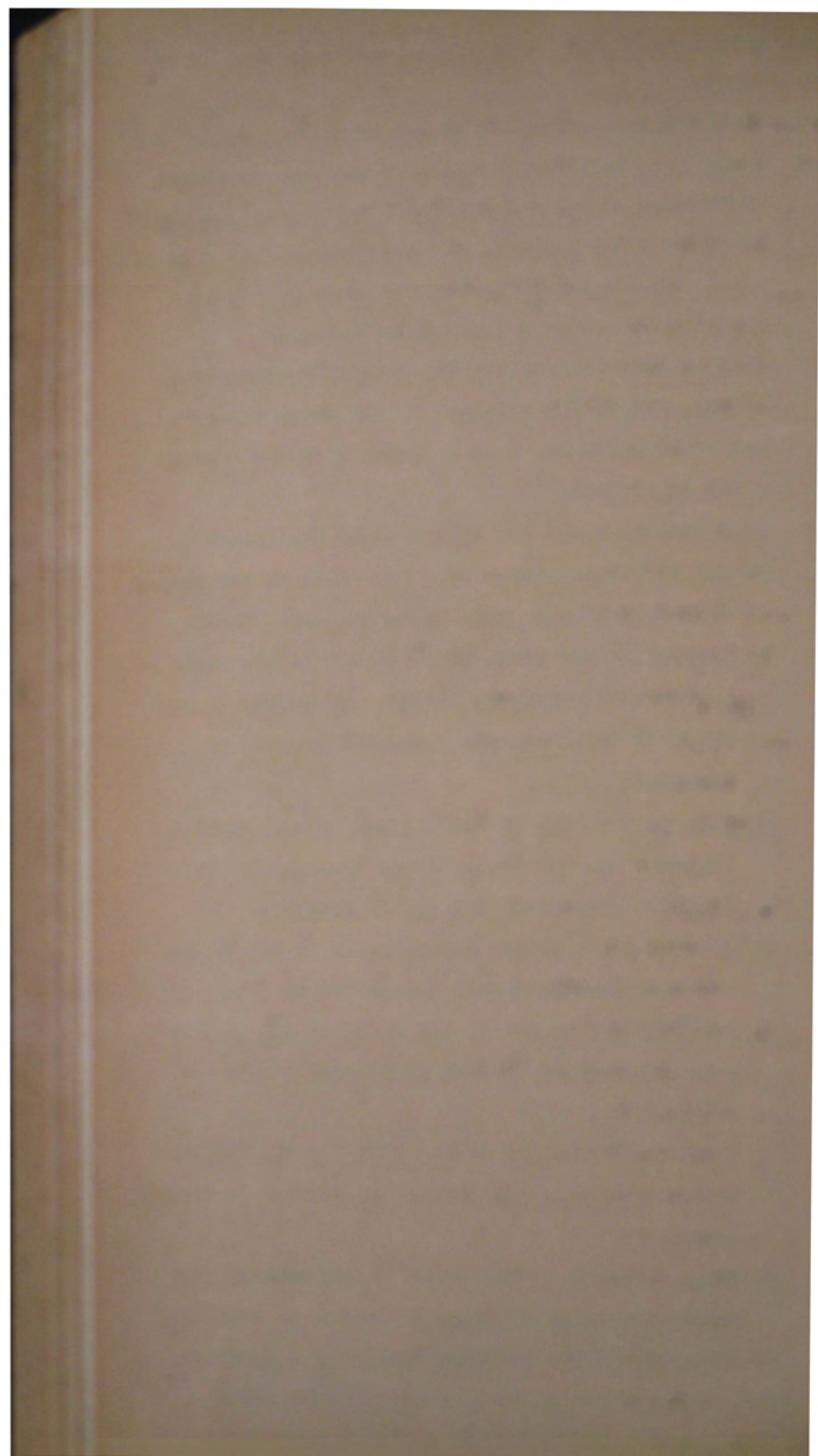
| | | |
|------------------|---|-------------------------------------|
| Engineering: | | under the Engineer-in-Chief. |
| Architectural: | " | " Government Architect. |
| Housing | : | " Director of Housing Construction. |
| Administrative : | " | " Under-Secretary. |

While the Commissioner of Works would have an over-riding control over all four divisions, each of the divisional officers would be responsible to the Minister through the Commissioner of Works for the execution of all work which fell within the province of his particular division. Each divisional head would deal direct with the Public Service Commissioner on matters of staff. The



Engineer-in-Chief would continue as Permanent Head of the Department.

- (b) That the Hydro-electric Branch be reconstituted as a separate Department 'but that the constructional activities of the reconstituted Department, as distinct from the generation, distribution, and sale of power, should remain within the structure of the Ministry of Works as a separate division'.
- (c) That as indicated in (d) the Housing Construction Branch, originally attached to the State Advances Corporation, should form a division of the Public Works Department.
- (d) That territorially the Public Works Department should be reconstituted by a reduction in the number of districts to six only, those suggested being:
 - A. Auckland - involving the division of the Auckland district as presently defined and taking in the whole of the Whangarei district: located at Auckland.
 - B. Waikato - Taking in the balance of the Auckland district and the whole of the Taumarunui and Tauranga districts: located at Hamilton.
 - C. Hawke's Bay - taking in the whole of the Napier and Gisborne districts: located at Napier.
 - D. Wellington - Taking in the whole of the Wellington, Wanganui and Nelson districts: located at Wellington.
 - E. Canterbury - Taking in the whole of the Christchurch and Greymouth districts: located at Christchurch.
 - F. Otago - Taking in the whole of the Dunedin district, including Southland: located at Dunedin.
- (e) That in lieu of the existing system of appointing inspecting engineers to control defined geographical areas, the general inspection should be undertaken by



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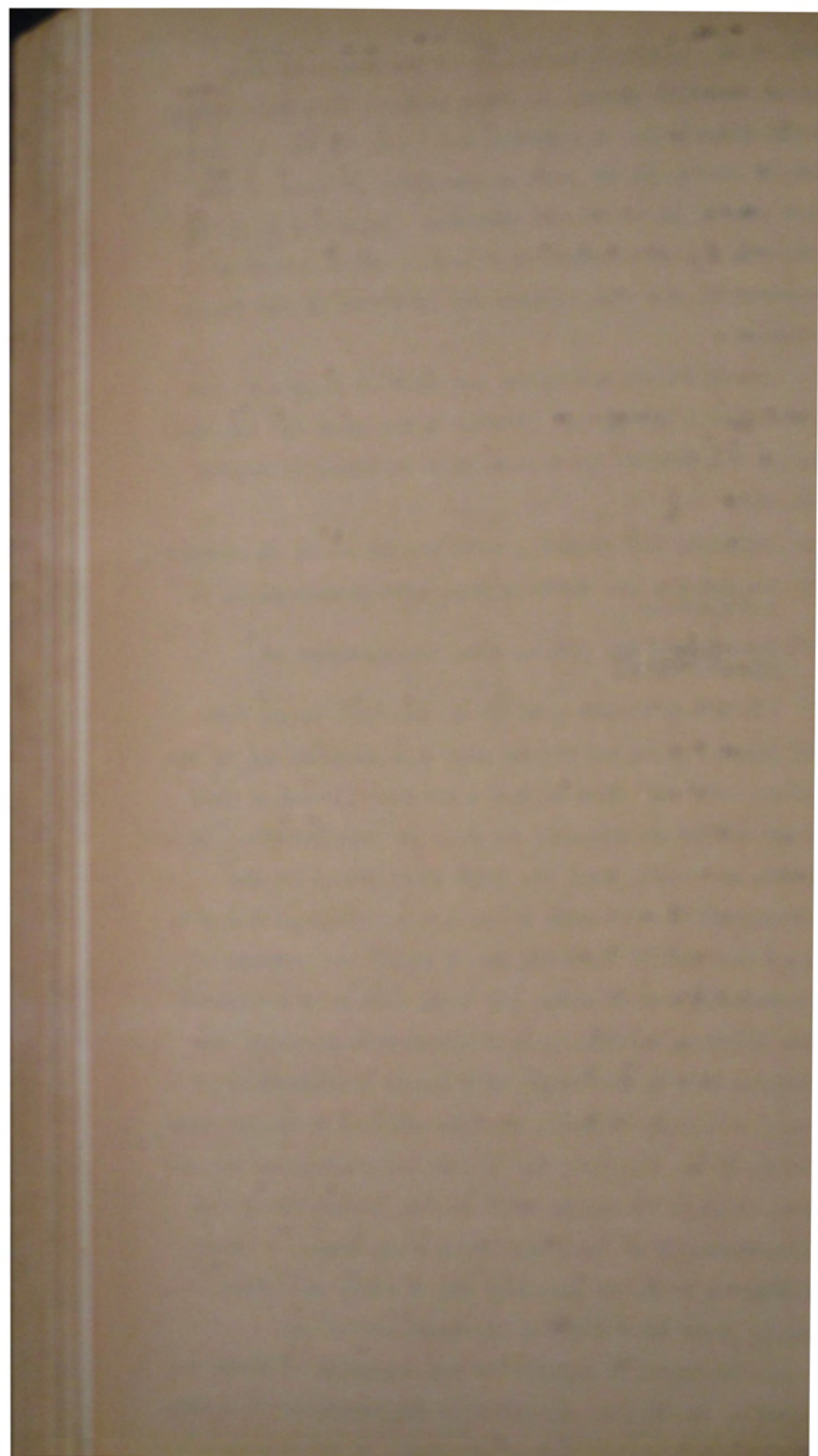
each of the District Engineers in the reconstituted larger district areas, and that control from Head Office should largely be on a functional basis by the appointment of engineers who were specialised in each of the major functions of the Department. This was to apply similarly to architectural, housing, and non-technical administration coming within the province of the Under-Secretary.

The Commissioner mentioned that in regard to the Architectural Division, provision was made for the setting up of district representation in three districts only, viz:

- A: Auckland and Waikato, with headquarters at Auckland.
- B: Wellington and Hawke's Bay, with headquarters at Wellington.
- C: Canterbury and Otago, with headquarters at Christchurch.

The Commissioner went on to say that these were broad interpretations of the main recommendations in the joint report, and that it was a Cabinet direction that they should be implemented as soon as practicable. It was obvious, he added, that the full realisation of the re-organisation proposals could not be effected for some time on account of limitations of staff and because of the necessity for avoiding any dislocation or confusion in the existing machinery of administration whilst the Department was in the midst of a heavy construction programme. However, he said, certain changes could be made immediately and the purpose of his memorandum was to give senior officers of the Department the framework of the new organisation so that any directions issued to them from then on could be properly interpreted and given effect to without confusion or misunderstanding.

An Executive Committee of the Ministry of Works had been set up under the direction of the Minister of Works, continued the Commissioner, consisting of the Commissioner

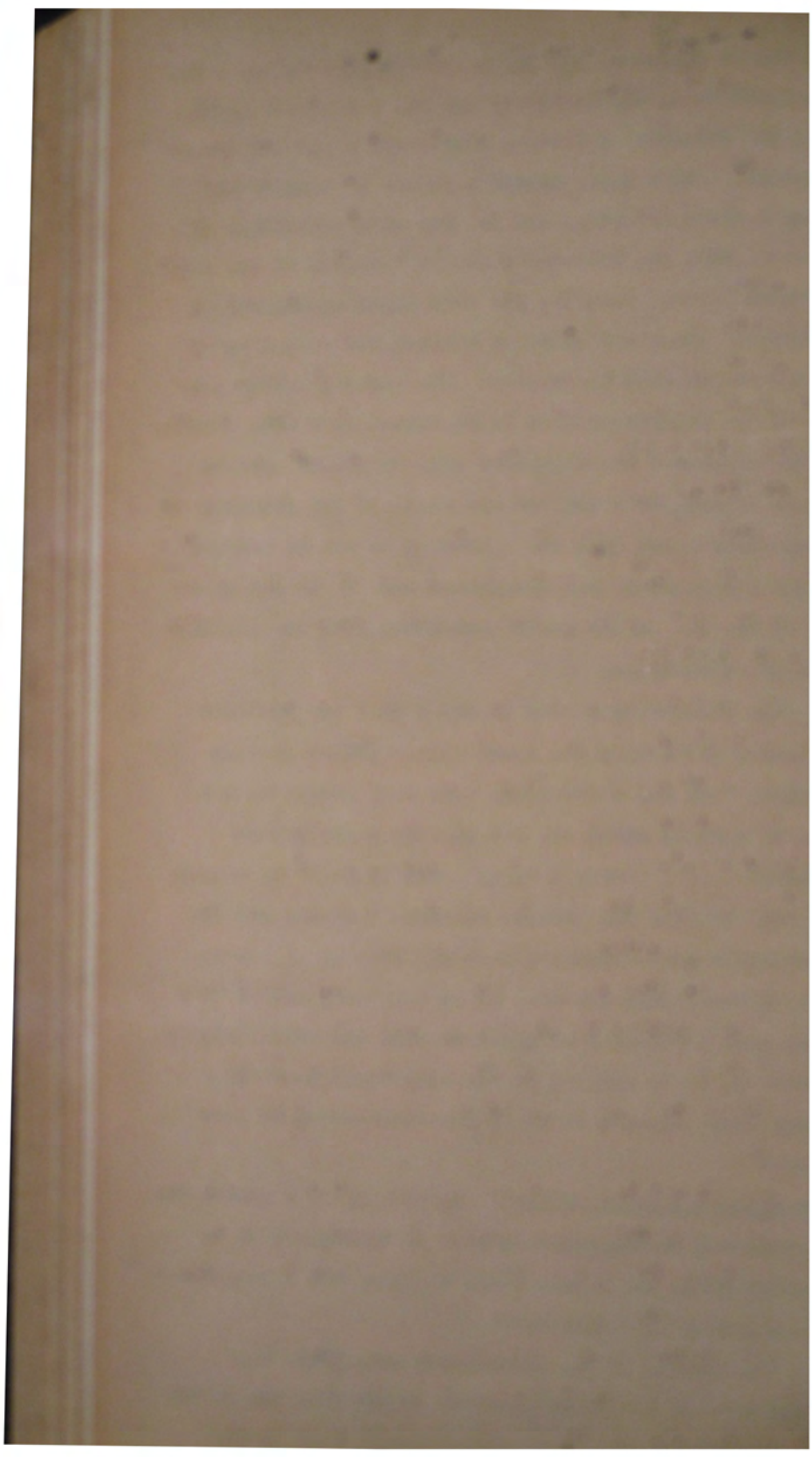


of Works as chairman, the Engineer-in-Chief, Public Works Department as deputy chairman, and the Government Architect, the Director of Housing Construction and the Under-Secretary. By holding weekly meetings to discuss all policy matters affecting the Department's activities it was hoped that the Minister would be 'assured of the most competent advice possible, and that misunderstanding or conflicting interpretations as between the divisions of the Department will be avoided. The general policy control of the Department will be exercised from this source, but the advice of the Committee will be sought also on matters arising from the broader field of the Ministry of Works, quite apart from the operation of the Department'. Similar inter-divisional committees were to be set up in each of the new public works districts, with the District Engineer as chairman.

The Commissioner made it clear that the District Engineer would remain the controlling officer in each district, 'but his controlling authority should be confined to matters which are not clearly sectional in character'. 'From a broad point of view' he concluded, 'and to make the picture clearer, I should say the Department's administration remains, from an operating point of view, much the same as in the past, except that within each particular division as much responsibility as possible is to be centred in the divisional head and through them directly to their representatives in each district.'

Re-Organisation takes Effect. Shortly after a conference of divisional representatives held in Wellington on 19 September 1945, steps were taken to bring the re-organisation proposals into operation.

The passing of the Electricity Act, 1945, had already severed the Hydro-electric Branch from the Public Works Department, and it commenced functioning as the



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MILES
56 MILES TO ONE INCH (APPROX)







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State Hydro-electric Department. As originally contemplated, the Public Works Department retained the constructional work relative to the development of hydro-electric energy, although a separate division to deal with this class of work did not come into being.

As from 1 December 1945 the six new districts were established, with boundaries as suggested in the joint report (see map), and from the same date the Housing Construction Branch became amalgamated with the Public Works Department.

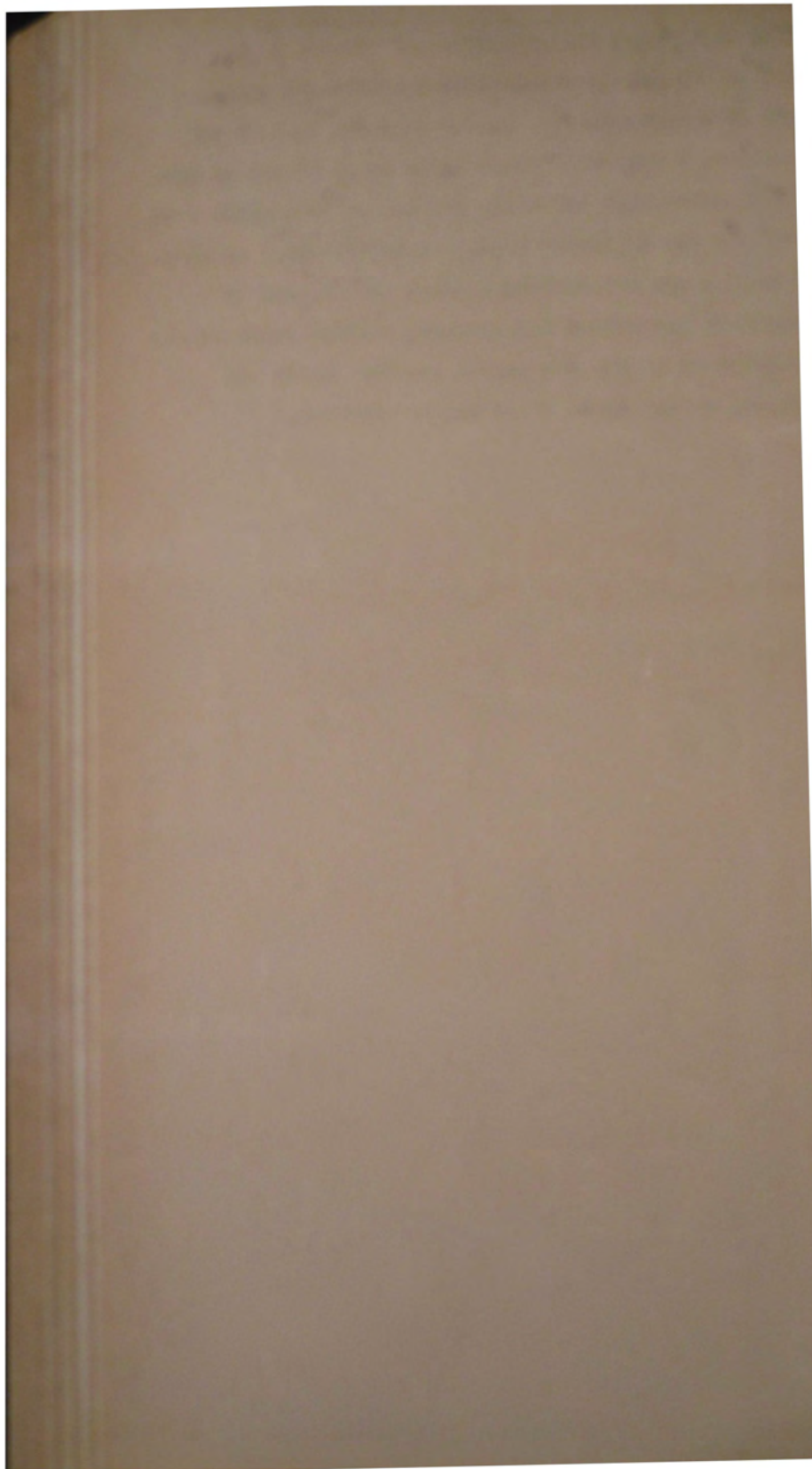
The designation of inspecting engineer was abolished, and new positions were created in Head Office with such titles as Construction Engineer, Highways and Roads Engineer, Municipal Engineer, River and Drainage Engineer, and Harbour Engineer.

Detailed instructions regarding changes in procedure were issued to District Engineers and divisional controlling officers by the Permanent Head on 17 October 1945⁽¹⁾ dealing principally with the manner in which correspondence was henceforth to be addressed as between Head Office and the major district offices and between the divisions. In effect, the head of each division would communicate only with the local controlling officer of his division in the new districts, while in respect of any general or non-technical policy matter Head Office correspondence with outside parties, other Government Departments, and District Engineers in charge of main districts, would be conducted by the Under-Secretary. Instructions concerning major policy questions, staff, and general administration matters applicable to officers of all divisions would, as formerly, be issued by the Permanent Head, and, likewise, inwards correspondence on similar subjects would be addressed to the Permanent Head.

'It should be generally recognised', concluded the



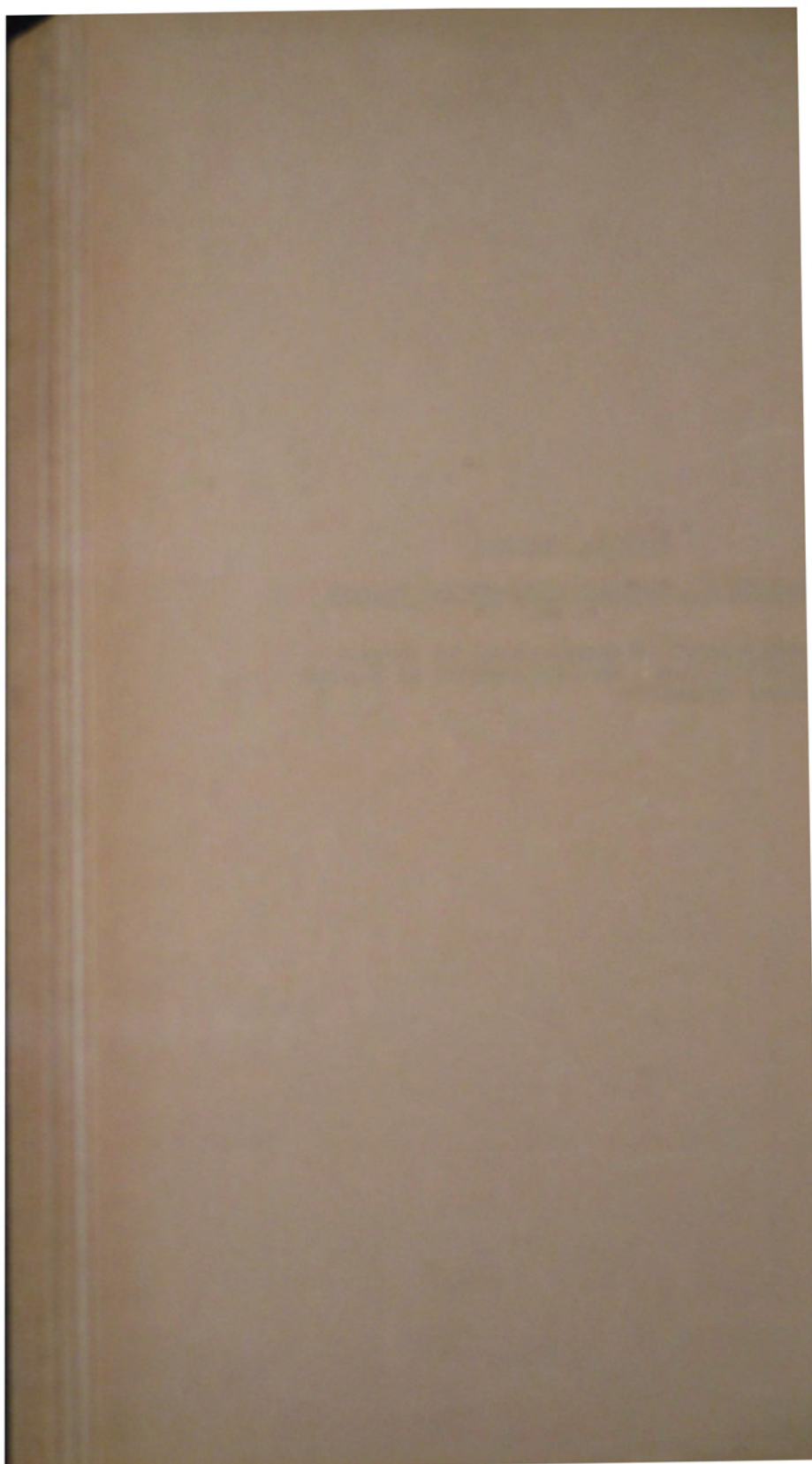
Permanent Head 'that the new divisions are not to be regarded as absolutely water-tight compartments entirely separate from each other. The whole conception of the re-organisation scheme provides that, while divisions have their respective responsibility and scope, they still form part of, and are to function as, one Department. By close collaboration and co-ordination based on a spirit of understanding and mutual helpfulness, results which should be satisfactory to the Government and the public and encouraging to the whole staff can be achieved.'



PART 1. GENERAL

CHAPTER 6 : DEFENCE CONSTRUCTION COUNCIL

Appointment of Commissioner of Defence
Construction : Re-organisation of Defence
Works Procedure.





SIR JAMES FLETCHER
Commissioner of Defence Construction.
(Commissioner of Works to Dec. 1944.)



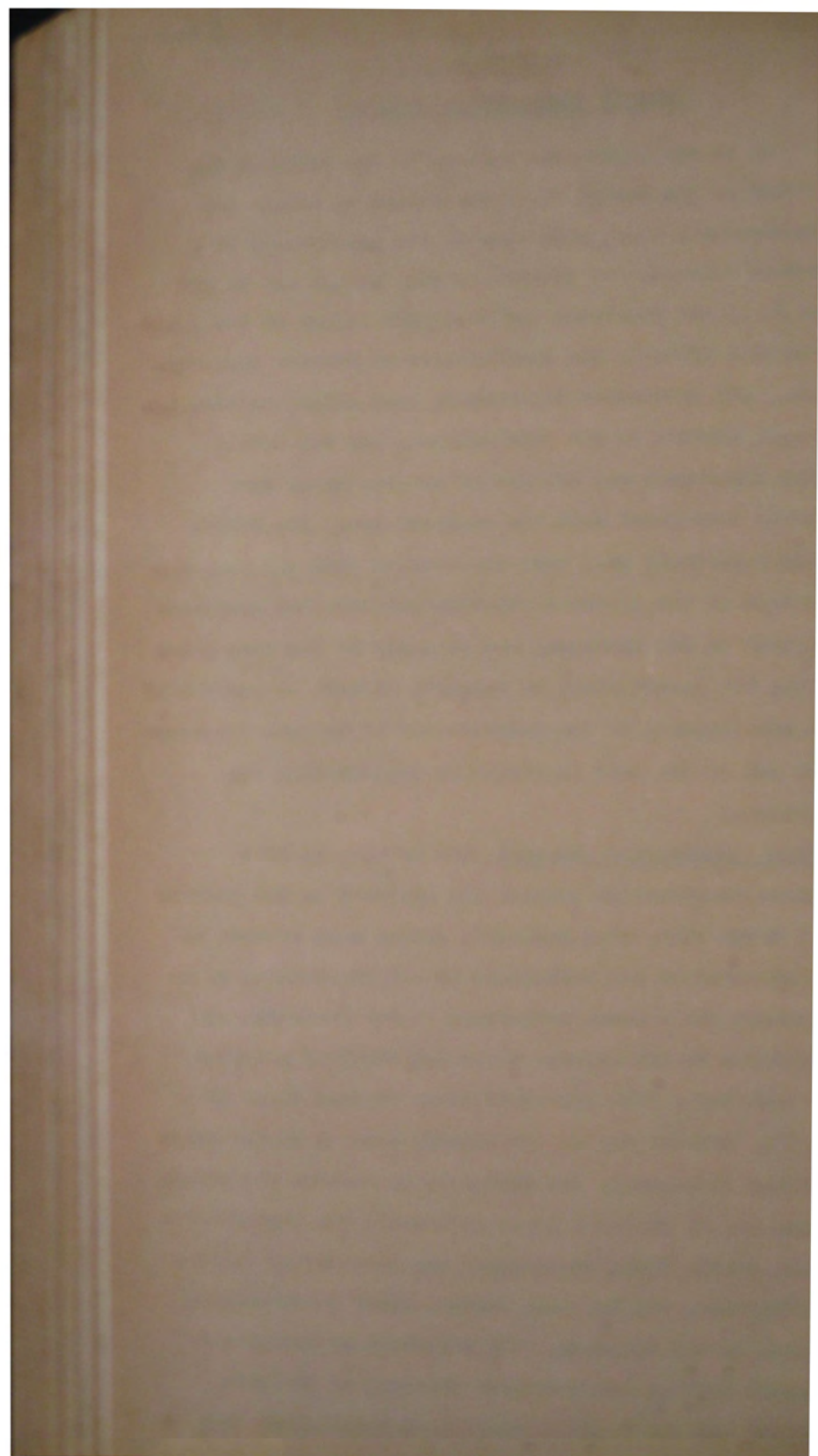
E. R. Mc. KILLOP.
Asst Commissioner of Defence Construction.
(Commissioner of Works Jan. 1945.)



DEFENCE CONSTRUCTION COUNCIL.

It is not within the purview of the Official War History of the Public Works Department to detail the circumstances which gave rise to the appointment of a Defence Construction Council in New Zealand nor to set out fully the functions and responsibilities of its chief executive officer, the Commissioner of Defence Construction. All Government Departments came under the administrative control of the Commissioner, and the Public Works Department was but one of several which were closely associated with his organisation. The Public Works Department was, however, charged with carrying out the bulk of the gigantic war-time construction programme required in the Dominion, and no story of its activities during the period would be complete without an account of its relationship to the Commissioner of Defence Construction and of the part it played in implementing his decisions.

Defence Construction Council. The setting up of a Defence Construction Council was approved by War Cabinet on 6 March 1942. The Council's duties were defined as 'to co-ordinate the activities of all Departments so as to secure the maximum efficiency in the execution and completion of all defence works and absolute priority for such works over all activities, whether State or civil'. The members of the Council were to be the Prime Minister (chairman), the Ministers of Defence and Public Works, Mr. J. Fletcher (vice-chairman), the Engineer-in-Chief, Public Works Department, the Director of Housing Construction, and Mr. A.B. Taylor, Chief Investigating Officer of the Treasury. The Ministers of Labour and National Service (or associate Minister of National Service) and the heads of both those Departments were to co-operate with the Council when requested to do so. The



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appointed Commissioner of Defence Construction without salary, travelling expenses to be paid on a basis to be arranged.

Commissioner of Defence Construction. On 11 March 1942 War Cabinet appointed Mr. J. Fletcher as Commissioner of Defence Construction, the relative minute reading as follows:

'1. Mr. James Fletcher to hold office as Commissioner of Defence Construction during the pleasure of the Prime Minister, and to act in accordance with all directions, general or special, given to him by the Prime Minister.

2. The general functions of the Commissioner shall be to organise and promote the undertaking of all defence works according to the importance thereof in the interests of defence, and for that purpose to determine the order of urgency thereof, and to ensure the supply of materials, plant and labour for the prosecution of defence works according to the order of urgency laid down from time to time by the Commissioner.

3. For the purpose of exercising his functions, the Commissioner may give such directions as he thinks fit to any officers of the Public Service in relation to the exercise of any powers possessed by them, whether under any Act or regulations or otherwise, including any powers that may be delegated to them by any Minister or other Authority.

4. In particular, the Commissioner may direct:-

- (a) That any constructional work (whether commenced by the Crown, any local authority or public body, or any other person) shall be stopped.
- (b) That contracts for any defence works shall be let on such basis and on such terms as he thinks fit.
- (c) That such labour and materials and plant as he thinks fit shall be made available for any defence works at such places and times as he thinks fit.

5. Subject only to any special direction to the contrary by the Prime Minister, it shall be the duty of all officers to carry out all such directions of the Commissioner, and their respective Ministers (where necessary) will authorise and direct them to do so, notwithstanding any previous decision or instruction to the contrary given by the Government or any other authority.'

Copies of both minutes reached the Public Works Department through the Minister of Public Works on 23
(1)
March 1942.



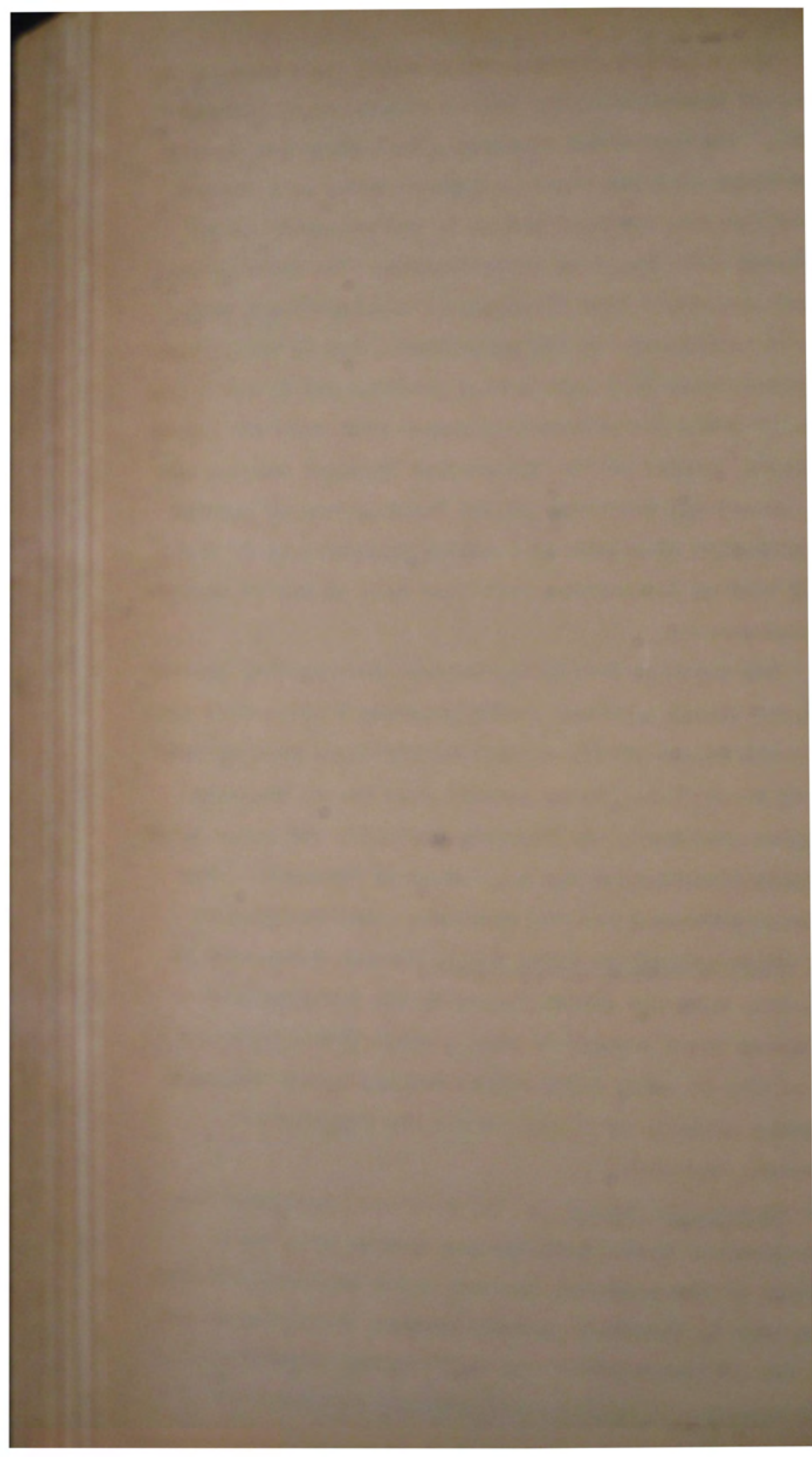
Advice of the Government's decisions was conveyed to District Engineers by the Engineer-in-Chief on 17 March 1942, ⁽¹⁾ his memorandum mentioning that steps had already been taken to place wages on defence works on a uniform basis and that instructions as to the procedure to be followed would be given in due course. The Engineer-in-Chief concluded: 'The functions of the Department will not be altered by the new arrangement, but it will place the Department in a much better position for securing men and materials for prosecuting urgent work with the utmost effort'. Copies of the War Cabinet approval setting out the powers and functions of the Commissioner of Defence Construction were sent to District Engineers on 27 March 1942 with an instruction that they were to act in accordance therewith.

The problems facing the Defence Construction Council and the manner in which it was proposed to deal with them were epitomised in the minutes of the first meeting held on 12 March 1942. Those present were Mr. J. Fletcher (deputy chairman), the Engineer-in-Chief, the Director of Housing Construction and Mr. Taylor of Treasury. The matters discussed and the decisions taken included -

(1) Non-essential Building Works, whether Government or private, were (by notice issued by the Building Controller) to be brought to such a stage that they could be closed at seven days' notice and the labour employed thereon transferred elsewhere (by the Director of National Service).

(2) Register of Tradesmen. The Building Controller and the Director of National Service were to call for a return of all employees engaged in the building industry, and then to compile a register showing the number of men in the different trades and their present location.

(3) Register of Building Contractors. A register of



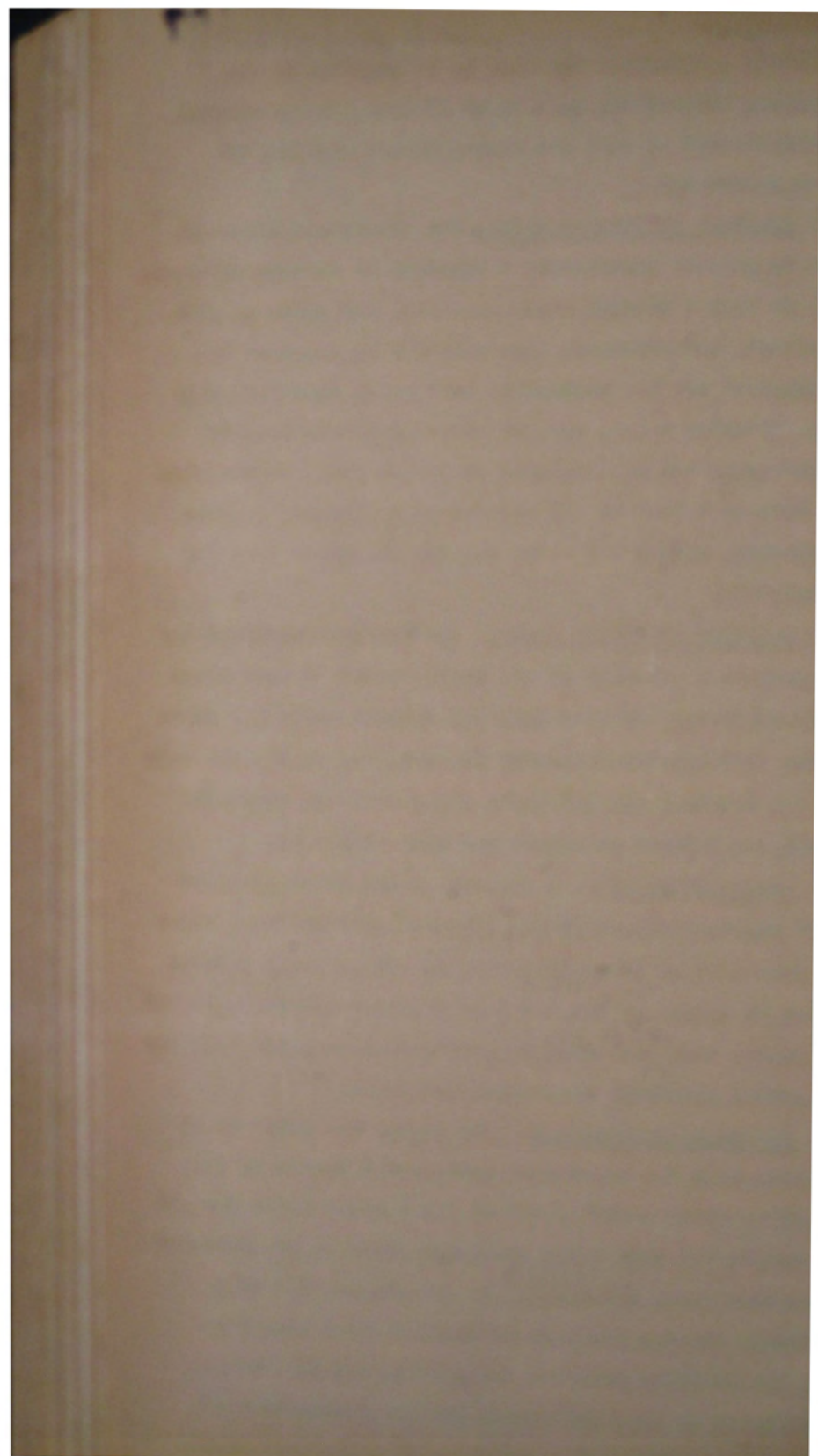
building contractors was also to be compiled by the Building Controller, such to be divided into provincial districts and to show the number of men employed by each contractor.

(4) Schedule of Defence Works. The Government Architect was to prepare immediately a schedule of defence contracts (a) in hand - showing name, location, and value of each contract, and estimated time required to complete (b) authorised but not commenced, indicating where possible the estimated value, and (c) proposed by the Service Departments but not included in (a) or (b). He was also to furnish a list of all current public works building contracts, giving the value and the estimated time for completion.

(5) Schedule of Public Works. The Engineer-in-Chief was to prepare a schedule of all public works in hand other than buildings, divided into (a) defence works (b) works other than defence necessary for carrying on the services of the country, and (c) works which could be suspended until the defence programme had been completed.

(6) Order of Priority. A conference was to be arranged with representatives of the Service Departments in order to arrive at an order of priority. Steps would then be taken to adhere to the order of priority decided upon and to ensure that essential contracts were supplied with the necessary manpower, materials, and plant.

(7) System of Contracting. The deputy chairman was to discuss with the Government Architect a system of contracting which would permit of (a) a fixed price for all contracts (b) work being commenced prior to the contract documents being finalised, (c) the preparation of a schedule showing the cost of materials and labour and the incidence of overhead and profit, and (d) the setting up of an organisation for the preparation of bills of quantities for contracts on a standard basis.



... the Building Controller was to set up an organisation to ensure supplies of building materials being available for essential contracts, including authority to let contracts for the manufacture of any material and to commandeer from stocks held by firms and merchants.

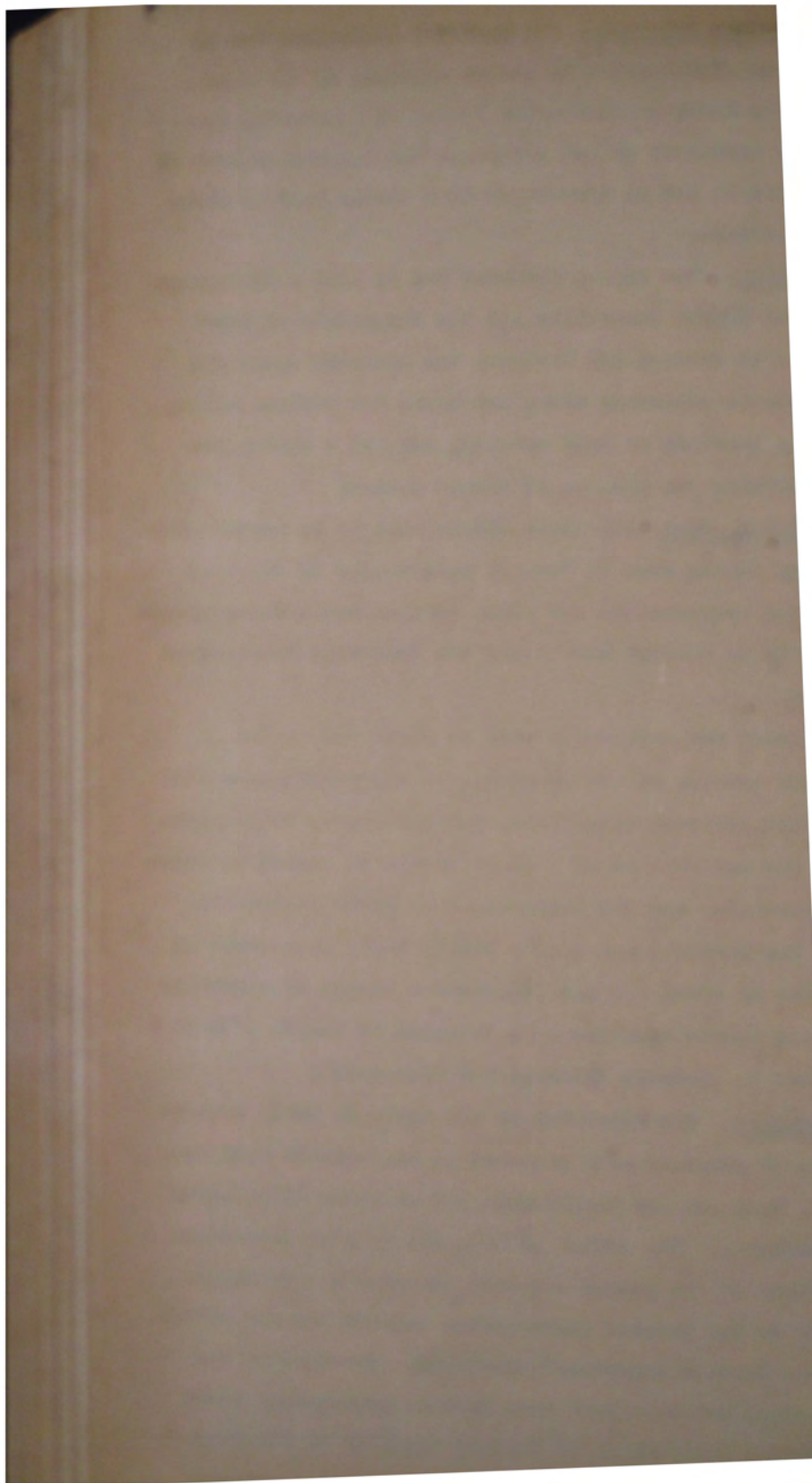
(9) Timber. The deputy chairman was to call a conference with the Timber Controller and the Federation of Sawmillers to discuss (a) bringing the industry under the regulations governing wages and hours for defence works, (b) the question of bulk cutting, and (c) a system for centralising the placing of timber orders.

(10) E.P.S. Work. All local bodies were to be served with notices asking them to furnish particulars of air raid shelters construction and other defence works being undertaken by or through them under the Emergency Precautions Scheme.

Other subjects dealt with or discussed at the initial meeting of the Council were the establishment of district advisory committees, the setting up of inspectors, the institution of a chart system to record progress on contracts, and the preparation of Press statements.

The action taken by the Public Works Department in respect of items (7) and (9) above - system of contracting and timber supplies - is detailed at length in Part 1 Chapter 7, 'Defence Construction Contracts'.

Priorities. The schedules of all works in hand, authorised, or proposed were prepared in conjunction with the Army, Navy and Air Departments and an order of priority established. The effect of this was to give precedence to works of the utmost national importance - as determined by the Defence Construction Council and not merely by the Service Department concerned. Previously, the procedure had been that each Service Department, after obtaining Ministerial or Cabinet approval to its proposals, requested the Public Works Department to commence

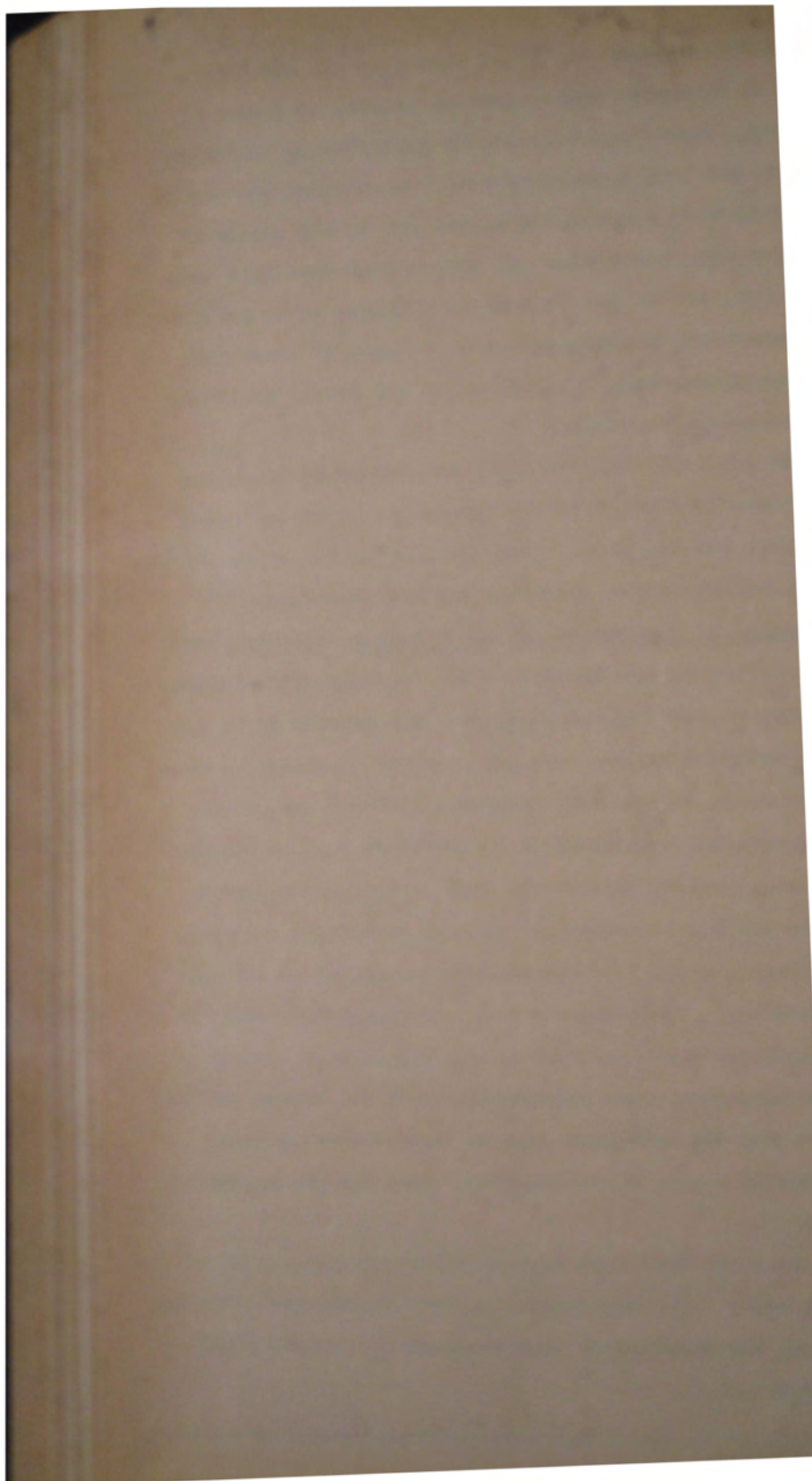


construction forthwith, since naturally all defence works at that time were urgent to greater or lesser degrees. There was, however, no authority to indicate, say, to the Army Department that a particular project it wished to have proceeded with was not at the moment of such pressing importance as, say, a Navy work also contemplated, and in the absence of a ruling as to priority the Department would have had to attempt to carry out both simultaneously, regardless of the plant, manpower, and materials available.

On 15 April 1942 the Commissioner of Defence Construction distributed to the Organisation for National Security, and the Army, Navy, Air and Public Works Departments, copies of the approved priority schedule.

Suspension of Non-Essential Public Works. In the meantime, following the receipt of the Department's schedule of works in hand, classified into (a) defence works (b) other essential works, and (c) works which could be suspended until the defence programme had been completed, the Commissioner of Defence Construction instructed the Engineer-in-Chief on 2 April 1942⁽¹⁾ to arrange immediately for the diversion of efforts from works included in classification (c) towards those included in classification (a), 'wherever this is practicable'. The Commissioner added that as he was desirous of having field defensive works constructed with the utmost expedition, men and materials were to be diverted to these classes of works, where required, from the non-essential works.

District Engineers were notified accordingly on 15 April 1942,⁽²⁾ the Engineer-in-Chief's memorandum advising them of the works which were regarded as falling within category (c).



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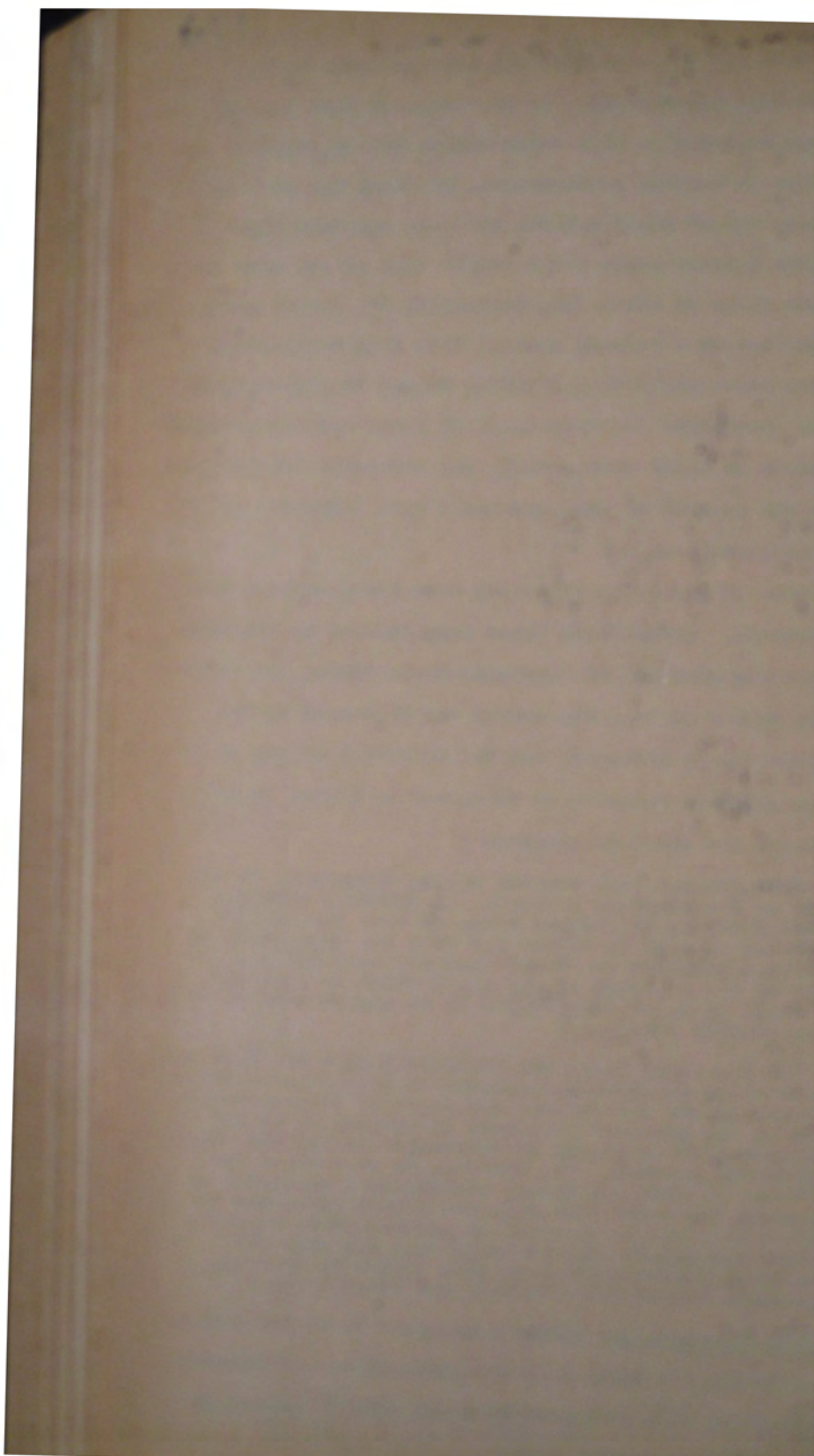
This did not mean that all non-essential works closed down immediately. It was realised that some of the men employed on them might not be fit or suitable for transfer to defence construction, and that the services of these and of other men who were not required right away for defence works would enable some of the more important works in class (c), especially the larger ones, to continue on a reduced scale. With this realisation and the reservation that District Engineers could report on any particular features which in their opinion rendered it unwise to close down a work, all non-essential projects under the control of the Department were suspended or heavily curtailed.

Some of the works suspended were being carried out by contract. Later, when these were resumed by the contractor the question of increased costs during the intervening period arose. The matter was discussed by the Department with Treasury, and the following ruling given to the District Engineer at Whangarei on 4 June 1943⁽¹⁾ indicates the attitude adopted:

'The general view adopted by the Department in the case of a contractor resuming his Treasury contract after a period on defence works is that the initial contract is open to review and that the Department is not in a position to insist that the contractor shall take up his contract at the point where he left off. It would be quite inequitable to so insist even if it were legally sound.

'On the other hand, the Department does not wish unnecessarily to re-open arrangements which may be satisfactory to the contractor, and where he is prepared to pick up his contract and carry it through it is not proposed that he should be encouraged to ask for some additional payment. If, however, he does raise the question of some additional payment as a condition of resuming the work, then will you please endeavour to settle with him as speedily as possible what would be a fair additional payment to be made and make the necessary recommendation to this office so that any necessary additional authority can be obtained.'

Working Organisation. What he referred to as the working organisation was defined by the Commissioner of Defence Construction in a letter of 23 March 1942⁽²⁾ addressed



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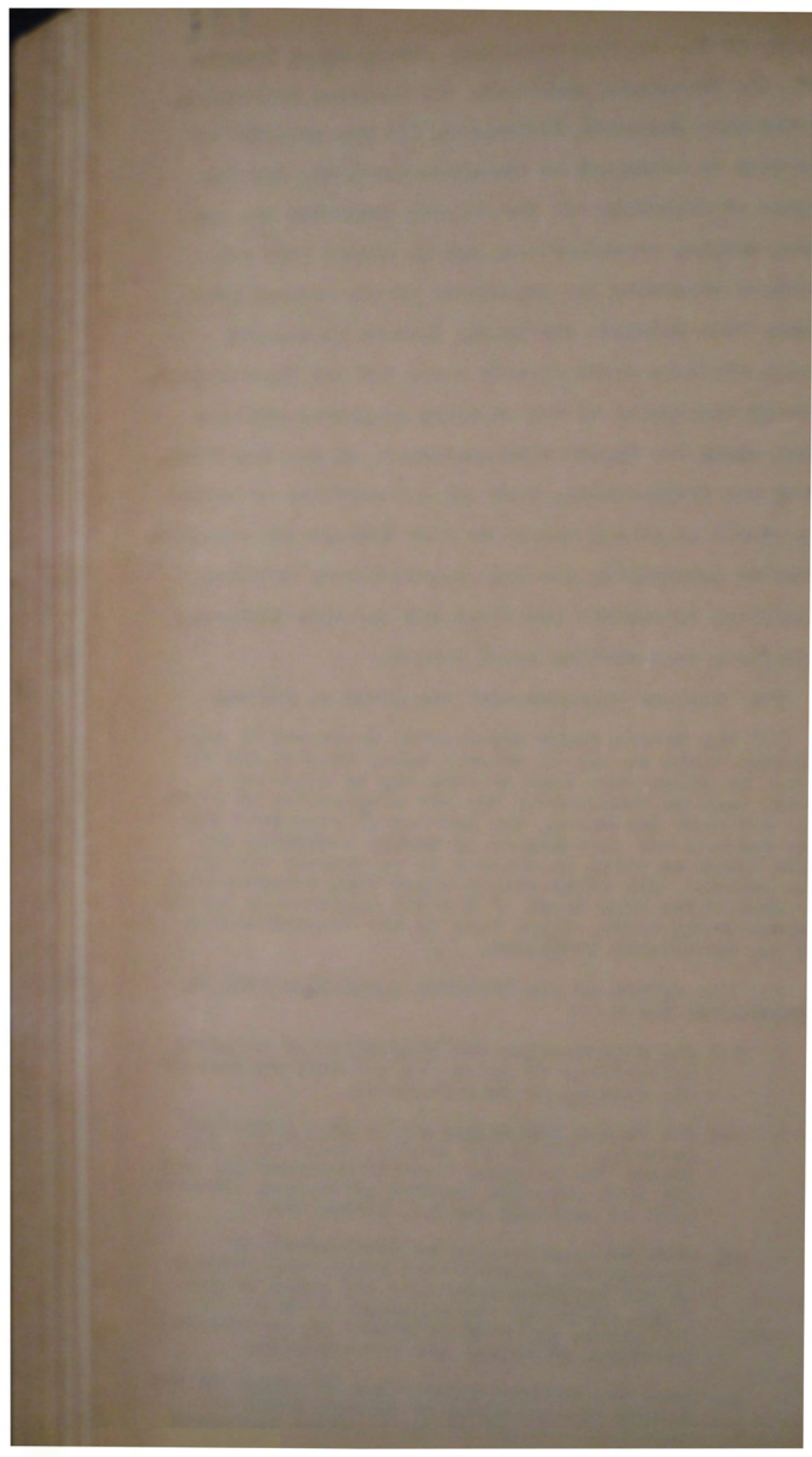
jointly to the Engineer-in-Chief, Public Works Department, the Government Architect, the Building Controller, and the City Engineer, Wellington. It was proposed at this time to establish an executive committee for the purpose of utilising 'to the fullest advantage the existing working organisations, and to ensure that all decisions affecting the expedition of the defence programme, both military and civil, will be prosecuted through channels which already exist and are functioning'. To avoid disruption of the existing programme and confusion among the Departments concerned, it was essential, stated the Commissioner, that all instructions emanating as a result of policy should be made through the executive committee (comprising the Engineer-in-Chief, Building Controller, Government Architect and the City Engineer, Wellington, representing local bodies).

The 'working organisation' was given as follows:

'(1) The Public Works Department, in regard to such defence works as are at present being carried out by them, or which from time to time may be allotted to them, will be responsible for the preparation of plans and contract documents, the letting of contracts and the payment and supervision of works, including all such works as shall be decided to be carried out by day labour. The works coming under this category will be subdivided into those of a civil engineering nature and building works, which will be the responsibility of the Government Architect.

(2) The office of the Building Controller will be responsible for:-

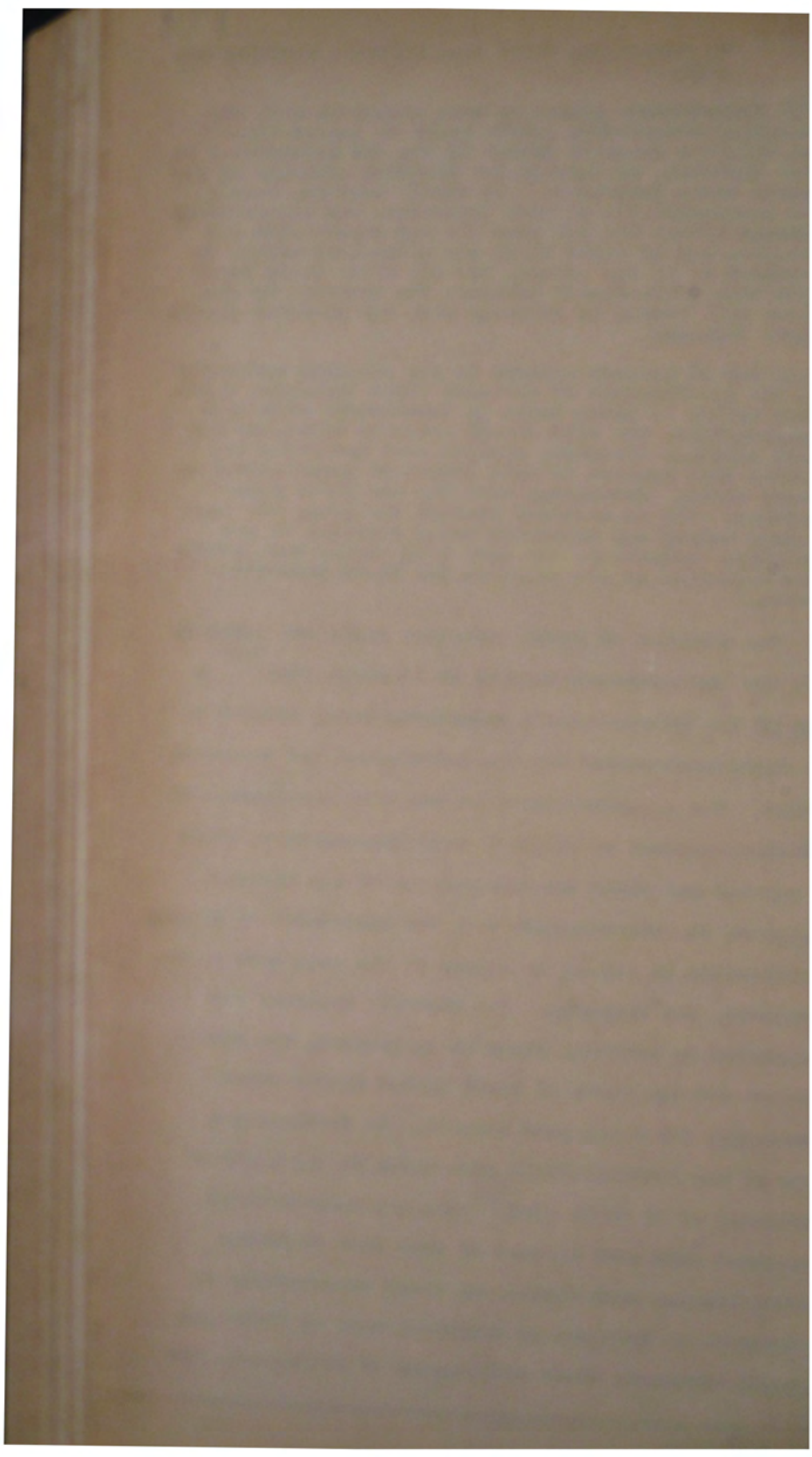
- (a) The organisation and allocation of manpower efficiently to prosecute the construction of all classes of defence works.
- (b) The design and organisation of a system of records, charts and graphs, which will indicate the progress of each undertaking, and all such relevant factors pertaining thereto such as material supply, labour etc.
- (c) That an organisation be established to arrange and maintain the supply and control of all building materials and plant generally, involving the register of materials and plant, in order to ensure an up-to-date knowledge of supply and availability.
- (d) That the various authorities in charge of the design of each class of defence works be regularly advised of the position in regard



(3) Instructions governing work connected with the Emergency Precautions Scheme shall be issued through the existing channels direct to the EPS Authorities in each District, or through the district officers of the Public Works Department. It shall, however, remain the responsibility of each individual EPS Authority to arrange within its own area for the supervision and carrying out of works which are authorised either by contract or by day labour. For all works which carry with them a Government subsidy, the approval of all plans will remain as formerly with the District Public Works Engineer.

(4) Not at present covered by any existing authority is the construction of military field defensive works. This matter is being taken up immediately with Army Headquarters, who will supply priority schedules for each military district, stating what materials and labour they require to make immediate commencement on these works. Camouflage work for the three armed services will be arranged through the Army, the necessary labour and materials being supplied by the Building Controller, who also will supply such labour and materials as are required for field defensive works.'

The question of field defensive works was taken up with the Quartermaster-General on 23 March 1942, ⁽¹⁾ a copy of the Commissioner's memorandum being minuted to the Engineer-in-Chief for his information and necessary action. The procedure approved was that such works, as and when required by district Army Headquarters, would be carried out under the supervision of the District Engineer, in collaboration with the Department of Housing Construction in regard to supply of the requisite plant, materials, and manpower. The District Engineer was authorised to utilise, where he so desired, the organisation and equipment of local bodies within whose boundaries the works were located. In forwarding a copy of the Commissioner's memorandum to all District ⁽²⁾ Engineers on 26 March 1942, the Engineer-in-Chief mentioned that some classes of work such as bridge strengthening, road blocks etc could conveniently be undertaken by boroughs or counties, many of which had already expressed their willingness to co-operate. The



cost of work done by local bodies would, of course, be met by the Government.

Procedure approved by War Cabinet. The Secretary to the Treasury forwarded to the Permanent Head, Public Works Department, and to the Heads of the Service Departments (1) on 9 June 1942 a copy of a minute approved in War Cabinet on 1 June 1942, setting out the procedure to be adopted in regard to defence works. This read as follows:

'Major Works:

(1) The Armed Services through the Minister of Defence will submit to War Cabinet full particulars and an approximate estimate of the cost of all new major defence construction works contemplated, including acquisition of sites. War Cabinet approval, if given, is to be an indication that the Service concerned may then submit the project to the Commissioner of Defence Construction to carry out the work after full examination of ways and means. If any doubt exists as to what projects are to be submitted to War Cabinet, the matter could be referred to Minister of Defence for decision.

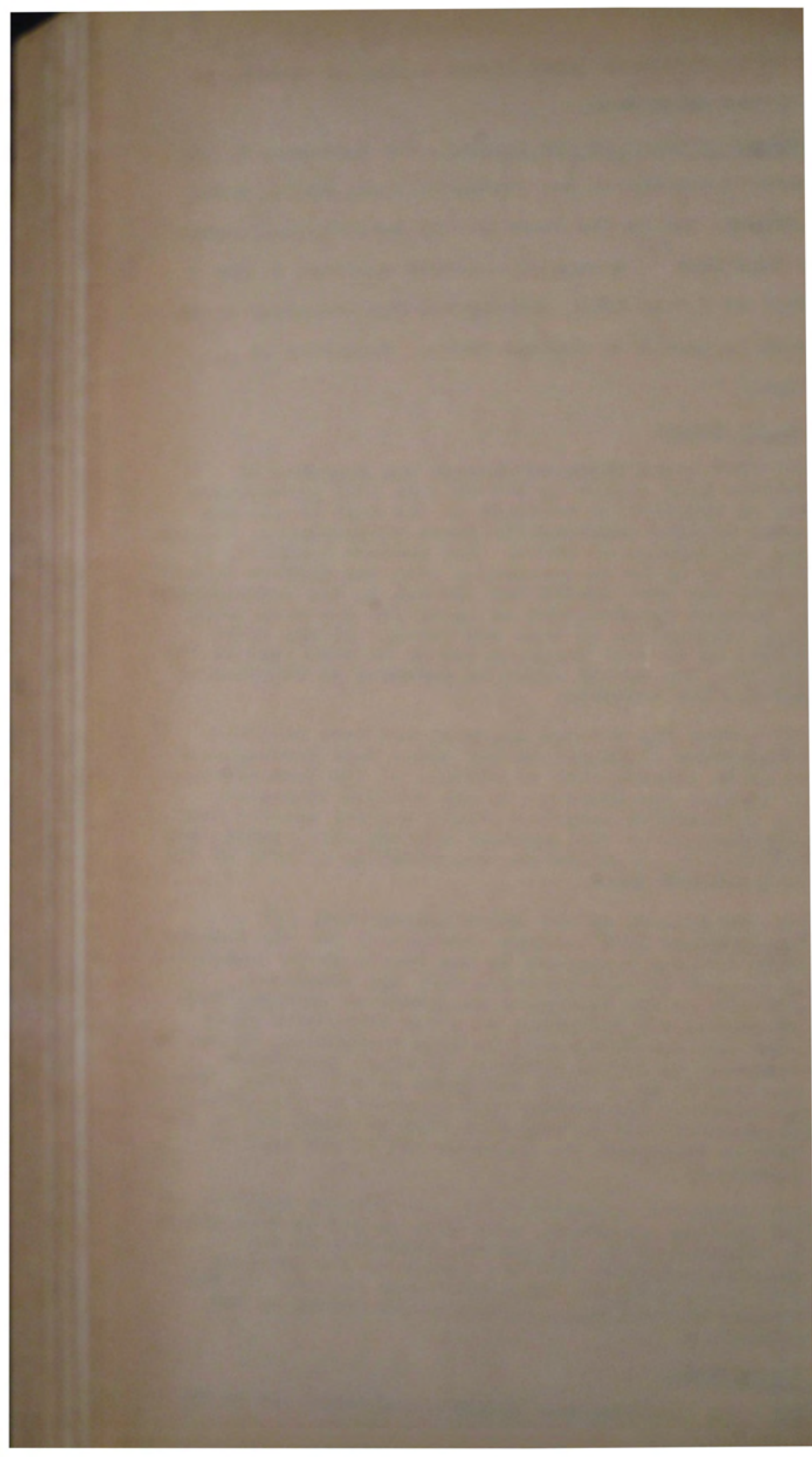
(2) After War Cabinet approval has been obtained, information in regard to any major work contemplated is to be communicated in writing to the Commissioner of Defence Construction by the Service concerned. The information supplied should outline briefly the requirements of the service, stating also, where such information is available, the locality or site of the contemplated work.

(3) On receipt of the above information, the Commissioner will arrange immediately for the responsible officer concerned in the Public Works Department to prepare in collaboration with the technical officers of the Service a programme of construction, scheduling out buildings or other structures where these are involved, and, in this connection, it may be necessary to employ officers of other Government Departments or private engineers or architects. The Construction Programme, duly approved by the Defence Construction Committee, will then be submitted to the Service concerned for approval before the work is commenced.

(4) When the proposals have been finally approved by the Service concerned, work will be put in hand either by contract or by day labour, according to the priority allotted, but the amount of the contract must not exceed the sum tentatively approved by War Cabinet without again referring the matter to War Cabinet.

Minor Works:

(5) All minor defence construction works are to be



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referred by the Service concerned to the Commissioner of Defence Construction for instructions regarding preparation of plans, etc., but contracts are not to be let until the proposals have been submitted to the Minister of Defence (a) for approval of works up to £500 (b) for approval jointly with Minister of Finance of works over £500, but not exceeding £2,500 and (c) for approval by War Cabinet of works estimated to cost over £2,500.

Schedule of Contracts let:

(6) The Public Works Department will prepare each week schedules of all Defence contracts entered into during that week and will forward these schedules to the Minister of Public Works for reference to the Minister of Defence. In accordance with the usual procedure, the Minister of Defence may approve works up to £500 and jointly with the Minister of Finance up to £2,500. The schedule of works costing over £2,500 would be taken to War Cabinet by the Minister of Defence.

Alterations:

(7) Once the proposals have been approved by the Service concerned, no major alterations will be permitted without direct reference to the Commissioner.

(8) Alterations in constructional details can be approved on application in writing to the following officers (a) for all building work, Mr. R.A. Patterson, Government Architect, (b) Civil engineering work, Air Department, Mr. T.M. Ball, Assistant Engineer-in-Chief (c) for Civil engineering work Army and Navy, Mr. H.H. Sharp, Inspecting Engineer.

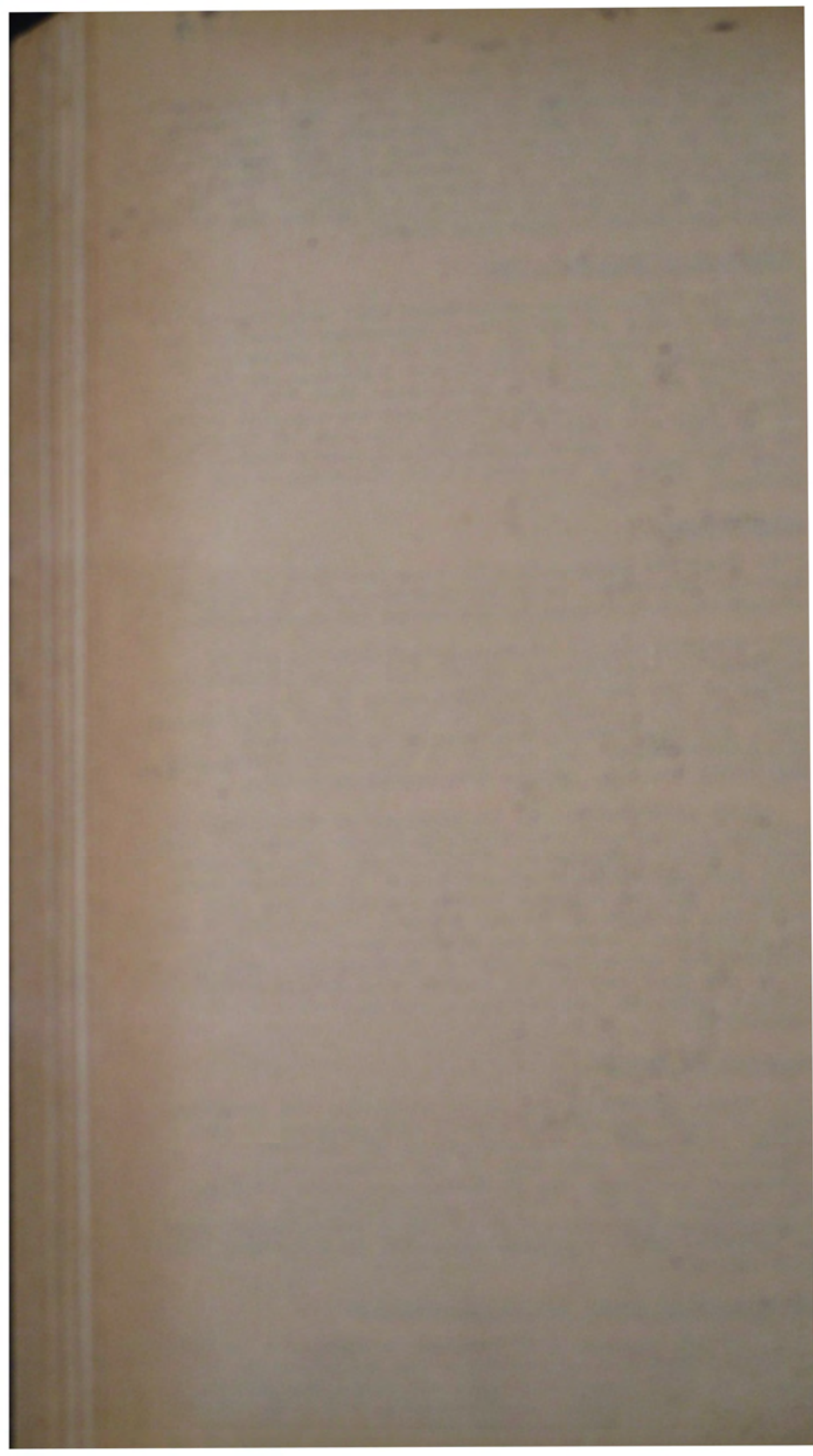
Minor alterations may be arranged on the ground between a responsible officer of the Services and the Public Works Engineer in charge of the job, provided that such alterations do not exceed in value the sum of £250, but the request for such alterations must be confirmed in writing by the Service representative to the Engineer. Information also in writing of such alterations agreed upon will be transmitted immediately by the Engineer to the Controlling Public Works Officer affected (one of the three mentioned in the foregoing).

Stoppage of Works:

(9) Where circumstances arise rendering the prosecution of works previously agreed upon tactically unsound, such work may be stopped by the Service affected without reference to the Commissioner. A statement outlining the circumstances necessitating the stoppage of work will be supplied to the Commissioner from the Chief of Staff concerned as soon as possible after any such direction by a Service has been taken.

Where Service needs cannot be provided:

(10) If the Committee of Defence Construction is not satisfied that the requirements are essential or is unable to find economical ways and means for satisfying approved Service requirements, they will consult the Service or services concerned, and if agreement cannot then be reached, the matter will be referred to the Treasury for investigation. If an amicable settlement



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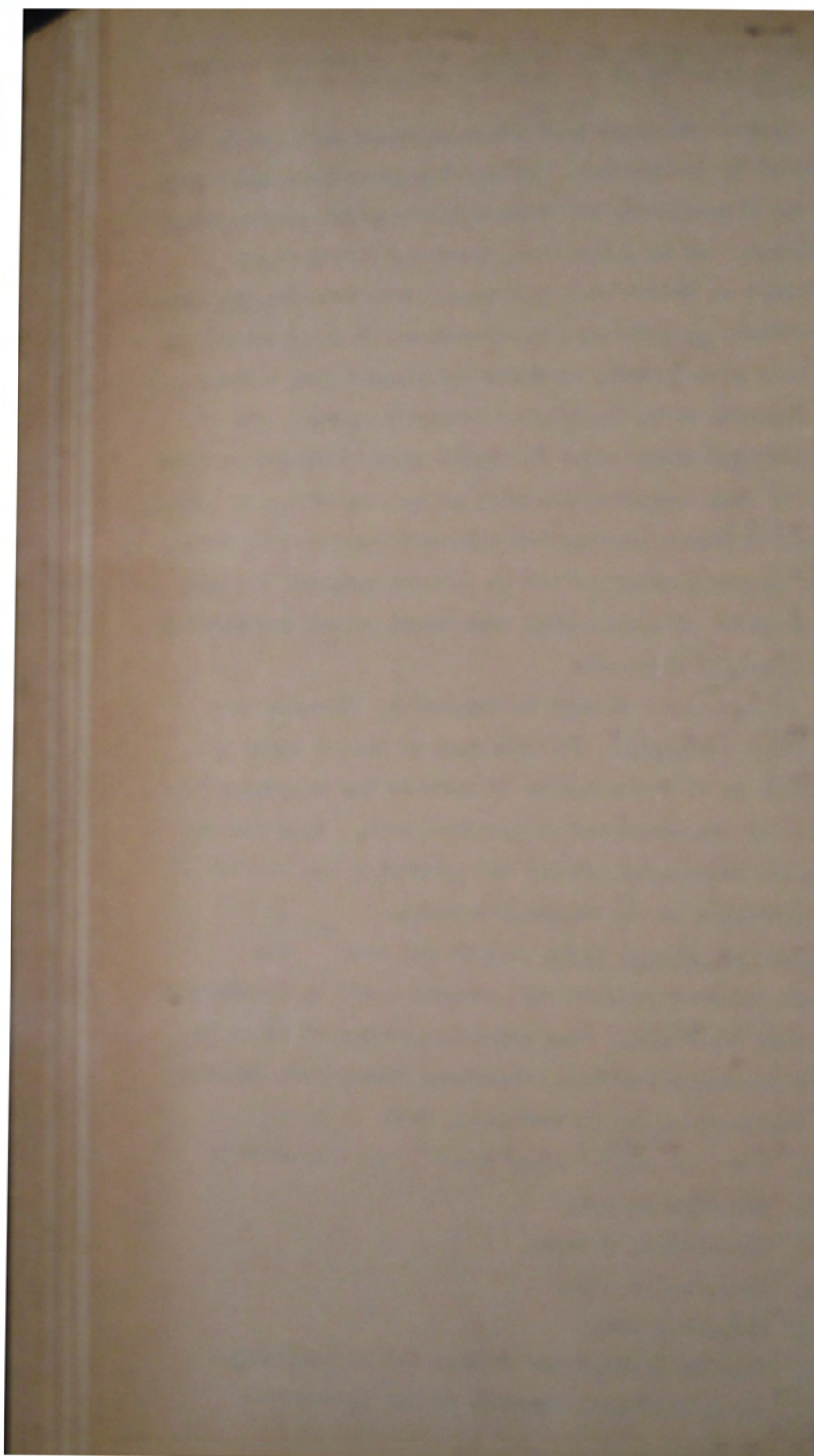
cannot be decided on, Treasury will submit the problem to the Minister of Finance for decision by War Cabinet.'

It will be noted that every proposed work had to be approved by War Cabinet, the Service Department concerned, and the Commissioner of Defence Construction before being commenced. As in peace-time, however, it was found difficult to ensure that all expenditure had firstly been authorised, mainly owing to estimates (on which authority had been given) being exceeded and works being altered and extended while in course of construction. The Commissioner endeavoured to remedy this by obtaining from time to time complete schedules of defence works in hand or contemplated, showing the financial position in each case, and thus enabling him to take up with War Cabinet the question of authorising such works as had not already been formally approved.

As mentioned in Part 1, Chapter 7, 'Defence Construction Contracts', the Minister of Public Works did not pass on to the Minister of Defence the schedules of contracts let submitted to him each week. This was not of great importance and did not prejudice the success of the procedure in any material respect.

(1)
Register of Defence Works. On 29 May 1942 the Commissioner of Defence Construction wrote to the Permanent Head instructing that immediate action be taken to start keeping a register of defence works, both building and engineering, in the following form:

1. Priority number (from schedule of allocation).
2. Priority granted.
3. Description of work.
4. Location of work.
5. Estimated cost.
6. Whether carried out by contract or day labour.
7. If by contract, the name of the contractor.



8. Date of commencement.

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9. Anticipated date of completion.

Summary of Departmental Activities. As stated above, the Public Works Department was only one of many Departments concerned in the defence construction organisation coming under the centralised control of the Commissioner of Defence Construction, its activities - important as they were - being limited to:

(a) Collaborating with the Service Departments in preparing for the Commissioner schedules of defence works required, and assisting in determining orders of priority.

(b) Suspending non-essential public works.

(c) Implementing the master schedule system of contracting (as described in Part 1 Chapter 7).

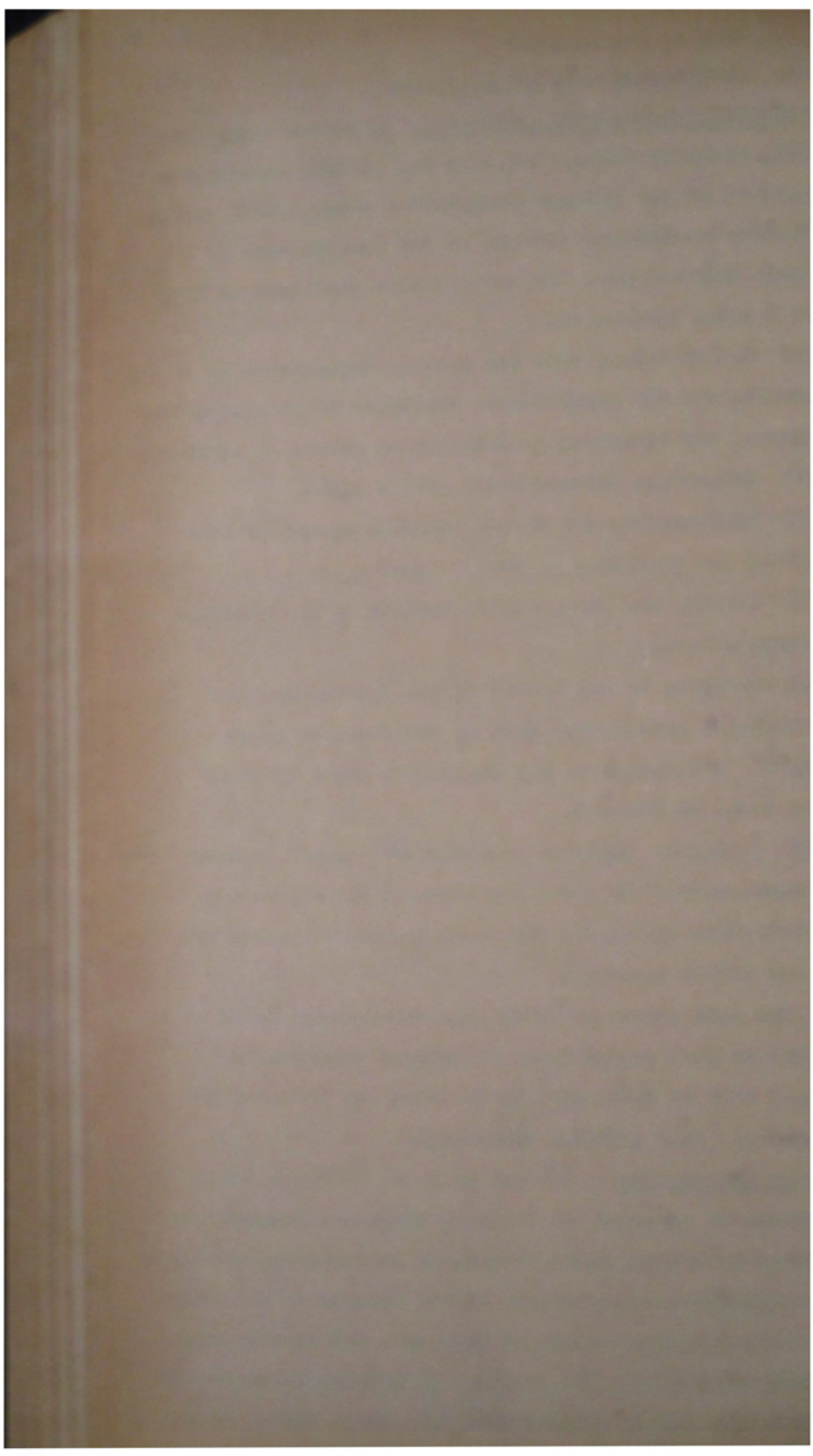
(d) Keeping the Commissioner advised of the progress of defence works.

(e) Bringing to the notice of the Commissioner difficulties encountered such as shortages of plant, material, and manpower, and suggesting means by which these could be overcome.

(f) Acting as required in a liaison capacity between the Commissioner and other Departments and organisations participating in the defence construction programme and the war effort generally.

The part played by other Departments associated to a greater or less degree with the Defence Construction Council will no doubt be told in their own Official War Histories. Very briefly, these were:

Housing Construction: Control over all building construction in terms of the Building Emergency Regulations 1939 and Amendments and particularly in regard to restricting private and non-essential works; control of buildings materials; pre-fabrication of Army huts and certain other defence buildings. (The Director of Housing Construction, who was also the Building Controller, was a member of the Defence Construction Council).



Treasury: Financial control over all aspects of defence construction, and responsibility for keeping the Minister of Finance fully informed of developments.

(A representative of Treasury, Mr. A.B. Taylor, Chief Investigating Officer, was a member of the Defence Construction Council).

State Forest Service: Controlling supplies of timber, including direct purchase of same for defence construction contracts (see Part 1, Chapter 7).

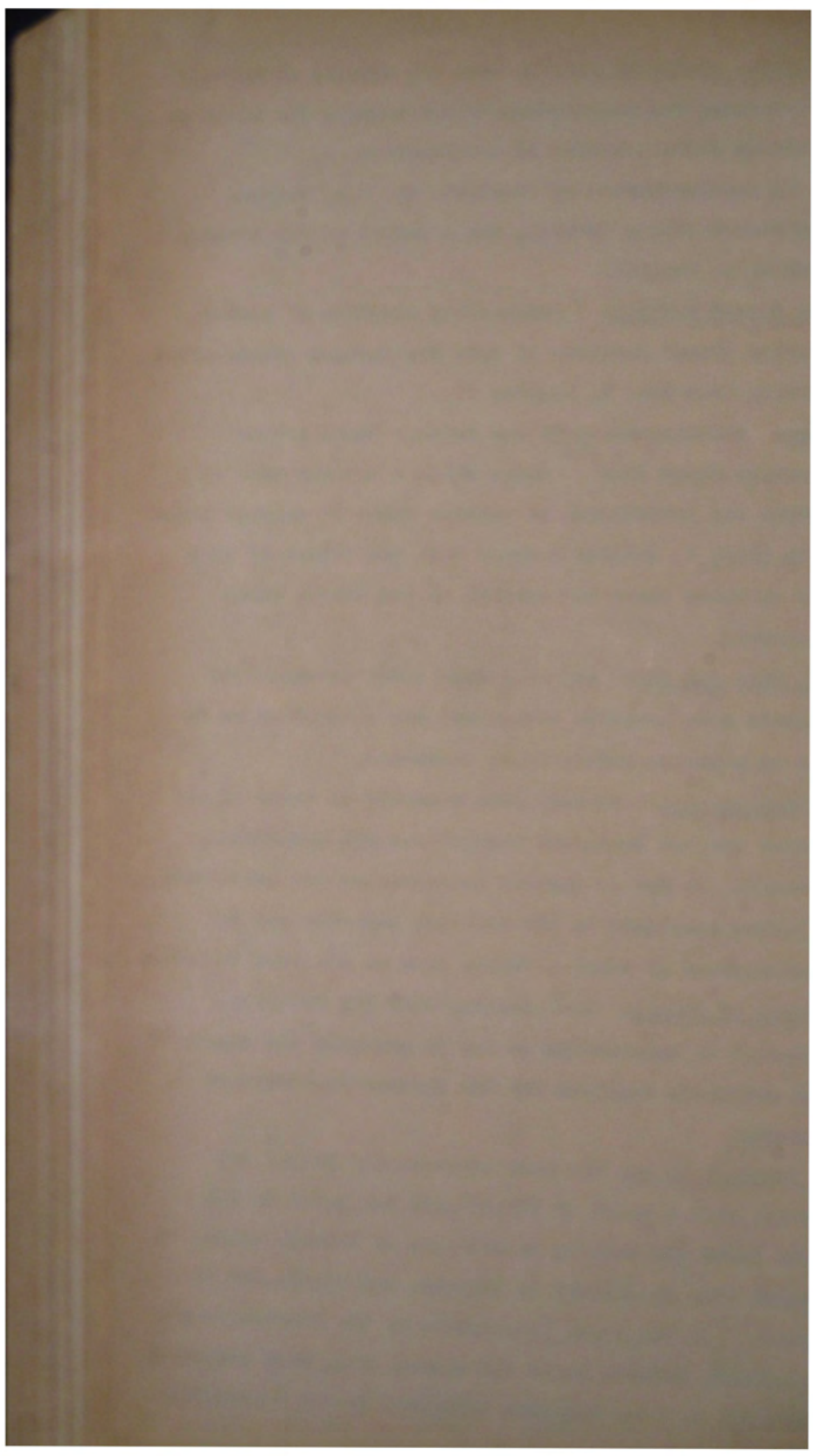
Labour: Administration of the Defence Works Labour Suspension Order 1942⁽¹⁾ under which a six-day week of 54 hours was established on defence works at uniform rates of pay (Part 1, Chapter 8 deals with the effect of this Order on works under the control of the Public Works Department).

Army, Navy and Air: Assuring that their construction proposals were properly authorised and classified as to order of priority before being commenced.

National Service: Control over manpower in terms of the National Service Emergency Regulations and Amendments, especially, so far as defence construction was concerned, the labour available in the building industry and the administration of civil defences such as air raid shelters.

Ministry of Supply: Co-operating with the Building Controller in maintaining so far as possible the supply of vital materials required for the defence construction programme.

The Pressure Eases: The peak construction period was 1942-43, when a total of £17,207,866 was spent by the Public Works and Housing Departments on defence works, as compared with £5,340,505 in 1941-42, and £3,384,158 in 1940-41. In the first five months of the Commissioner's appointment, between March and August 1942, work exceeding £8,000,000 in value had been completed by the Department,



was in hand, or was about to commence. This was made up as follows:

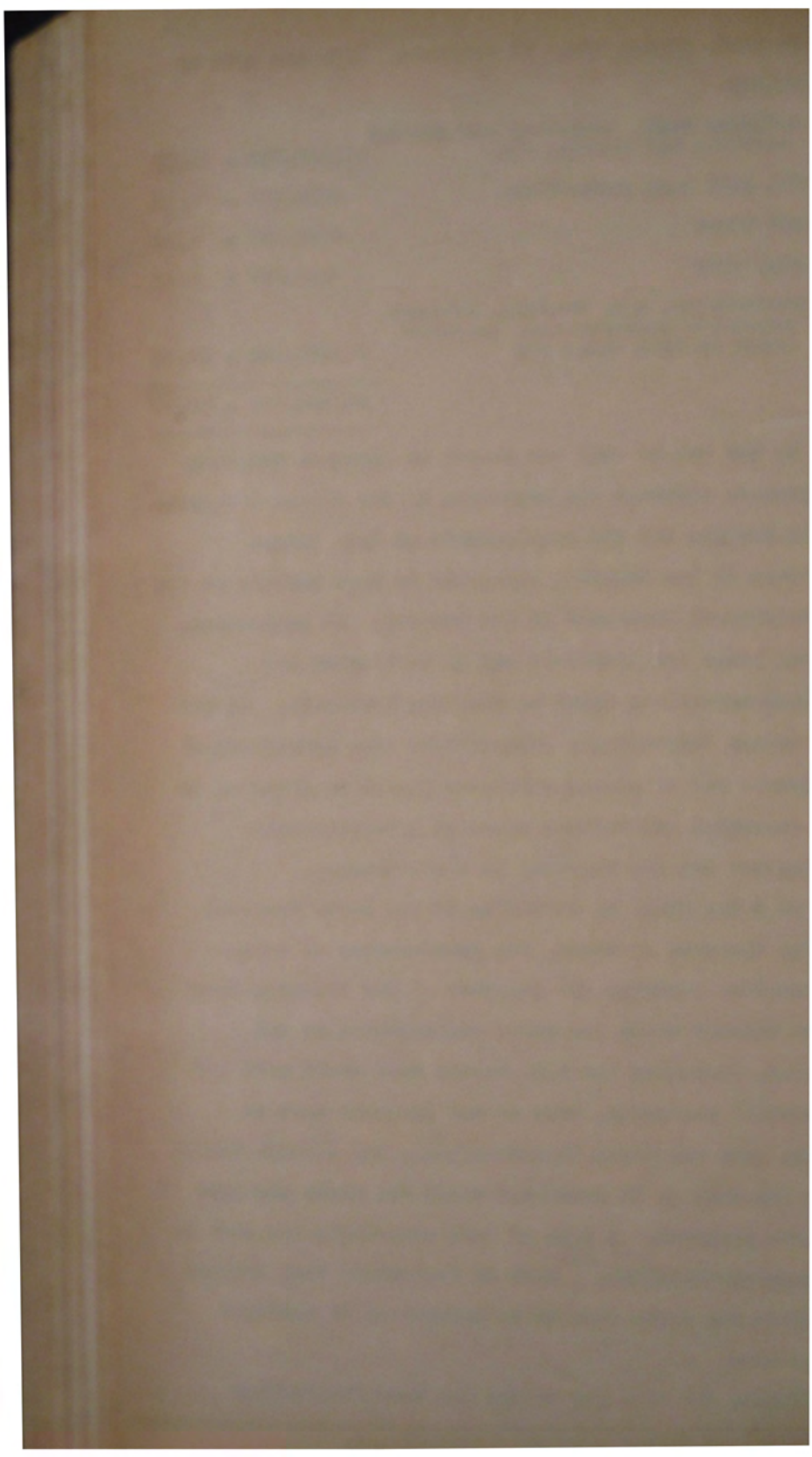
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| (a) Building work, including engineering services and roading etc. | £5,489,250 = 68.5% |
| (b) Oil fuel tank protection | £136,270 = 1.7% |
| (c) ARP works | £124,390 = 1.5% |
| (d) Army huts | £445,000 = 5.8% |
| (e) Engineering, e.g. roading, bridges, aerodrome construction, installation of fuel tanks etc | £1,807,790 = 22.5% |
| | <hr/> |
| | £8,002,700 = 100% ⁽¹⁾ |

By the end of 1942 the danger of Japanese invasion had passed, although the beginning of the Allied offensive in the Pacific and the requirements of U.S. troops stationed in the Dominion continued to draw heavily on the constructional resources of the country. In particular, several large new hospitals had to be erected and military extensions added to existing hospitals. It had also become increasingly evident that some proportion of the labour and materials available should be diverted to such essential non-defence works as hydro-electric development and the erection of State houses.

On 8 May 1943, by direction of the Prime Minister and the Minister of Works, the Commissioner of Defence Construction notified the chairman of the Planning Committee through which the works requirements of all Services, including the U.S. Forces were dealt with (or 'screened') initially, that no new projects such as stores, camp buildings, fortifications, oil storage facilities etc were to be commenced until the whole position had been reviewed. A copy of this memorandum was sent to the Engineer-in-Chief, ⁽²⁾ with an intimation that defence buildings and works were to be restricted to absolute necessities.

During the next few months the need for further

(1) Return of 26 Aug 1942 on 32/9025/3 p.2.



defence works was exhaustively reviewed by the Commissioner, following the submission of schedules of their requirements by the Services, and with the advice and assistance of officers of the Public Works Department. Projects which hitherto had been classed as urgent were deferred or cancelled altogether in the light of the improved war situation, the labour and materials thereby saved being diverted more and more to important civil public works which had perforce been closed down a year or two earlier or drastically curtailed.

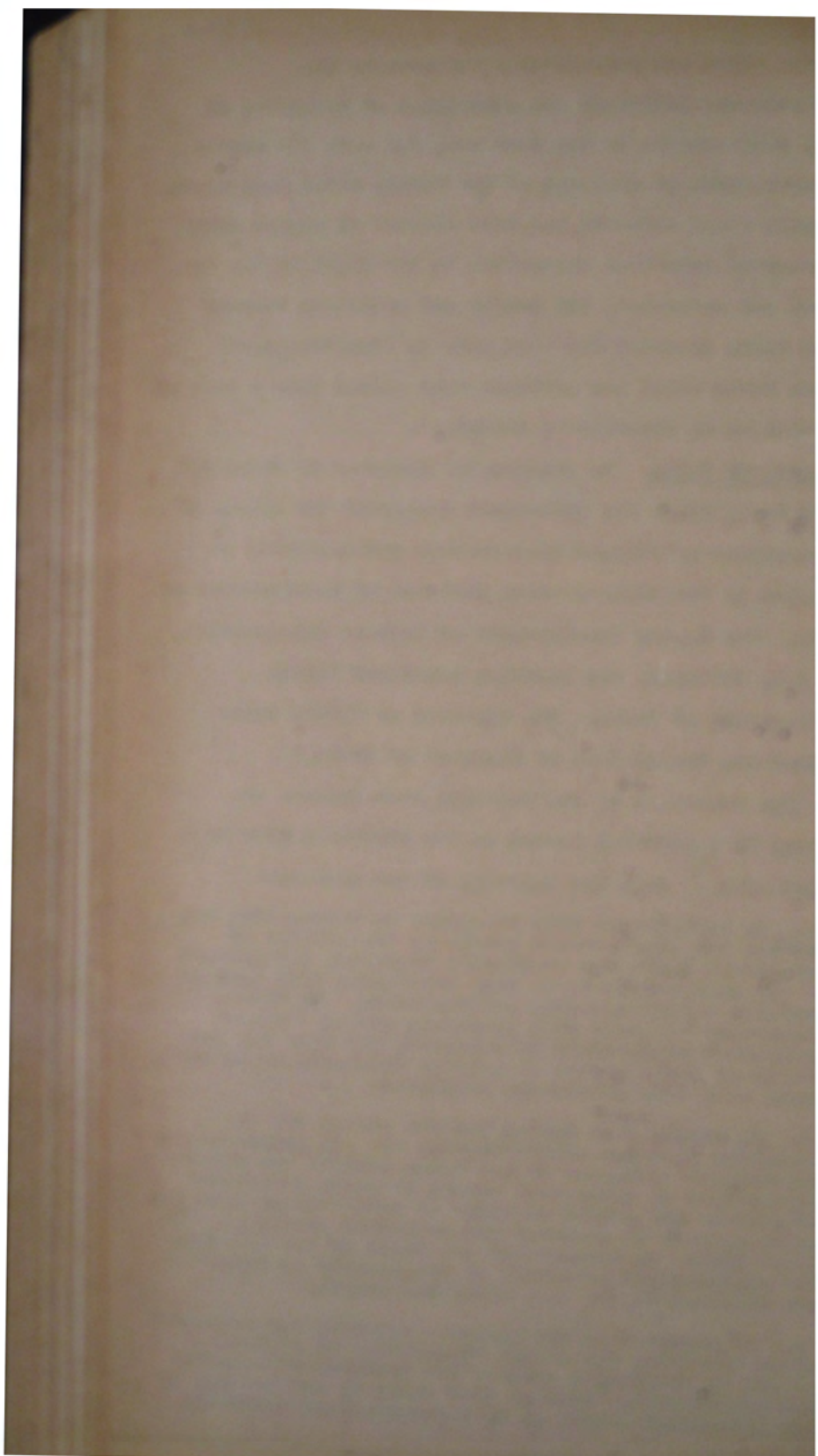
Ministry of Works. By passing the Ministry of Works Act on 16 March 1943, the Government abolished the office of Commissioner of Defence Construction and appointed Mr. Fletcher to the newly-created position of Commissioner of Works. The Deputy Commissioner of Defence Construction, Mr. E.R. McKillop, was likewise appointed Deputy Commissioner of Works. The Minister of Public Works assumed the designation of Minister of Works.

The functions of the Ministry were defined as follows in a circular issued by the Permanent Head on 4 August 1943⁽¹⁾ with the approval of the Minister:

1. In association with Treasury, to ensure that all schemes for construction involving expenditure of Government funds are thoroughly examined, independent of the source from which they originate, both from an economic and a technical point-of-view. In this connection not only will proposals coming through Government Departments be examined, but also the proposals of local bodies or private interests where such carry with them Government subsidies.

2. To ensure that during the war period and the immediate post-war rehabilitation era all proposals for construction (whether or not these involve the direct expenditure of Government moneys or carry Government subsidies) are ranked in order of essentiality from the point-of-view of manpower and materials available. In other words, to ensure that the whole of the building and construction potential of the country is assembled and utilised in the most efficient manner.

3. To ensure that the projects approved for consideration involving the direct expenditure of Government moneys or Government subsidy are executed efficiently and economically, whether such works be carried out by the Government itself or by the subsidised authority.

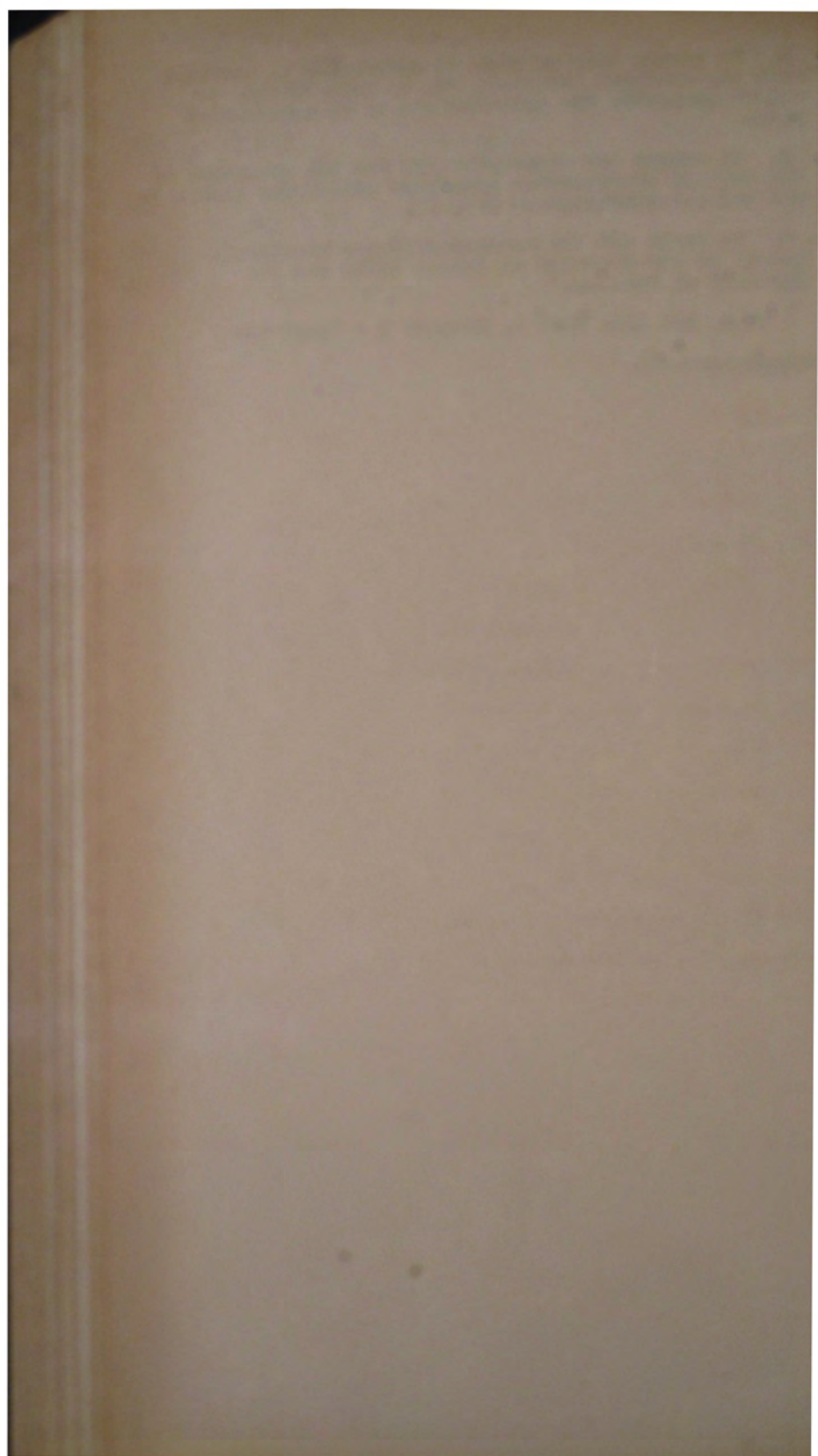


4. To ensure that no work is undertaken in conflict with the national interest, or, in other words, to relate proposals for construction to an established plan.

5. To assume the responsibility for the execution of the defence construction programme previously vested in the Defence Construction Council.

6. To carry out the responsibilities previously vested in the Ministry of Public Works and the Ministry of Housing.'

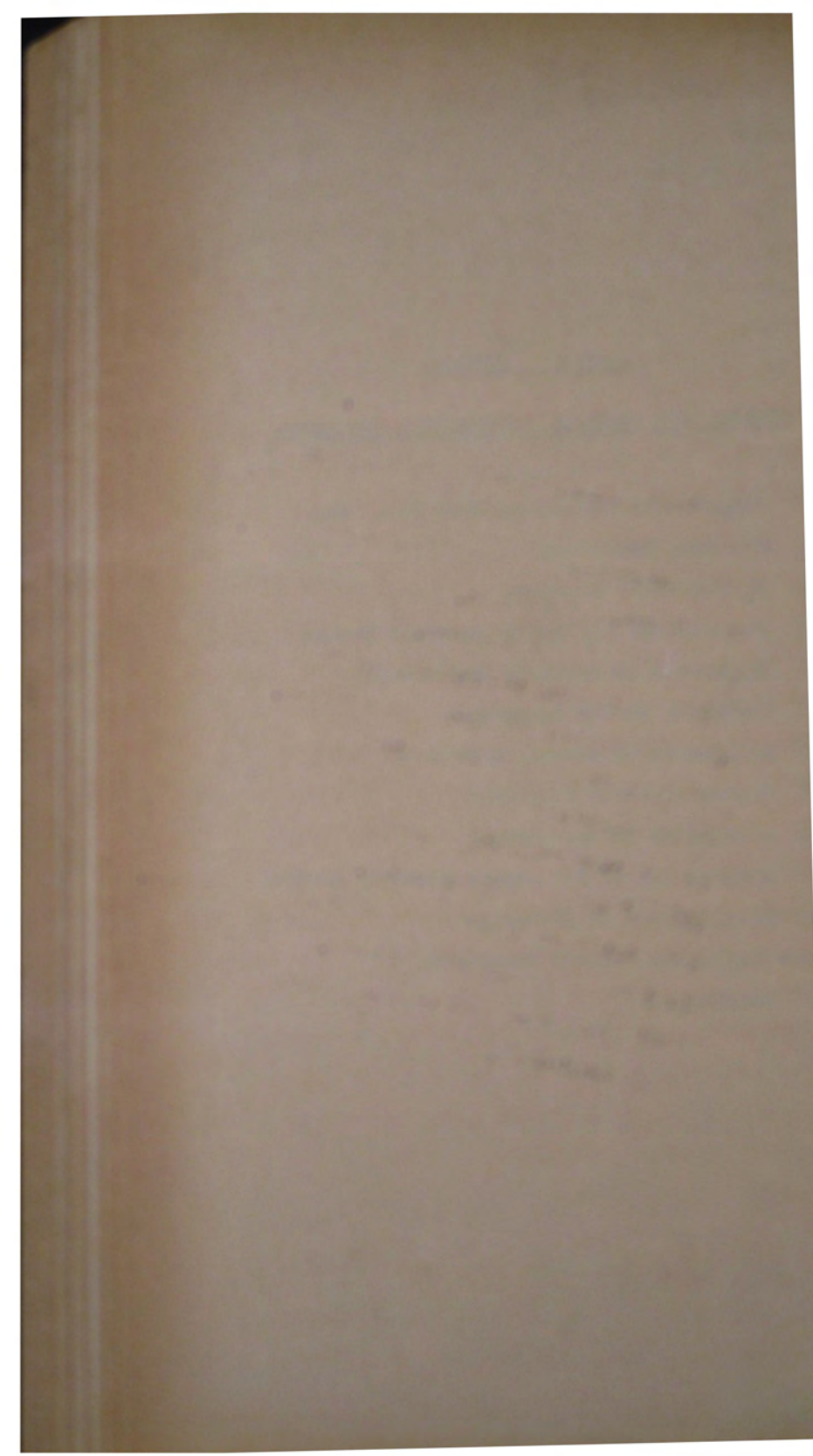
(N.B. See also Part 1, Chapter 5 - 'Post-War Re-organisation').



PART I : GENERAL

CHAPTER 7 : DEFENCE CONSTRUCTION CONTRACTS

- (1) Competitive Tendering, Cost-Plus, etc.
- (2) Overseas Practices.
- (3) Difficulties Foreseen.
- (4) Introducing the Master Schedule System.
- (5) Engagement of Quantity Surveyors.
- (6) Compiling Master Schedules.
- (7) Amendments to Master Schedules.
- (8) Master Schedule Procedure.
- (9) Allocation of Contracts.
- (10) Application of the Master Schedule System.
- (11) Finalisation of Contracts.
- (12) Profits on Defence Contracts.
- (13) Conclusion.



DEFENCE CONSTRUCTION CONTRACTS.HISTORIAN'S NOTE.

The story of the master schedule system, under which the greater part of the defence building construction programme entrusted to the Department was carried out, falls into three parts : (a) the procedure laid down, (b) the procedure actually followed, and (c) the results achieved.

Although (a) and (b) differed in several essentials (for reasons which are explained), I have considered it desirable to set out the precise instructions originally issued but which through force of circumstances could not be complied with in their entirety or were later superseded. This complicates somewhat an already complex subject but is, I feel, justified on the grounds that the master schedule contracting system, as perhaps the most important administrative experiment in the history of the Department, deserves to be fully recorded from the point-of-view of what was attempted as well as what was in fact accomplished.

The question of contractors' profits has been covered in detail which is possibly disproportionate to the rest of the chapter, since the success or otherwise of the master schedule system must be judged to a considerable degree by the cost factor. This in itself was a matter of such a contentious nature that it could not be outlined in a more concise form without sacrificing clarity and objectiveness.

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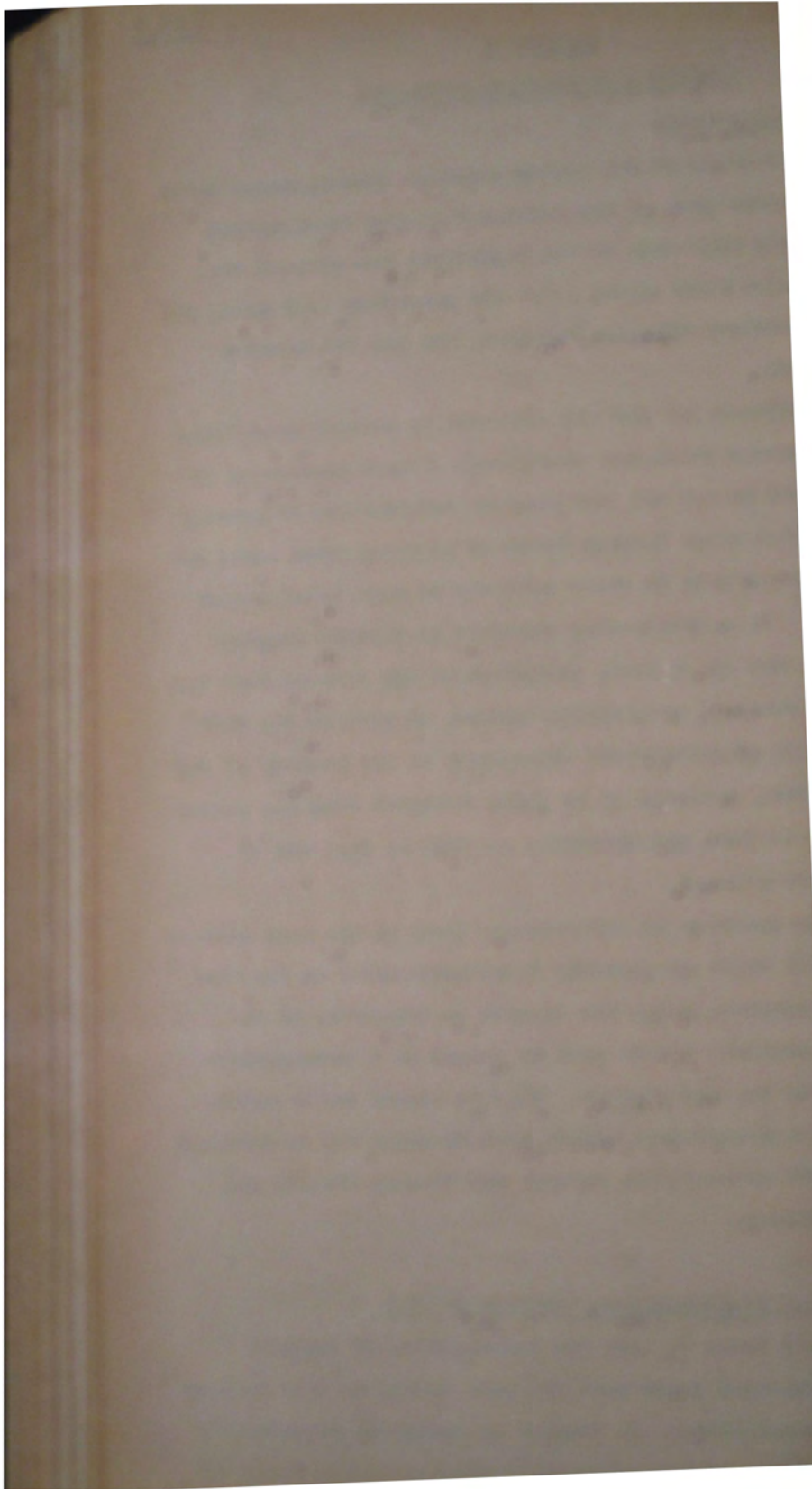
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, COMPETITIVE TENDERING, 'COST-PLUS' ETC.

Until early in 1942 the construction of defence works proceeded under much the same system as that followed in normal times. On receipt of authority to undertake work, the District Engineer advertised in the Press for



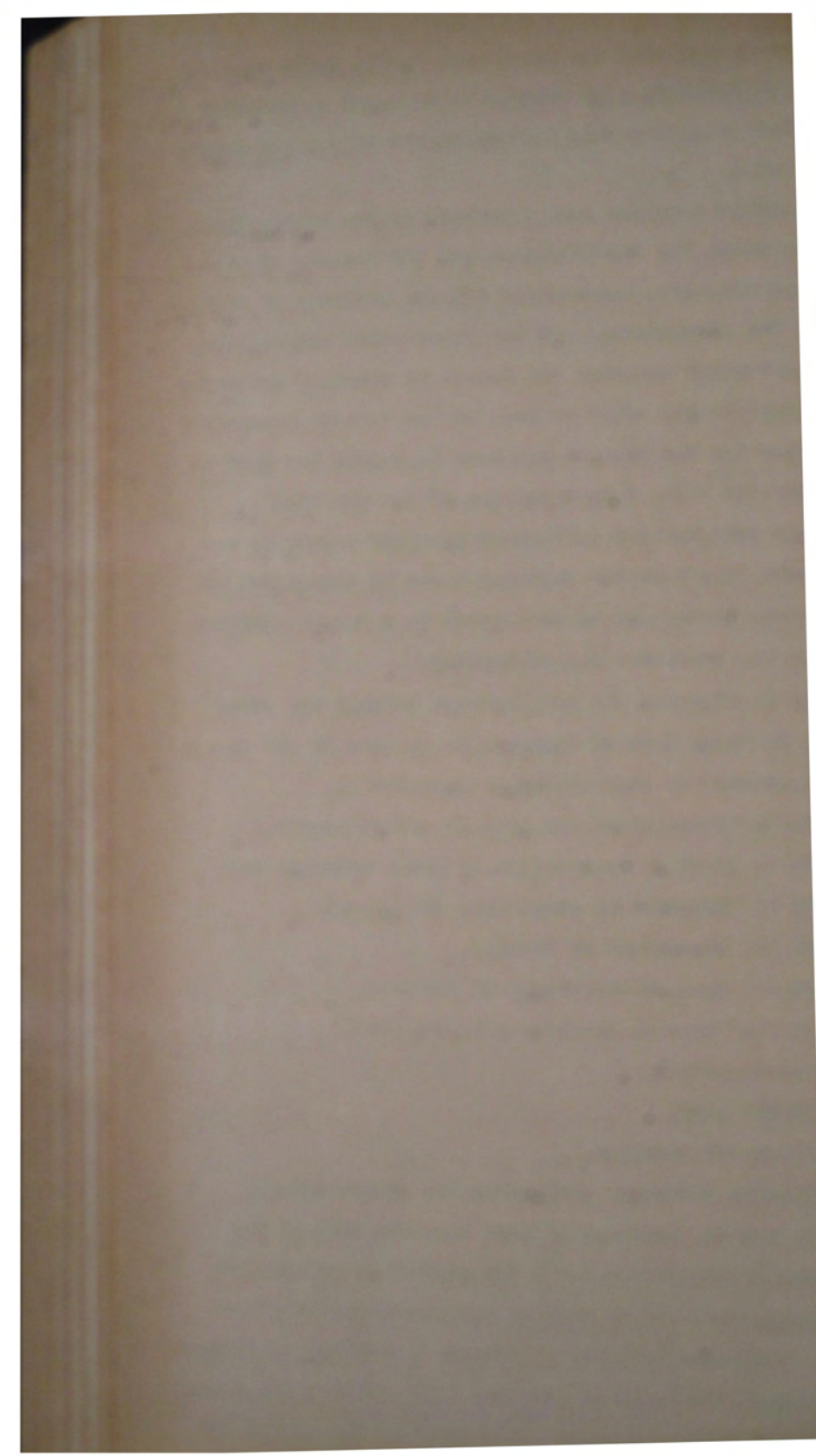
tenders closing with the Secretary, Public Works Tenders Board, Wellington, such tenders to be based on detailed plans and specifications indicating the extent and nature of the work.

Tenders received were submitted to the Public Works Tenders Board for consideration and the lowest, if otherwise satisfactory, recommended (to the Minister of Public Works) for acceptance. If the recommended tender (plus 5% supervision) exceeded the amount of monetary authority held, application would be made to the Service Department concerned for the balance required to enable the work to be proceeded with. Upon receipt of the Minister's approval and provided sufficient monetary authority was available, the District Engineer would be instructed to accept the tender and to have drawn up a formal contract between the Crown and the contractor.

No distinction was made between defence and other works, the same form of contract being used in all cases. This consisted of the following (Appendix 1):

- (1) PW 54: Cover sheet and copy of advertisement.
- (2) PW 55 or 55 A: Tender (55A if for a building work).
- (3) PW 77: Schedule of quantities and prices.
- (4) PW 56: Acceptance of tender.
- (5) PW 64: General conditions of contract.
- (6) PW 71A: Special conditions of contract.
- (7) Specification.
- (8) PW 58: Bond.
- (9) Plans and drawings.
- (10) Copy of newspaper containing the advertisement.

It was the practice to have complete sets of the contract documents available for perusal by prospective tenderers, thus giving them an opportunity of familiarising themselves with the Department's standard conditions of contract etc while at the same time studying the plans and specifications prepared in respect of the particular



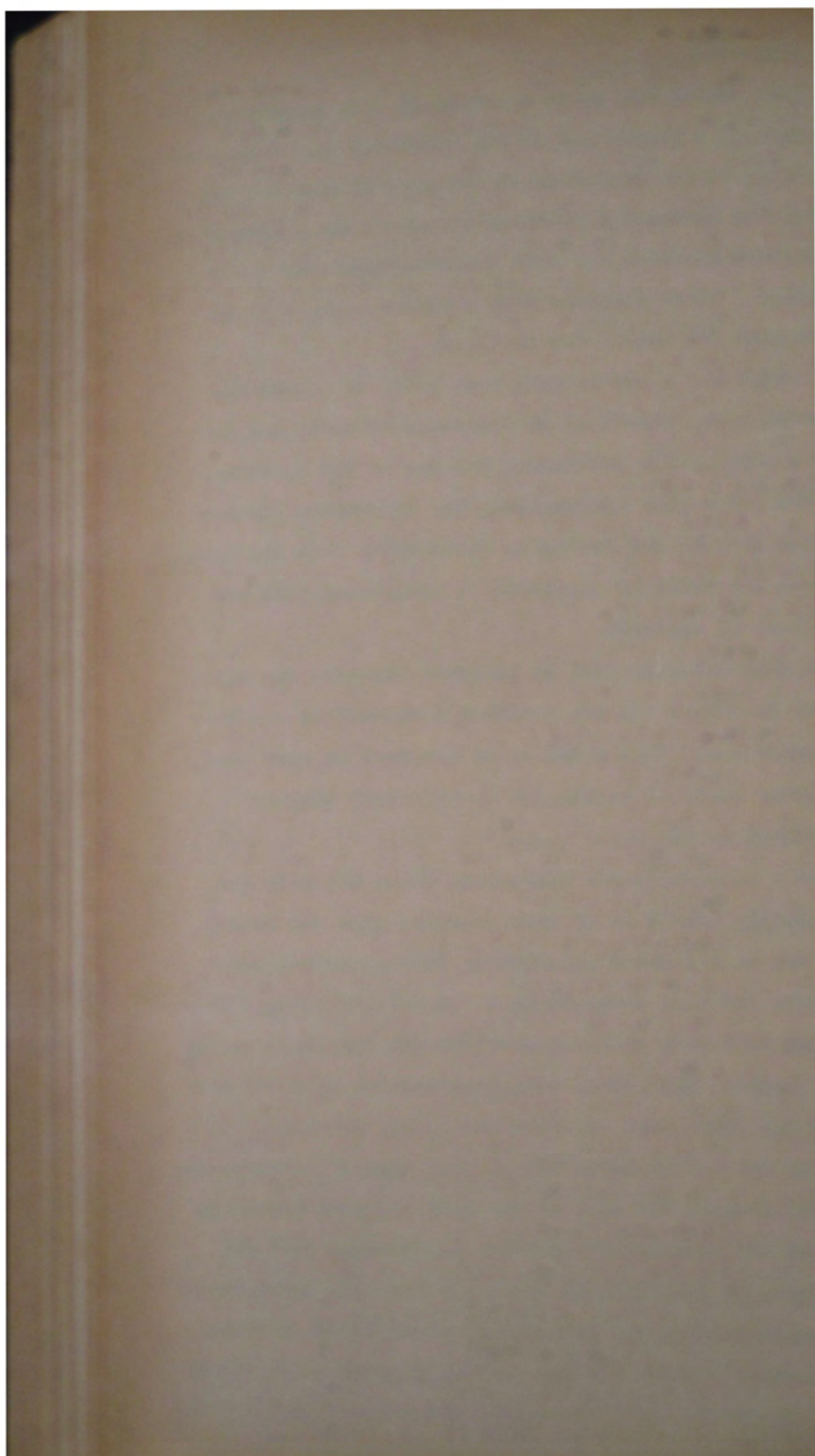
Each tender had to be accompanied by a deposit cheque representing a percentage of the estimated cost - ranging from $1\frac{1}{2}$ to 5%, depending on the type of work and its value. The successful tenderer's deposit was retained by the Government until the work had been completed satisfactorily. Other deposits were returned along with an advice that the tender was declined.

A bond for a sum ranging from $3\frac{1}{3}$ to 10% of the estimated cost, depending on the value of work, had to be entered into by the contractor and one or two sureties. This was not a cash transaction, the contractor and his sureties jointly and severally undertaking that the work tendered for would be completed in accordance with the conditions of contract.

A standard condition of contract required the contractor to effect his own accident compensation and fire risk insurance. This point is of interest in that under the master schedule system the Crown itself assumed responsibility for these risks.

In a relatively few instances, where the work was particularly urgent or of such a nature that its extent could not be estimated accurately, defence construction contracts had been arranged on a 'cost-plus' basis. This involved refunding to the contractor all his outgoings by way of labour, materials, etc, plus payment of a percentage of the total cost to cover profit and overhead.

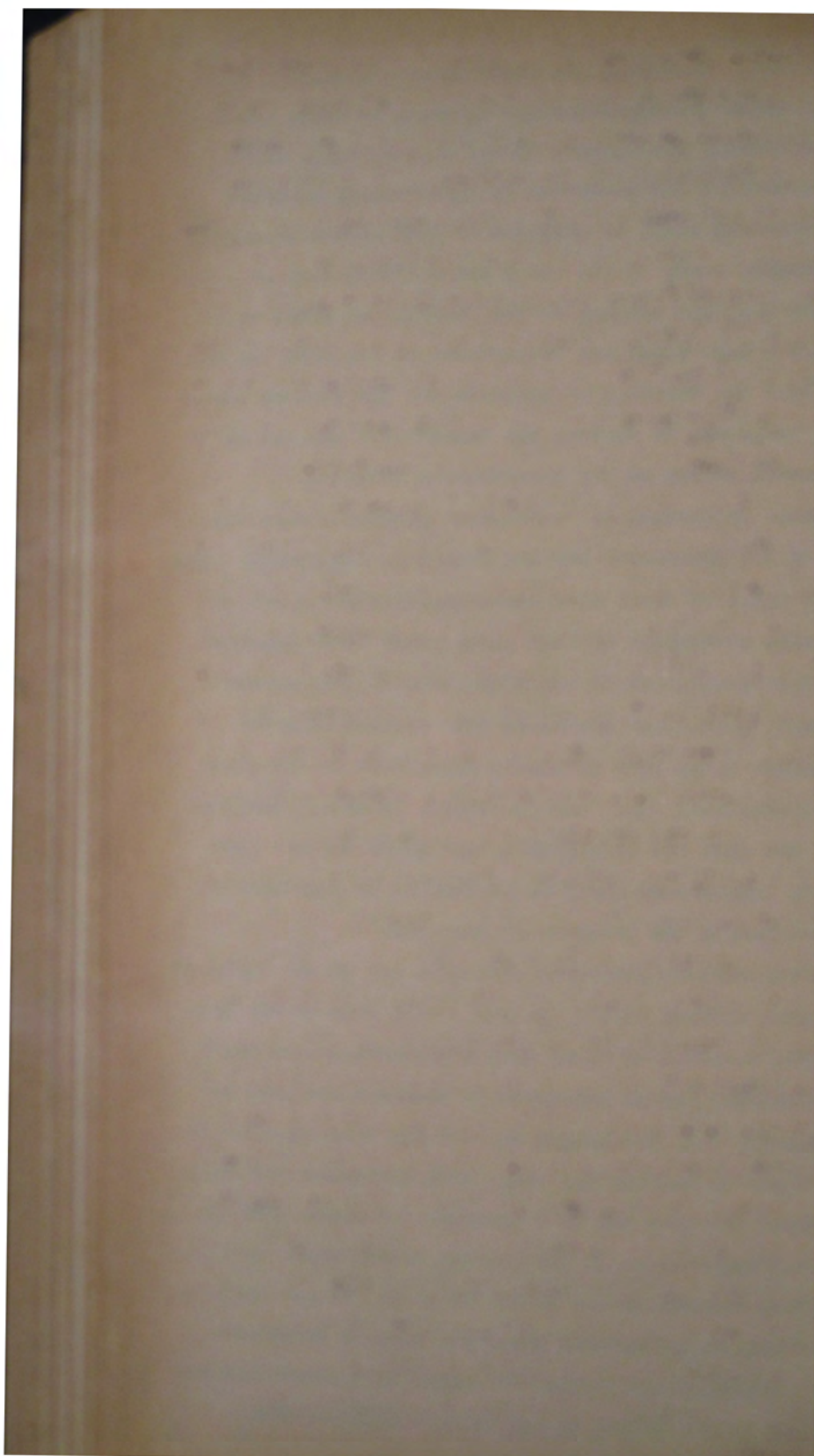
The serious disadvantage of this type of contract was that the greater the cost of the work the more lucrative would be the contractor's profit, which meant that far from being an incentive to carry out the work efficiently and economically - the fundamental principle in ordinary relationship between the contracting parties - the system tended to reward inefficiency and extravagance and left the Department more or less at the mercy of unscrupulous



contractors. Moreover, the checking of innumerable invoices, wages sheets, and other evidence of costs was a task of immense proportions in the case of large works and monopolised the attention of departmental officers whose services could be utilised to much better advantage. For example, early in the war a new military camp at Papakura had been erected on the 'cost-plus' basis and, although a huge staff was transferred to the site, it was found that the checking of accounts and the general supervision necessary to control the expenditure imposed an intolerable burden on the Department's officers.

These objections to 'cost-plus' contracts were well known to the Department and the Minister, but nevertheless certain types of works were occasionally carried out on this basis throughout the war period when there appeared to be little alternative under the special circumstances. As a rule 'cost-plus' contracts were awarded only to responsible firms with extensive experience in the class of work concerned (e.g. refrigeration, plumbing, heating, etc.), and with the stipulation that close supervision over all expenditure would be maintained by departmental officers during the progress of the work.

A few defence contracts were also let on the basis of 'cost plus a fixed fee.' This obviated some of the less desirable features of 'cost plus a percentage', in that the contractor had an incentive to complete the work expeditiously, i.e. the longer he took the more expenses he would incur in earning his fee. Such contracts were suitable where the work was of a straight-out nature and the estimated cost (on which the fee was based) could be arrived at accurately - a condition which did not apply to many of the urgent defence projects, some of which were altered considerably during the course of construction in the light of amendments to the Service Department's requirements.



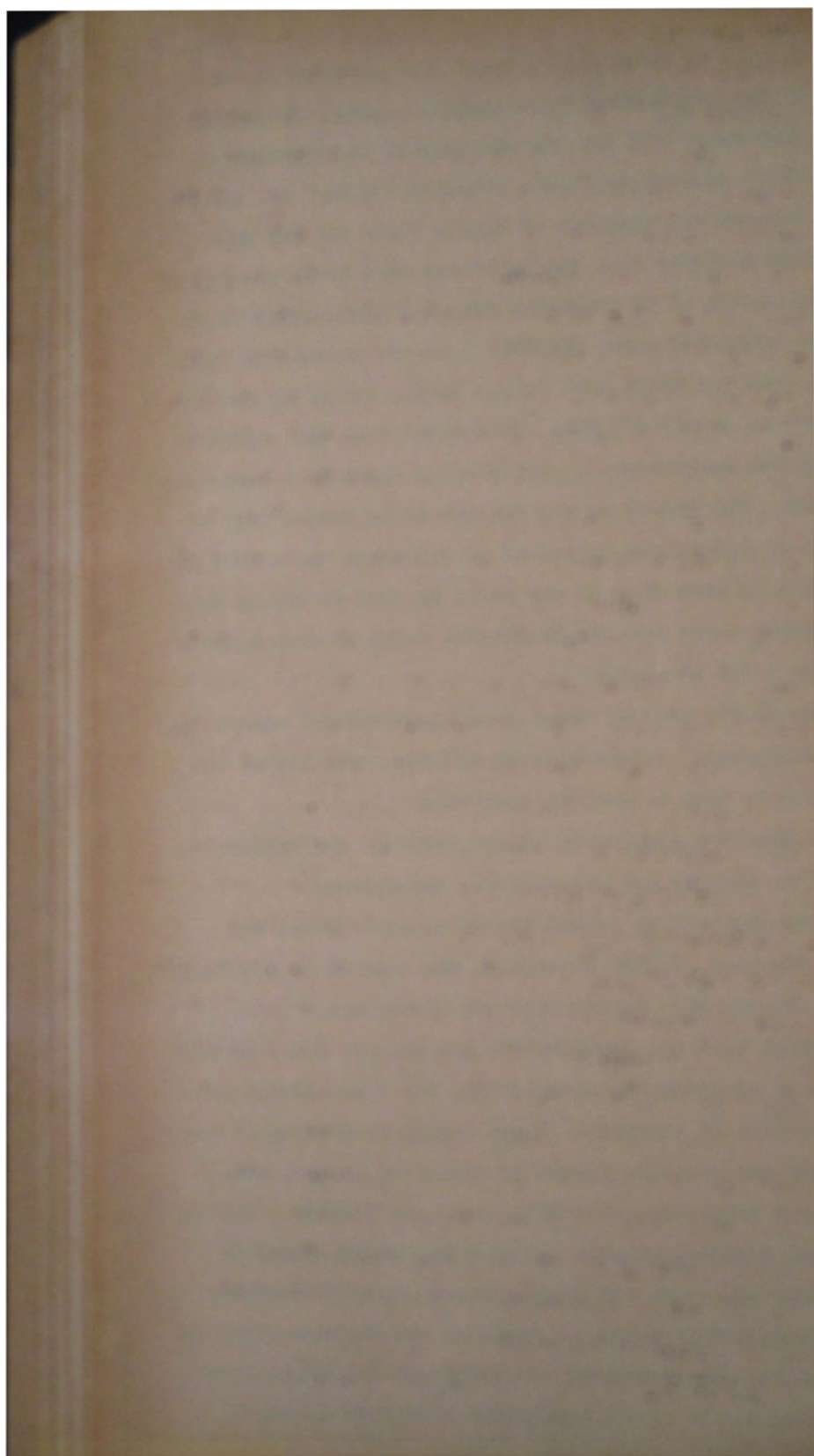
A typical 'cost plus a fixed fee' contract was one let to the Love Construction Company Limited of Dunedin on 7 September 1939 for the erection of 16 buildings at the Taieri Elementary Flying Training School. The agreement between the Minister of Public Works and the contractors provided that the buildings were to be erected in consideration of an inclusive fee of £3,000, equal to 5% of the estimated cost, £60,000. It was stipulated, however, that the total cost to the Crown, including the fee, was not to exceed £63,000. This meant that any expenditure by the contractors beyond £60,000 would be a dead loss to them. The amount of the fee was to be varied only if extras or reductions increased or decreased the extent of the work by more than 20 per cent, so that in effect the Government could have up to £72,000 worth of work carried out for a fee of £3,000.

As in the case of 'cost plus a percentage' contracts, the contractors' expenditure on materials and labour was refunded to them at monthly intervals.

A date for completion of the contract was specified, though no penalty for lateness was prescribed.⁽¹⁾

The competitive tender system of contracting had stood the test of time throughout the history of the Department. In the past practically all works except those undertaken with the Department's own forces, i.e., by day-labour or co-operative contracting, had been carried out by this form of contract. Under normal conditions it was the only satisfactory method of arranging to have work done by a contractor with efficiency and economy - and was (and is) accepted as such all over the world. That it could not cope with the unprecedented amount of defence construction with which the Dominion was confronted during the war was not so much an indictment of the competitive tendering system as the cumulative effect of depleted

(1) Contract No. 11297, file 23/393/4, p.1.



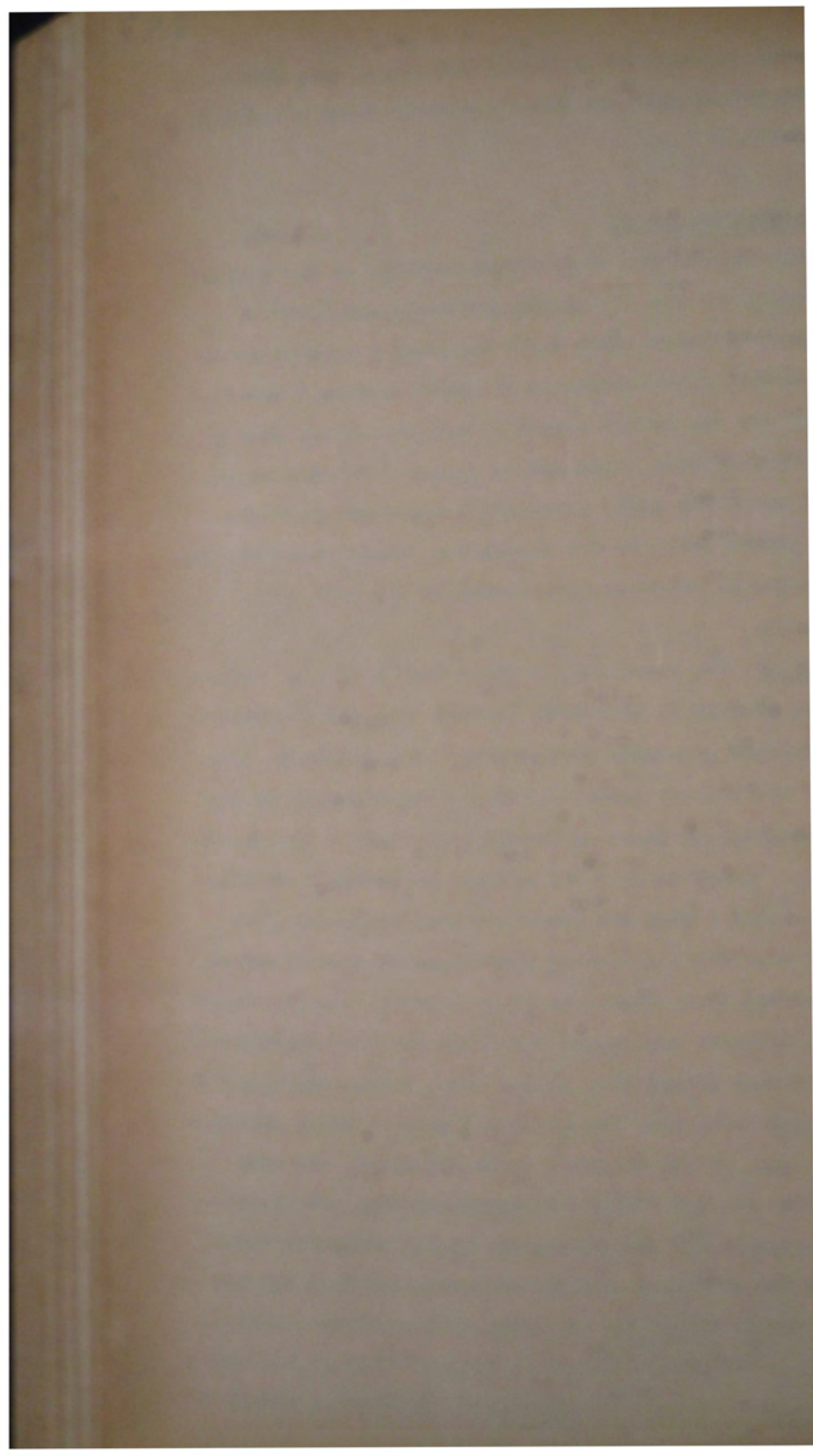
manpower, shortage of essential materials, and, above all, the imperative need for speed following Japan's entry into the conflict.

2. OVERSEAS PRACTICES.

The problem was by no means peculiar to New Zealand, for during the war all allied countries had found it necessary to re-organise their building resources to meet the abnormal requirements of national defence. Both in England and the United States it was recognised that plans and specifications could not be prepared in advance for urgent works nor could contractors undertake to tender fixed prices owing to the demand for labour exceeding the supply and to constant fluctuations in the cost of materials.

Australia: The 'cost plus a fixed fee' system of contracting was adopted in Australia in June 1942 for the defence construction programme necessitated as a result of the threat of Japanese invasion and the requirements of the large numbers of American troops stationed in the Commonwealth. Prior to this the pre-war procedure of letting contracts on a lump sum basis had been followed. The 'fixed fee' was a specified percentage of the estimated cost of the work, decreased (within limits) as the amount of the estimate increased. The fee remained unaltered whatever the actual cost of the work, unless additions or reductions were made the estimated cost of which equalled 10% or more of the original estimated cost. In such cases the fee was decreased proportionately, or increased by agreement, but the percentage of the increased fixed fee to the estimated cost of the increased work was not permitted to exceed the previous corresponding percentage.

Discussing this system in the course of an address to the Annual General Meeting of the Brisbane Division of the Institution of Engineers, Australia, on 28 April 1944,



'The fundamental purpose of this method was to expedite construction generally by the saving of time in the preliminary stages due to eliminating competitive tendering, with its attendant preparation of quantities, full specifications, and complete drawings. This enabled contracts to be placed without having to wait for the full particulars normally supplied to tenderers, and the consequent delay in commencing operations.

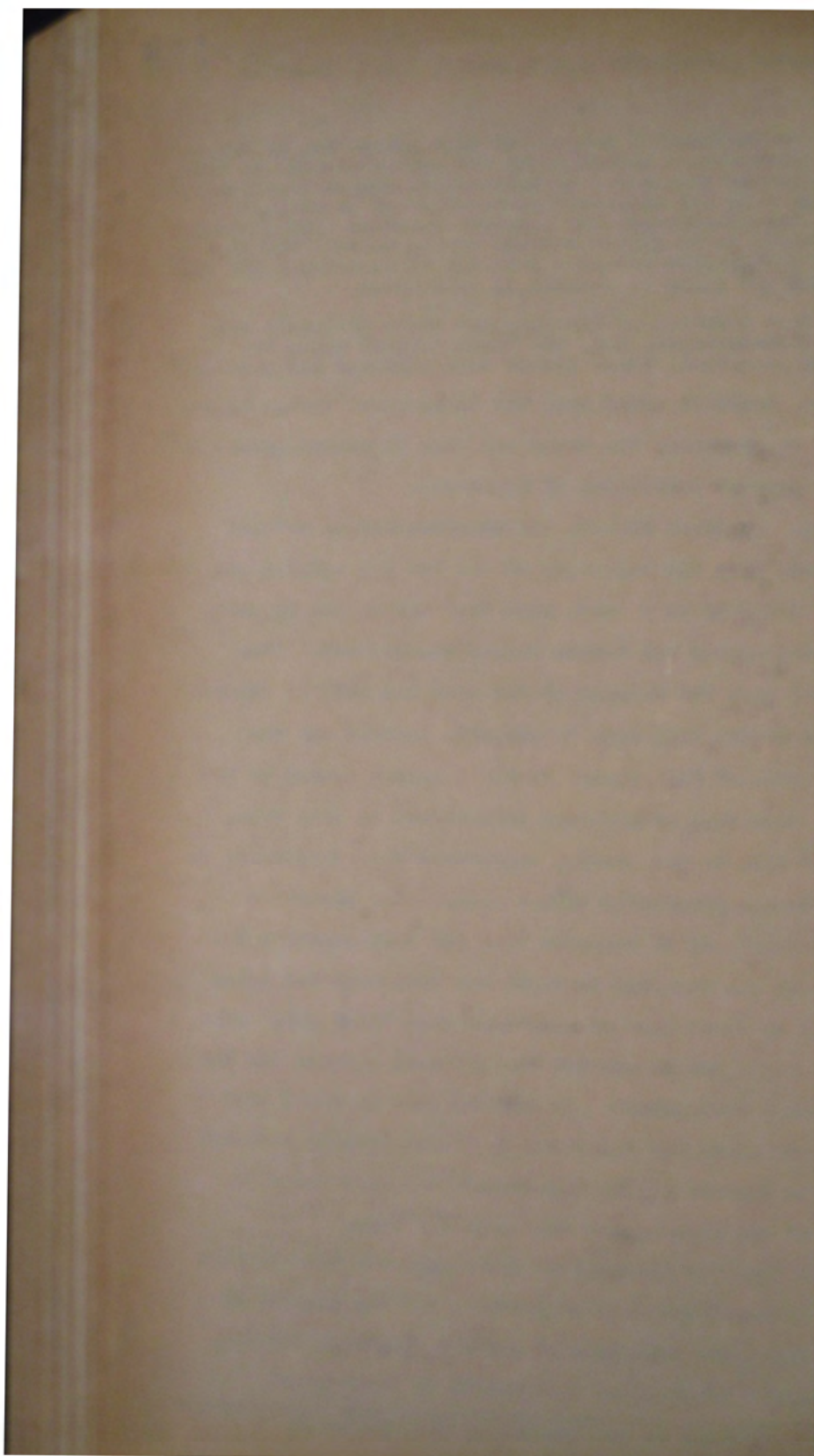
'Such a method of carrying out works obviously had its disadvantages, but, the "time factor" being the chief essential, other issues were perforce perfunctory.'

Mr. Mitchell added that the 'cost-plus' system having served its purpose, the trend was then to revert gradually to the pre-war conditions of tendering.

Britain: In Great Britain the construction of defence buildings from the beginning of the war was carried out almost entirely on a 'cost plus fee' basis, but by early 1941 this system had become widely discredited. 'The argument that the urgency of the need has made it impossible to devote full time to adequate surveys and the preparation of full plans' stated a report issued by the Select Committee on National Expenditure at that time, 'breaks down on the general experience that failure to do these things frequently delays rather than expedites completion.' On 26 February 1941 the Parliamentary Secretary to the Ministry of Works and Buildings was asked whether he would give an assurance that 'cost-plus' contracts would not be adopted for any work carried out for Government Departments. He replied that he could give no such assurance, but undertook that this form of contract would be limited by his Department to 'those cases in which it was clearly the only suitable form.' (1)

In 1942 the Ministry of Works approved the adoption of a 'Standard Schedule of Prices', for 'the purpose of simplifying the procedure of letting contracts and also providing a practicable alternative to "cost-plus"

(1) As recorded in the Journal of the Chartered Surveyors' Institute, April 1941.



contracts.' This standard schedule, which had been prepared by a technical sub-committee of the Central Council for Works and Buildings, was intended primarily to enable priced bills of quantities for standardised types of war-time construction to be issued to contractors, such bills to serve as a basis for the compilation of tenders - the idea being to save the contractors' time when preparing a tender. The prices in the standard schedule included a uniform margin over cost (10% to cover profit, risks, and overhead), and tenders were to be based as overall percentages on or off the priced bill as a whole.

Increases or decreases in the cost of labour and materials were to be dealt with by adjustment from the basic costs given in the schedule.

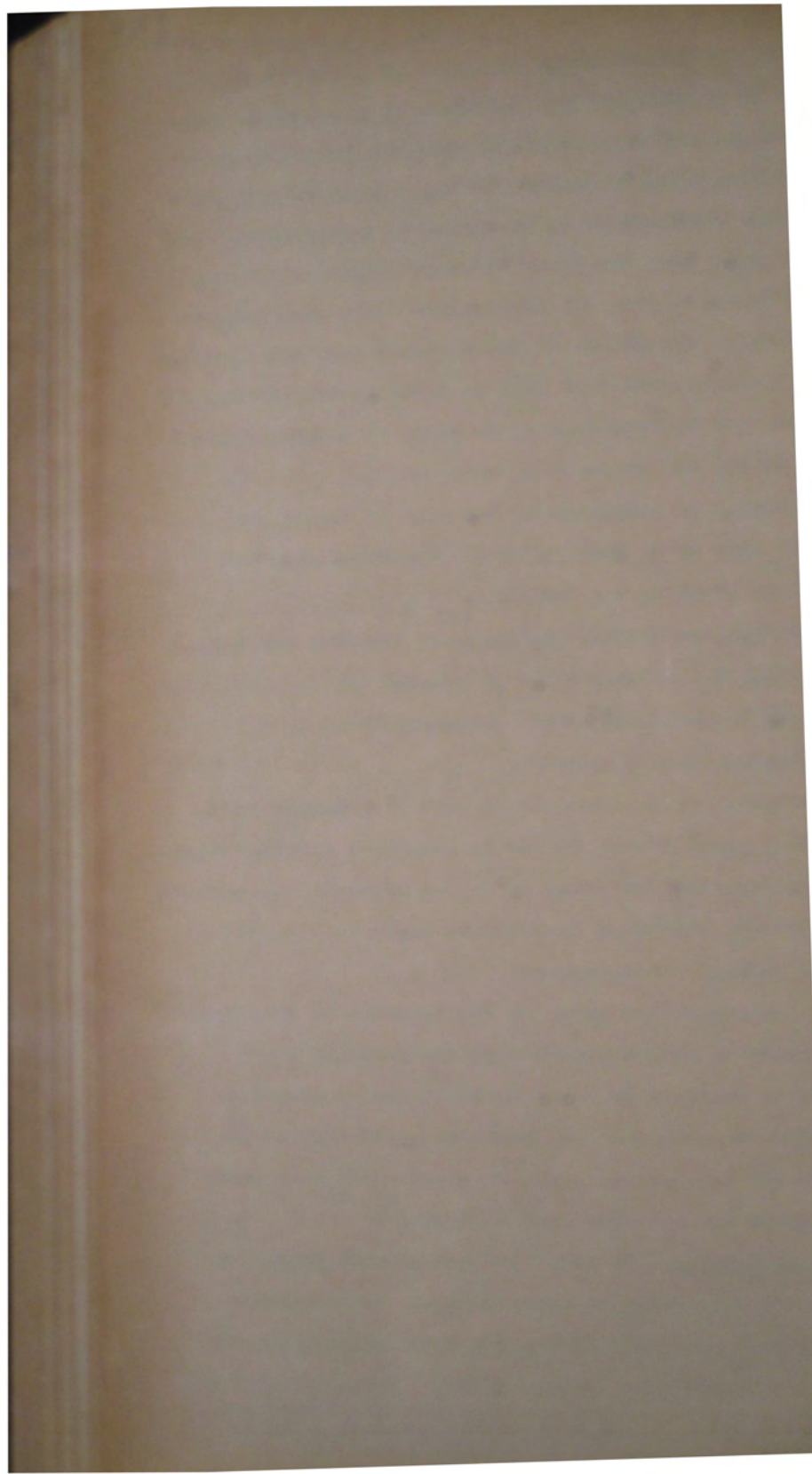
Although, as stated, the standard schedule was intended primarily for pricing bills of quantities, it could also be used on 'measure and value' contracts where no bills of quantities had been prepared.

The schedule was drawn up to meet the demands of specific classes of work in the Government's war-time building programme, and the scope of its application was accordingly limited, 'although it could no doubt be adjusted to suit any special circumstances.'

An indication was given in the foreword to the standard schedule by its compilers that the schedule might usefully be employed in cases where it was necessary to start work in advance of the complete preparation of drawings and quantities, i.e., in cases where the 'cost-plus' system had hitherto been followed.⁽¹⁾

Payment by Results. In July 1941 a system of payment by results was introduced in Great Britain, to accelerate completion of certain building and civil engineering work of vital importance to the war effort. This consisted of

(1) This information extracted from 'Journal of the Chartered Surveyors' Institute, April 1942.



payment of a bonus for all work over and above a fixed hourly output, and was compulsorily applicable only to certain classes of work scheduled under the Essential Work (Building and Civil Engineering) Order, 1941. Commenting on the new procedure, a Joint Memorandum from the Ministers of Labour and Works said 'With regard to reimbursement of contractors' expenses arising out of the introduction of payment by results under the Essential Work Order, the increased output obtained under the system of payment by results will normally more than compensate the contractor for any increased outlay arising from the application of the Order.

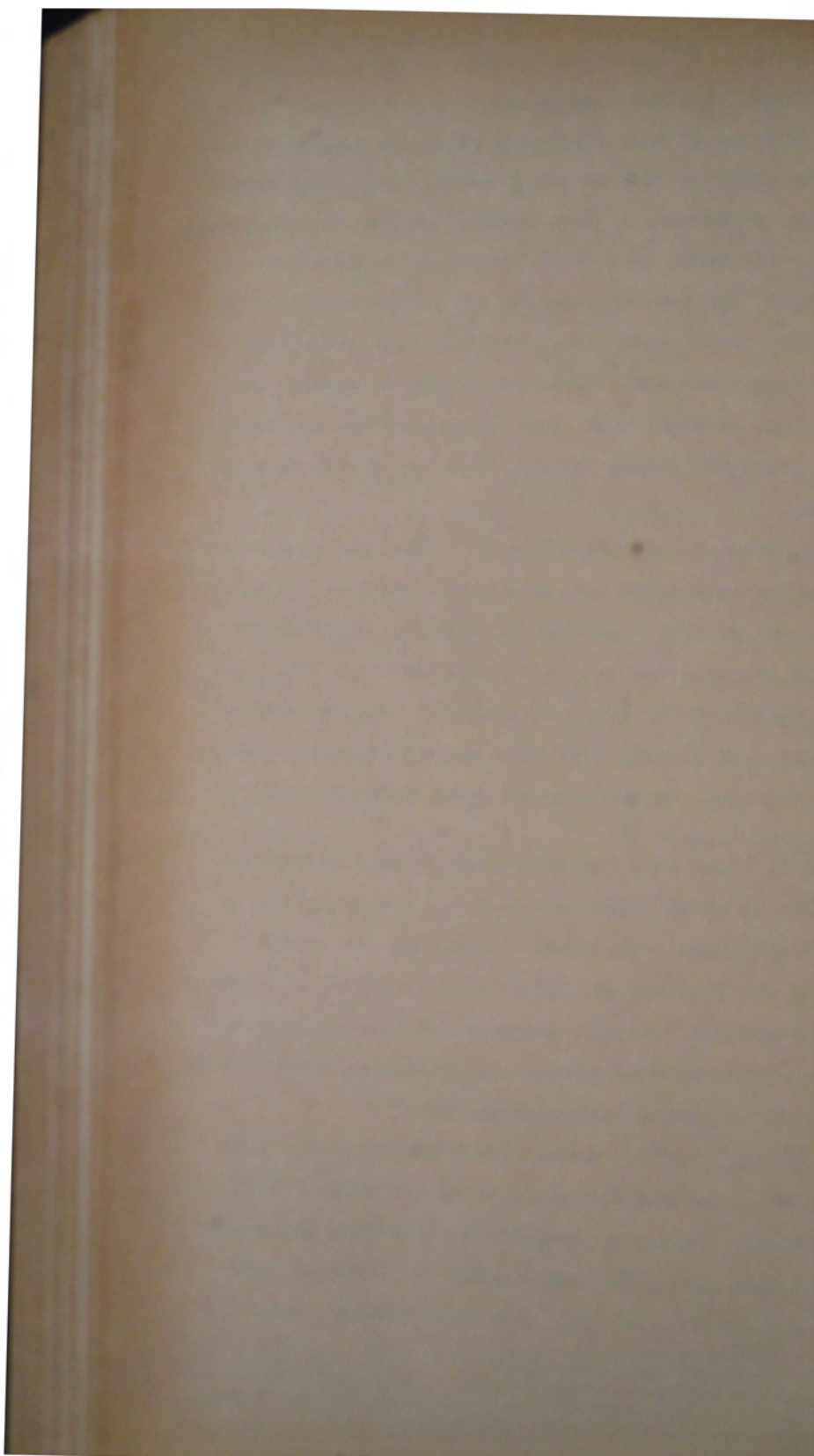
'If, however, on completion of a lump sum or similar contract the contractor can show that, owing to the operation of the system of payment by results, the cost of executing the work has been adversely affected, the contractor will have the basis of a claim. The out-turn of the contract as a whole will be a factor in consideration of such a claim. In the case of prime cost contracts no difficulties arise.' (1)

'It is clear that the system of payment by results has proved of great value in achieving the Government's object,' concluded a statement describing the scheme issued by the Ministry of Works and Planning on 11 February 1943, 'production has been substantially accelerated and the bonus payments have proved a considerable incentive to work-people in giving increased output.' (2)

United States: Defence works in the United States were carried out under the jurisdiction of the Army or Navy. As elsewhere, the normal competitive tendering system was departed from during the war largely in favour of 'cost-plus', a fixed fee, or prime cost (percentage) contracts.

(1) Quoted by Mr. Herbert Mitchell, M.I.E. Aust.F.S.I.Eng. in his address to the Annual General Meeting of the Brisbane Division of the Institution of Engineers, Australia, 28 Apr 1944: 32/483, p.4.

(2) 32/483, p.4.



Another expedient adopted was the fixed fee principle, the fee being payable not to the contractor but to a private firm of architects in an arrangement known as an architect/engineer contract. In consideration of this fee the architect prepared drawings, specifications, etc, which were used by the United States Army Engineers to invite tenders and let a contract (to the engineer, i.e. the engineering contractor). The architect supervised the work and certified payments, etc.

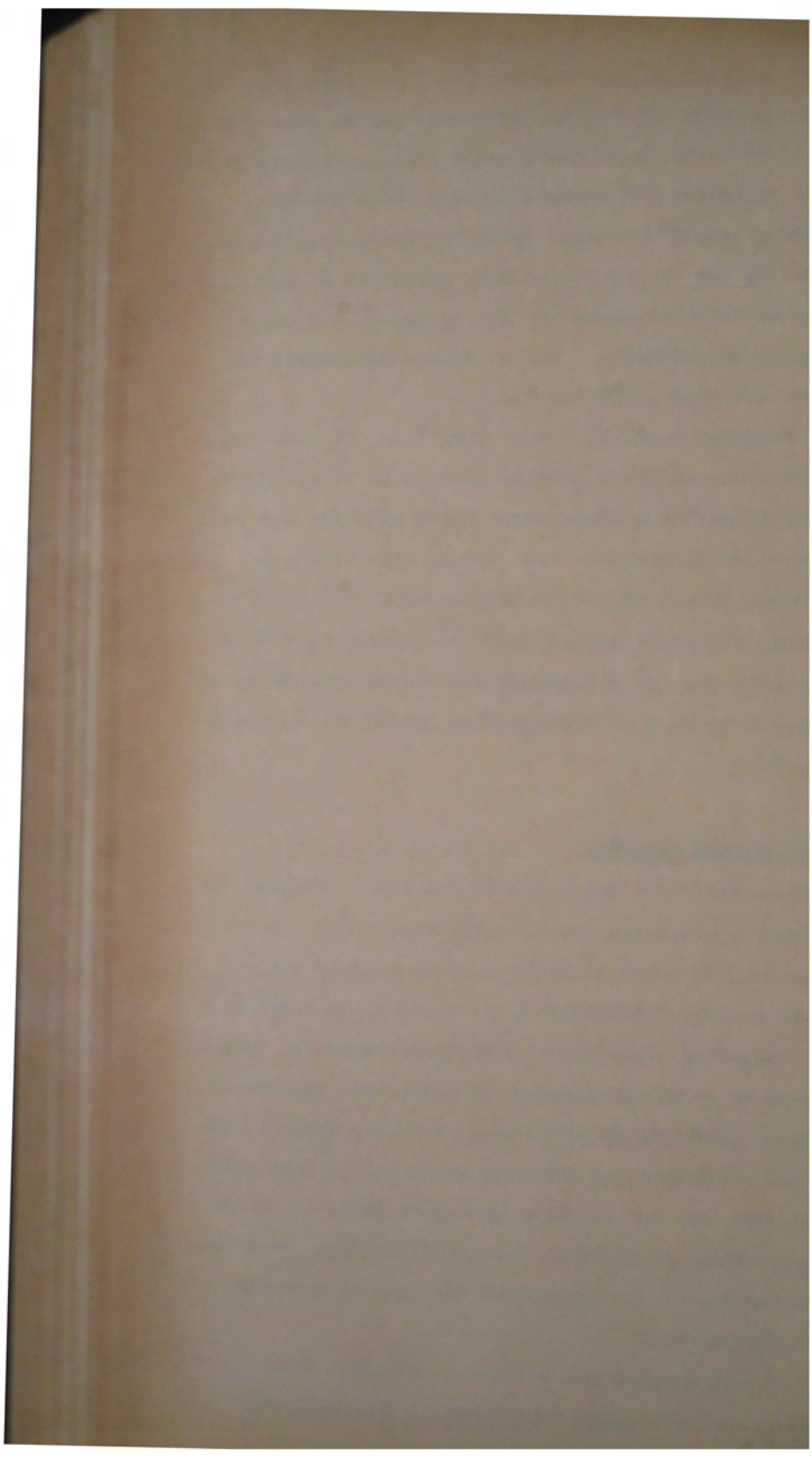
'Negotiated contracts' were also let. In such cases the contractor was given a brief outline of requirements, e.g. a hospital for a stipulated number of beds, but no drawings or specifications were necessarily supplied. A lump sum was quoted and the work proceeded with. After completion, the price quoted could be reduced by mutual agreement between the Government and the contractor if it were considered that an unreasonable profit was likely to be made. (1)

3. DIFFICULTIES FORESEEN.

During the first two years of the war the imposition of building control had considerably restricted private construction, thus enabling the greater part of the country's building potential to be diverted to Government works. Under the competitive tendering system, by 'cost-plus', and by direct engagement of labour the Department had erected hundreds of buildings, involving millions of super feet of timber, at military camps and on aerodromes. In fact, with all but the most essential civilian public works suspended, practically the entire building resources at the disposal of the Department had been concentrated on defence construction.

A note of warning was sounded even before Pearl Harbour by the Government Architect, on whom fell the

(1) Mr. Mitchell's address.

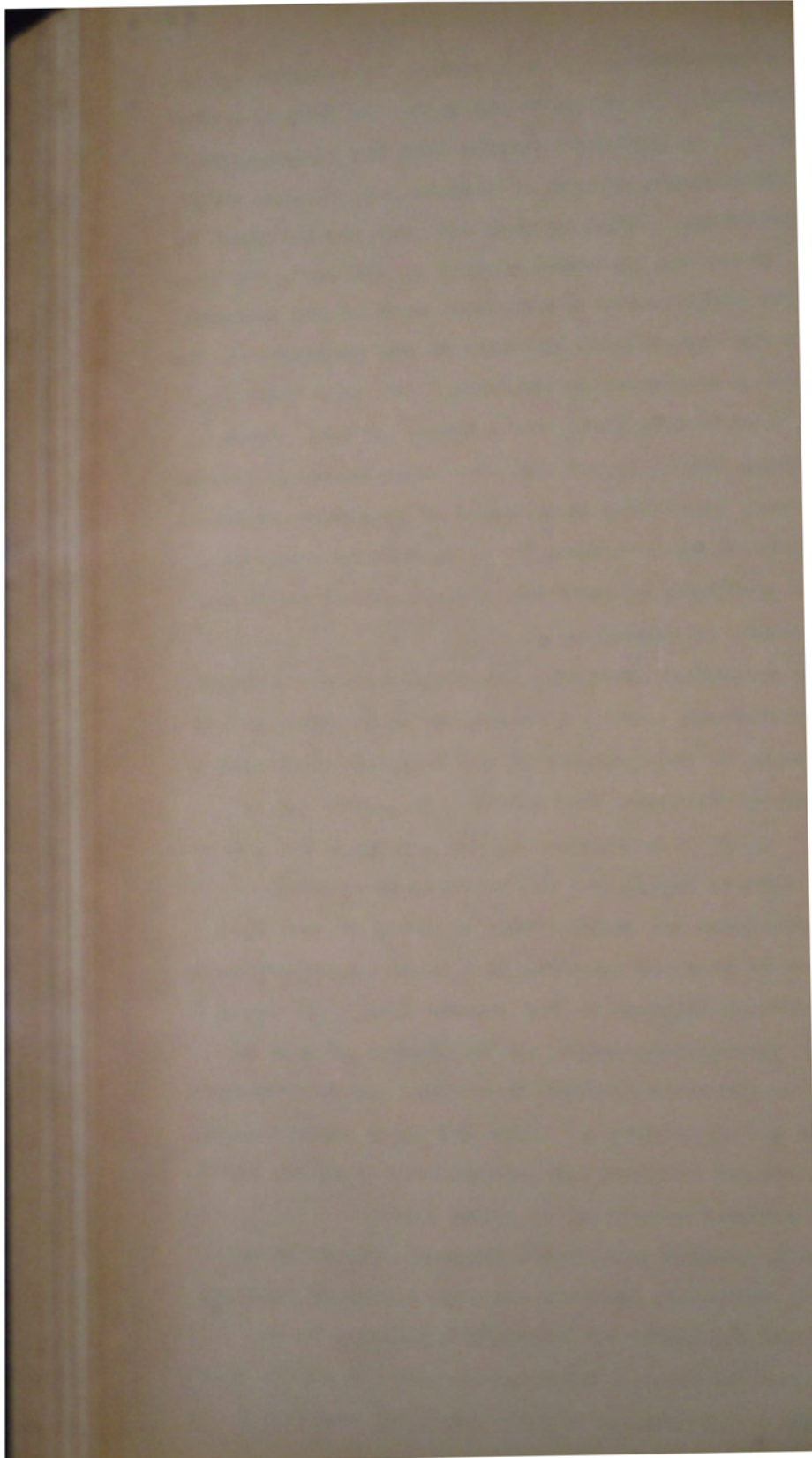


initial responsibility for implementing the defence building programme. Reporting to the Permanent Head on 9 October 1941, (1) he expressed concern over the 'inelasticity' of the Department's methods of dealing with defence building construction. 'Much of what had been accomplished' he stated, 'using the procedure adopted in the past, has been due to the enthusiastic and tireless work of all concerned, from our own departmental officers to the contractors, sub-contractors, tradesmen, and workers,' but conditions had altered considerably since the outbreak of war. Fresh difficulties had to be met and were daily assuming greater proportions, especially as a result of shortages of labour and materials. Contractors, he said, were becoming more and more unwilling to incur the risks involved under the usual process of tendering.

The Government Architect suggested that the problem could be overcome - and a speedier and more efficient use of the means at the disposal of the Department achieved - if a central committee were set up with powers (1) to 'second' in all main centres the men necessary for carrying out defence works, and (2) to allocate contracts to firms both large and small, 'thus ensuring an even distribution of work and removing to a large extent criticism of the methods employed at the present time.' It would also, he anticipated, result in 'no element of risk or gamble, no excessive profits, no losses, and an efficient and fast moving programme.' The committee would consist of departmental officers and representatives of the builders and sub-contractors and of trade unions.

The Government Architect's proposal, which foreshadowed with remarkable accuracy the very system of manpower control and allocation of contracts instituted by the Commissioner of Defence Construction some six months later, was considered by executive officers of the Department,

(1) 32/9025/3, p.1.

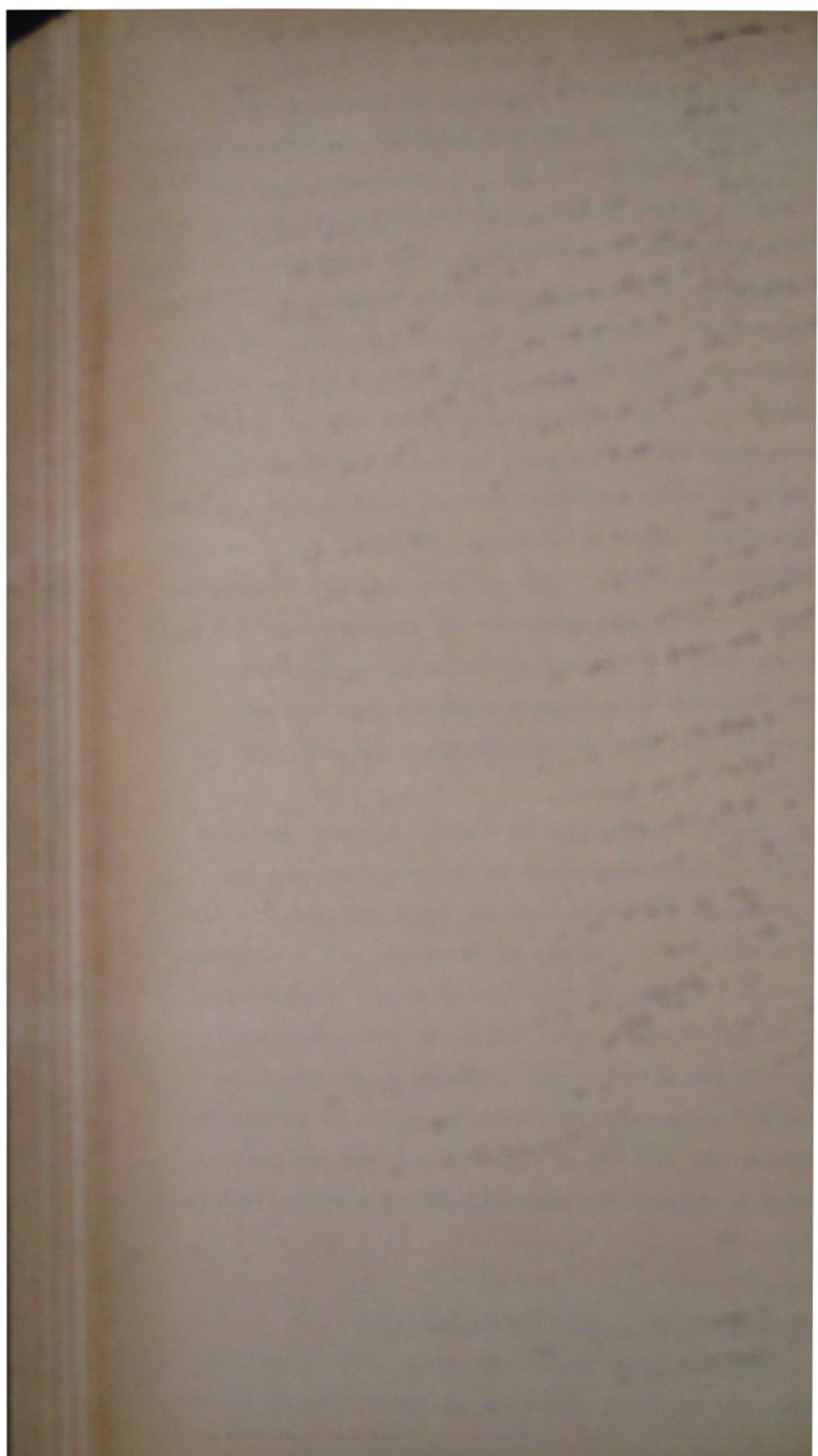


but no specific action in the matter was taken. In the months that followed the position deteriorated still further and, with the enormous expansion of defence building occasioned by the threat of Japanese invasion early in 1942, it became increasingly evident that the competitive tender system of contracting could no longer cope with requirements. The larger firms were becoming over-loaded, having tendered successfully for more work than their organisations could handle. This led to keen competition for labour - a reservoir steadily being drained off as more and more men were called up for military service - and although costs continued to rise the defence construction programme began to slacken. Yet there was a wastage of building potential. The smaller builders through unsuccessful tendering or because the projects were too big for them, were not sharing sufficiently in the work. Private construction, despite restrictions, was still draining off too much of the available manpower and materials.

To enable contractors to compile tenders, detailed plans and specifications had to be made available for their perusal. Valuable time was taken up through a number of tenderers all having to price the same work (which would be carried out by only one of them). Tenders received by the Tenders Board had to be considered and referred to the Minister for approval in the usual way, and although every possible step was taken to obviate delay between the receipt of a tender and its acceptance, there was an unavoidable time-lag inherent in the system itself.

4. INTRODUCING THE MASTER SCHEDULE SYSTEM.

The problem to be solved was this: How to utilise fully all the building resources of the country on defence construction in such a manner that the works required were



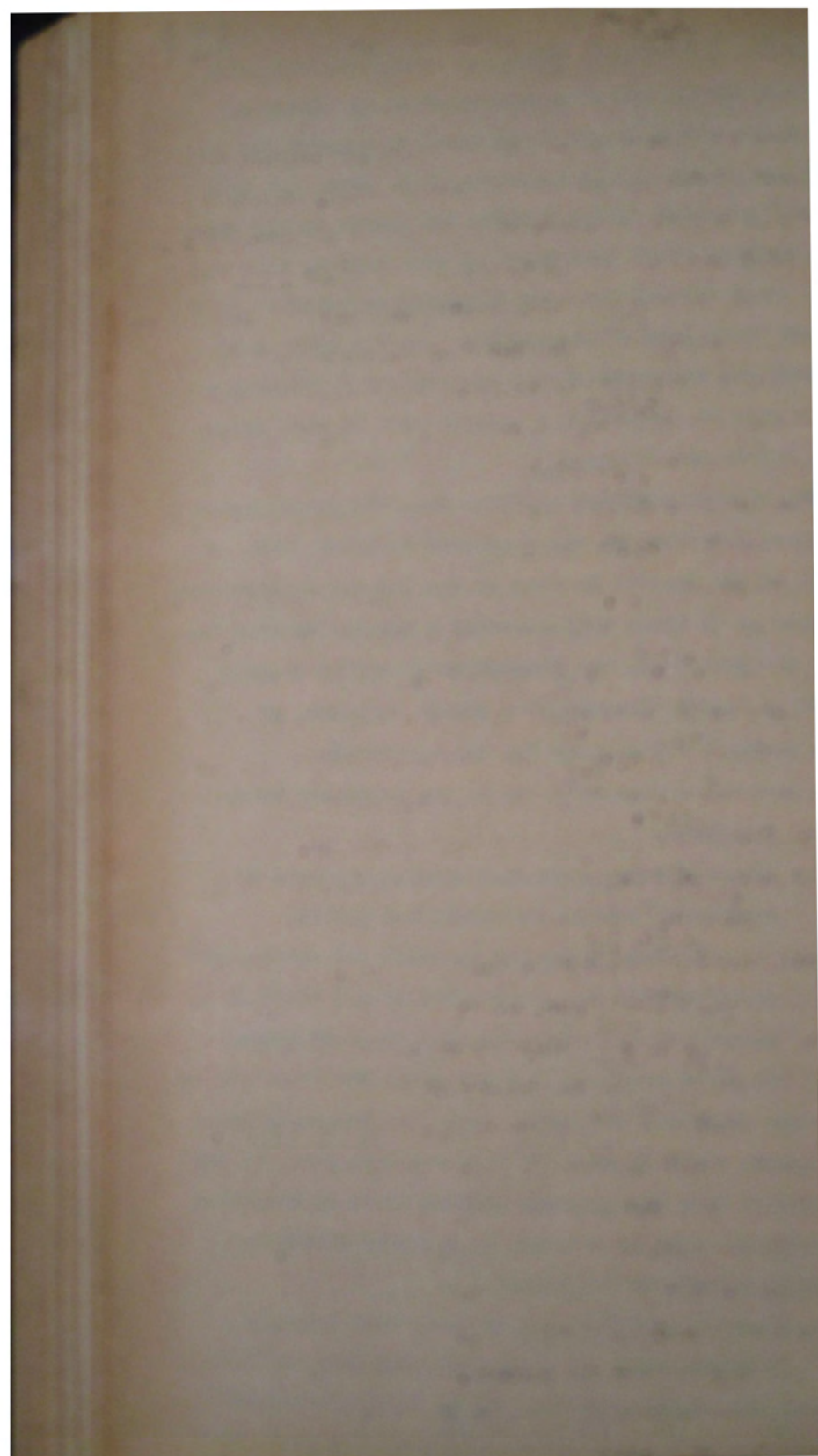
carried out according to plans and specifications, with a minimum of delay, and at a reasonable cost. Under the 'cost-plus' system sketch plans could be substituted for detailed drawings and an immediate start made, but this was likely to mean inflated costs and impose on the Department's reduced staff (one third of whom were by this time in the Armed Forces) the time-consuming responsibility of checking every item of expenditure. On the other hand, the drawbacks to competitive tendering under existing conditions made it obvious that continuation of this system should not be countenanced.

The problem remained unsolved when the Commissioner of Defence Construction was appointed in March 1942. The minutes of the initial meeting of the Defence Construction Committee on 12 March 1942 recorded a resolution that the deputy chairman (i.e. the Commissioner) should discuss with the Government Architect a system to permit of :

- (a) Having a fixed price for all contracts.
- (b) Work being started prior to the contracts being finalised.
- (c) A schedule being furnished showing the cost of materials, labour, overhead, and profit.
- (d) An organisation being set up under the Government Architect for the preparation of all bills of quantities for contracts on a standard basis.

At the third meeting (23 March 1942) the principle of allocating contracts was agreed upon, the suggested basis being £1,000 worth of work for each man employed. It was also decided that the proposed uniform bills or schedules of quantities would be prepared by quantity surveyors specially engaged for the purpose.

Thus was evolved the idea of the master schedule system - a system under which the proposed work was divided into its component parts, and an initial contract price arrived at by multiplying such component parts by



the unit prices (labour and material) allowed in the master schedule. To the initial contract price were added extras allowed in respect of country work and other appropriate adjustments, plus 5% profit and $2\frac{1}{2}\%$ overhead, thus making up the final contract price.

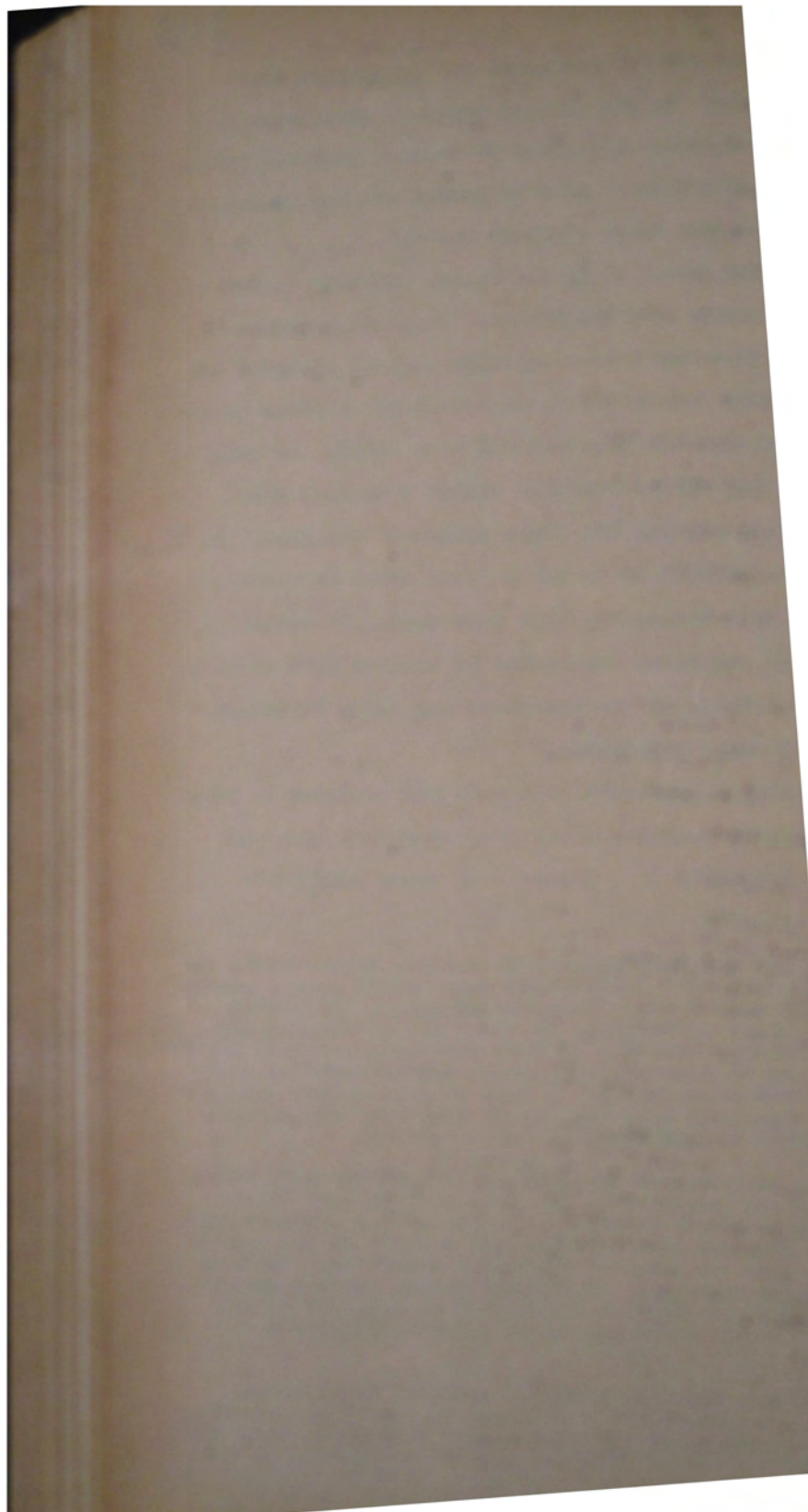
The object aimed at by the master schedule system differed slightly from the British 'Standard Schedule of Prices', in that the priced schedule arrived at under the master schedule became the fixed tender price after incidentals and profit and overhead had been added. As will be seen later, the master schedule system dispensed with competitive tendering, but every contract 'allocated' to a builder was intended to be for a fixed price determined and agreed upon before the work commenced. In actual practice, it was found impossible to achieve this object, the great majority of the contracts not being finalised until after their completion.

The precise procedure laid down was included in form PW 71X, special conditions relating to master schedule contracts (appendix 2). Clause 7 of these conditions read as follows:

7. (1) (a) The Commissioner of Defence Construction and the Master Builders' Association have agreed upon a master schedule of unit prices (hereinafter called the master schedule) which is believed to cover all classes of material and labour included in this contract, and this shall be deemed to be incorporated herein notwithstanding that it is not attached hereto. A copy of such master schedule has been deposited with the Master Builders' Association as applicable to contracts in this district.

(b) The said master schedule sets forth the unit rates for labour and material in the city or town area of the particular district to which it relates, and includes full allowance for workshop expenses and profits in the case of materials such as joinery, plumbers' requisites, heating and hot-water services, electrical works, fibrous plaster, metal-work, etc., whether fabricated or produced in the Contractor's own workshops or in a Sub-contractor's workshops.

(2) (a) The Minister shall as speedily as possible supply to the Contractor a schedule of quantities setting forth the quantity of each and every class of material and labour in the works (including subcontract works) at the rates allowed by the master schedule. Such prices for those quantities shall be totalled and a sum equal to 5 per cent thereof added for contractor's profit. To the total of these shall be added a further sum equal to



2½ per cent of that total for overhead charges, and the sum so arrived at shall be shown and described as the initial price.

(b) Within three days after receiving the said schedule of quantities with the initial price endorsed, or such further time as the Minister may allow, the Contractor shall return the same to the Minister with a schedule (hereinafter called the list of adjustments) showing the adjustments which he claims in respect of -

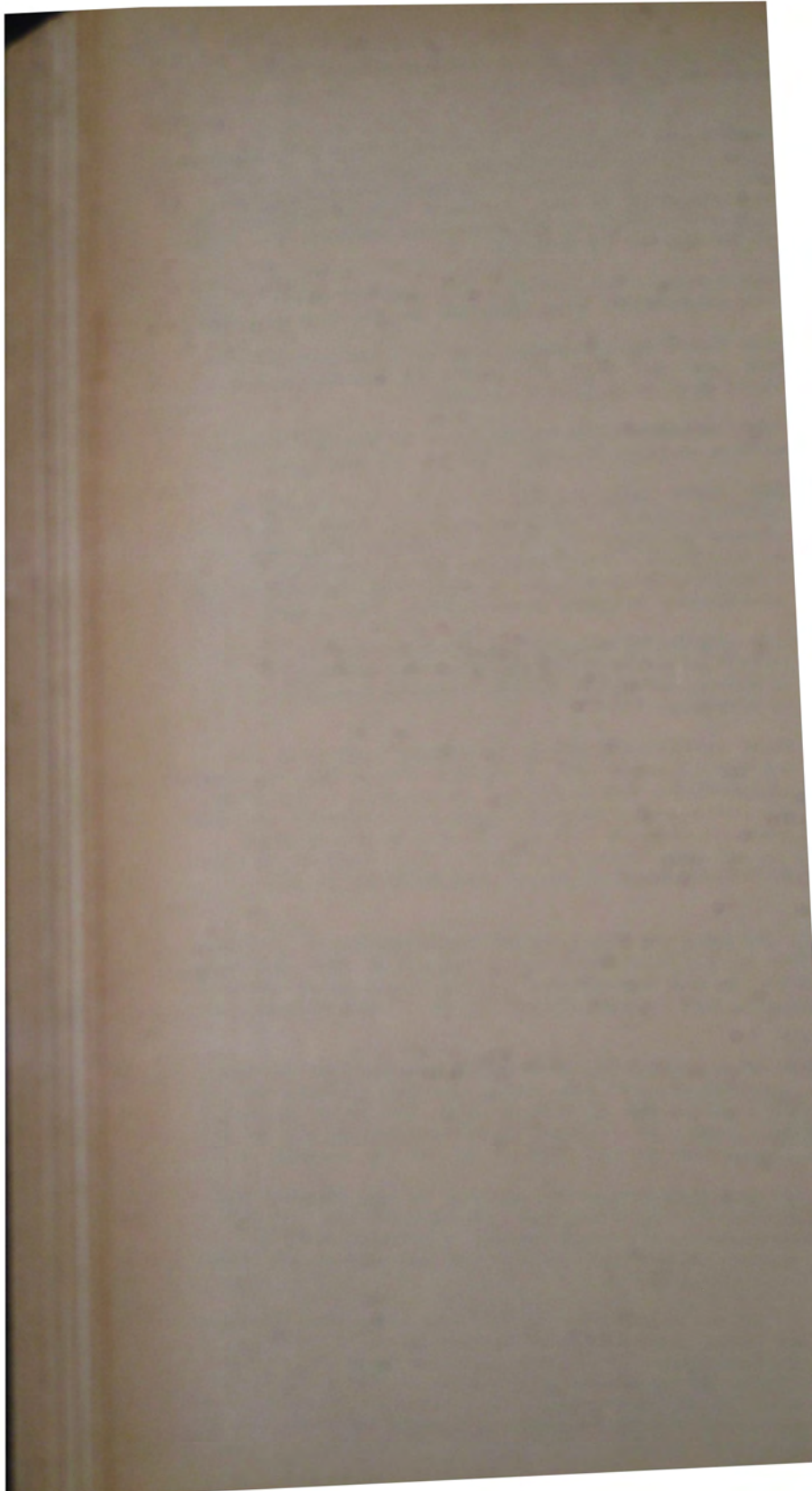
- (i) Fares, travelling-time, and country money which the contractor will require to pay his workmen;
- (ii) Any boarding-allowance (up to a maximum of 30s. per week per man) and costs of accommodation which he is required to pay;
- (iii) All increases and reductions in freight charges having regard to the location of the work;
- (iv) Any extra payments, with profit and overhead allowances as in paragraph 2 (a) above, which he claims to cover the cost of features peculiar to the work - for example, extra excavations, and concrete, preparation of existing structures for additions, special foundations, etc.; and
- (v) Any errors of commission or omission in the schedule of quantities or in the prices or adjustments which in his opinion require correction.

(c) Within seven days after receiving such list of adjustments the Minister shall either advise the Contractor that the adjustments are accepted or appoint a Quantity Surveyor not previously engaged upon the contract to examine the items in dispute and inform the Minister what corrections, if any, should be made. The finding of such Quantity Surveyor shall be final and binding on all parties.

(3) (a) As soon as the list of adjustments is settled as provided in the last preceding paragraph, the Minister shall return to the Contractor his schedule of quantities duly completed and adjusted showing the fixed contract price.

(b) Notwithstanding the fixing of the said contract price in accordance with sub-paragraph (a) hereof, the said contract price may be varied with the prior approval of the Commissioner of Defence Construction in any of the following cases and to the following extent, namely :-

- (i) If the Contractor has to pay to any workman the difference between his actual earnings and the minimum weekly wage in any one week, then by adding to the contract price the amount of such difference;
- (ii) If there is made or arises any addition, reduction, or other alteration of the contract or other circumstance in respect of which any other provision of this contract provides for an alteration of the contract price, then by increasing or reducing the fixed contract price as required by that provision;
- (iii) If any price for freight charges, material, or



labour is varied materially by competent authority, then by increasing or reducing the contract price by the amount of such variation that has been paid by or saved to the Contractor;

- (iv) If any article, material, or labour is in accordance with the General Conditions of Contract incorporated in the works in place of material or labour for which allowance has been made in the contract price, or if there is any addition or reduction in accordance with the Conditions of Contract, then by increasing or reducing the contract price in accordance with the appropriate provisions of the contract;
- (v) If the actual cost of any item for which a p.c. or provisional sum has been allowed exceeds or is less than the sum so allowed, then by increasing or reducing the contract price in accordance with the provisions of the contract; and
- (vi) If through the occurrence of any of the contingencies specified in clause 11 of the General Conditions of Contract the cost to the Contractor of executing the works is varied in any respect for which no provision is made in the fixed contract price, then to the extent of such variation.

N.B. In terms of Head Office circular No. 1942/35 issued to District Engineers on 28 October 1942,⁽¹⁾ clause 7 was amended as under, following a conference between representatives of the Master Builders Associations, the quantity surveyors and officers of the Public Works Department :

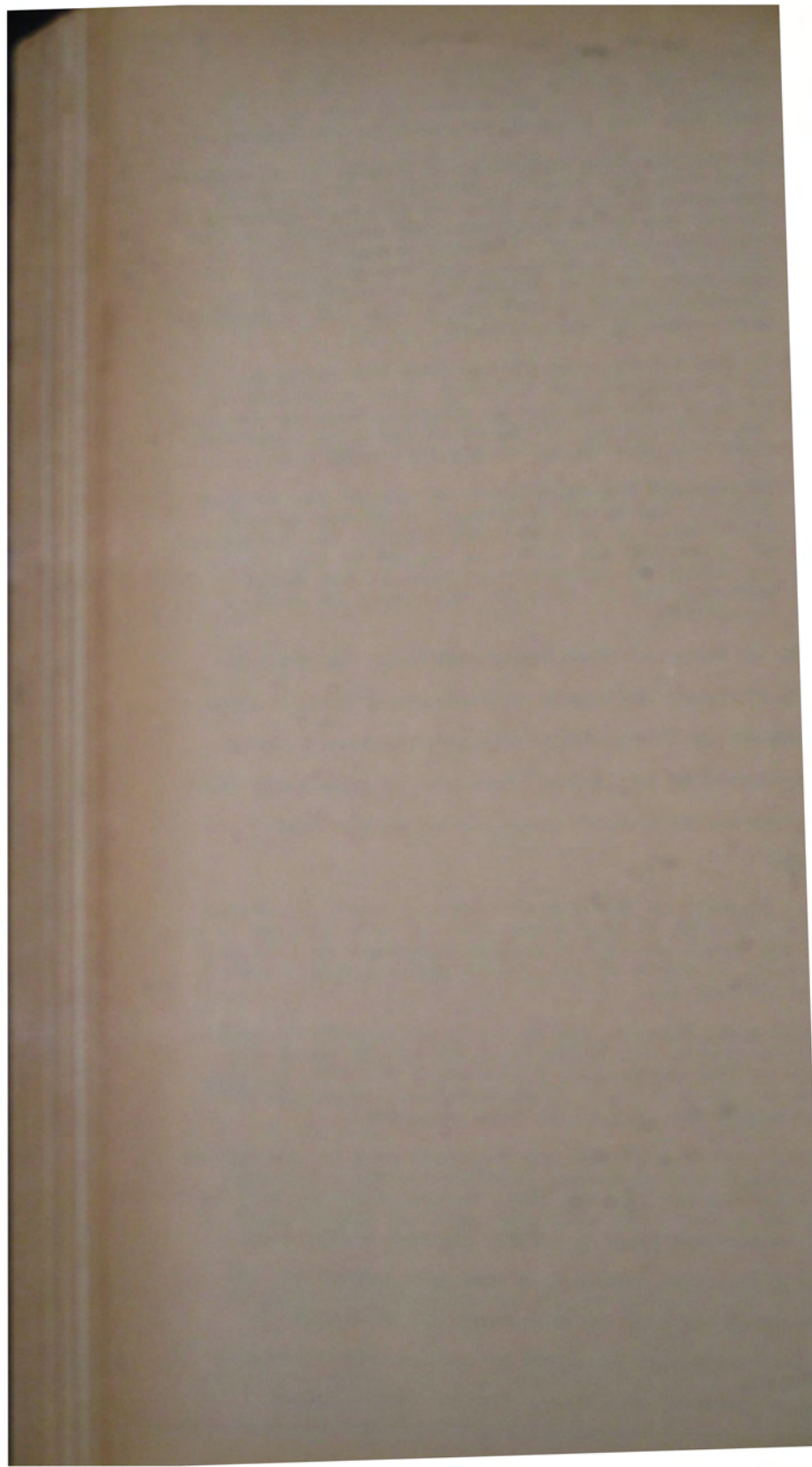
'(i) Payment to workmen of cost-of-living allowance will be refunded to the contractor up to a maximum of 3% of the total scheduled labour cost, and to this payment shall be added 5% for profit and 2½% for overhead (a new provision).

(ii) Five percent and 2½% will be payable on costs of accommodation and meals provided by and under the control of the contractor (amending 2 (b) ii), but not in respect of meals and accommodation neither provided by nor under the control of the contractor.

(iii) Neither profit nor overhead will be allowed on (a) articles and apparatus provided by the Government (but handling and installation charges will be paid for at agreed rates), (b) sick pay, and (c) allowance to bring weekly earnings up to the minimum weekly wage.

(iv) The last sentence of the sub-section (c) of clause 7 (2) is deleted and the following substituted therefor, to be read as paragraph (4) of clause (7):

"All disputes as to rates of payment and conditions of contract shall be referred to a committee consisting of the Government Architect, the Assistant Under-



Secretary, Public Works Department, and the District Engineer of the district (or his deputy)." ,

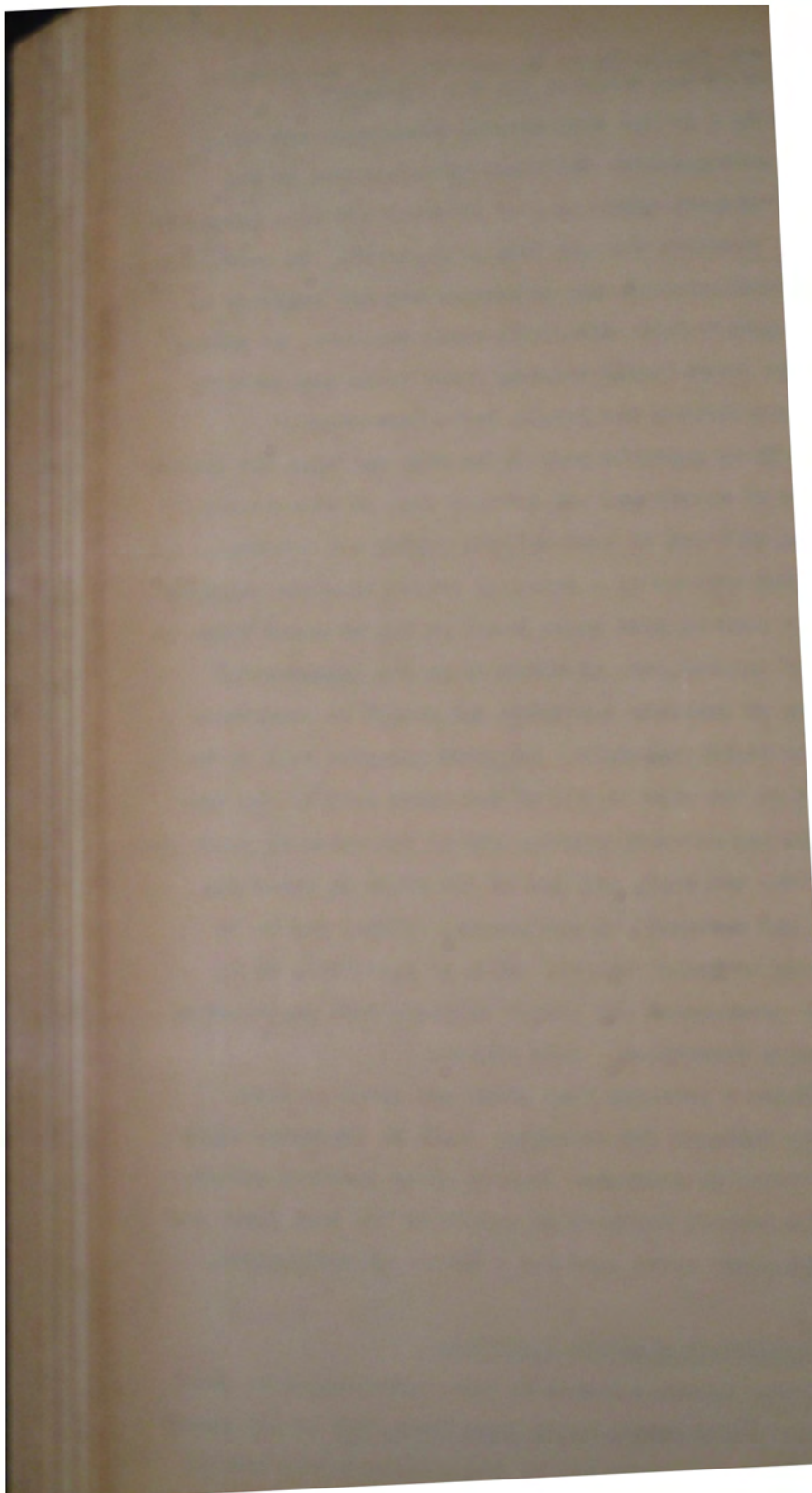
Clause 8 of the same special conditions set out a list of consequential and other modifications to the standard general conditions of contract (PW 64), necessary to adapt them for the new form of contract. In particular, it was provided that the contractor was not required to insure against fire, builder's risk, accident, or public risk, the Crown itself bearing these risks and settling any claims through the Public Works Department.

Progress payments were to be made up 'upon the priced schedule of quantities and settled list of adjustments, with the addition of contractor's profit and overhead....' but in the absence of a properly priced schedule progress payments were in most cases based on the estimated value of the work carried out, as measured by the departmental officers or quantity surveyors and priced in accordance with the master schedule. Progress payments were to be allowed at the rate of 90% of the wages paid by the contractors and sub-contractors, 90% of the value of materials built into the work, and 50% of the value of materials, plant, and machinery on the ground. Timber was to be expressly excluded from the value of materials, as by special arrangement all timber supplies were purchased by the Timber Controller. (see below).

Clause 9 provided that plans and specifications properly numbered and deposited could be incorporated in the contract by reference instead of by physical attachment - a measure designed to permit of the same plans and specifications being used for a number of contractors.

5. ENGAGEMENT OF QUANTITY SURVEYORS.

Master schedule contracts were administered in their entirety by the Public Works Department, but as the system entailed the extensive use of quantity surveyors both in compiling the master schedules and in arriving at the



contract prices, the services of four quantity surveying firms in private practice were engaged by the Government. The Department's own quantity surveying staff was few in number and quite inadequate to handle the vast volume of work involved.

The quantity surveyors concerned and the district allocated to them were as follows:

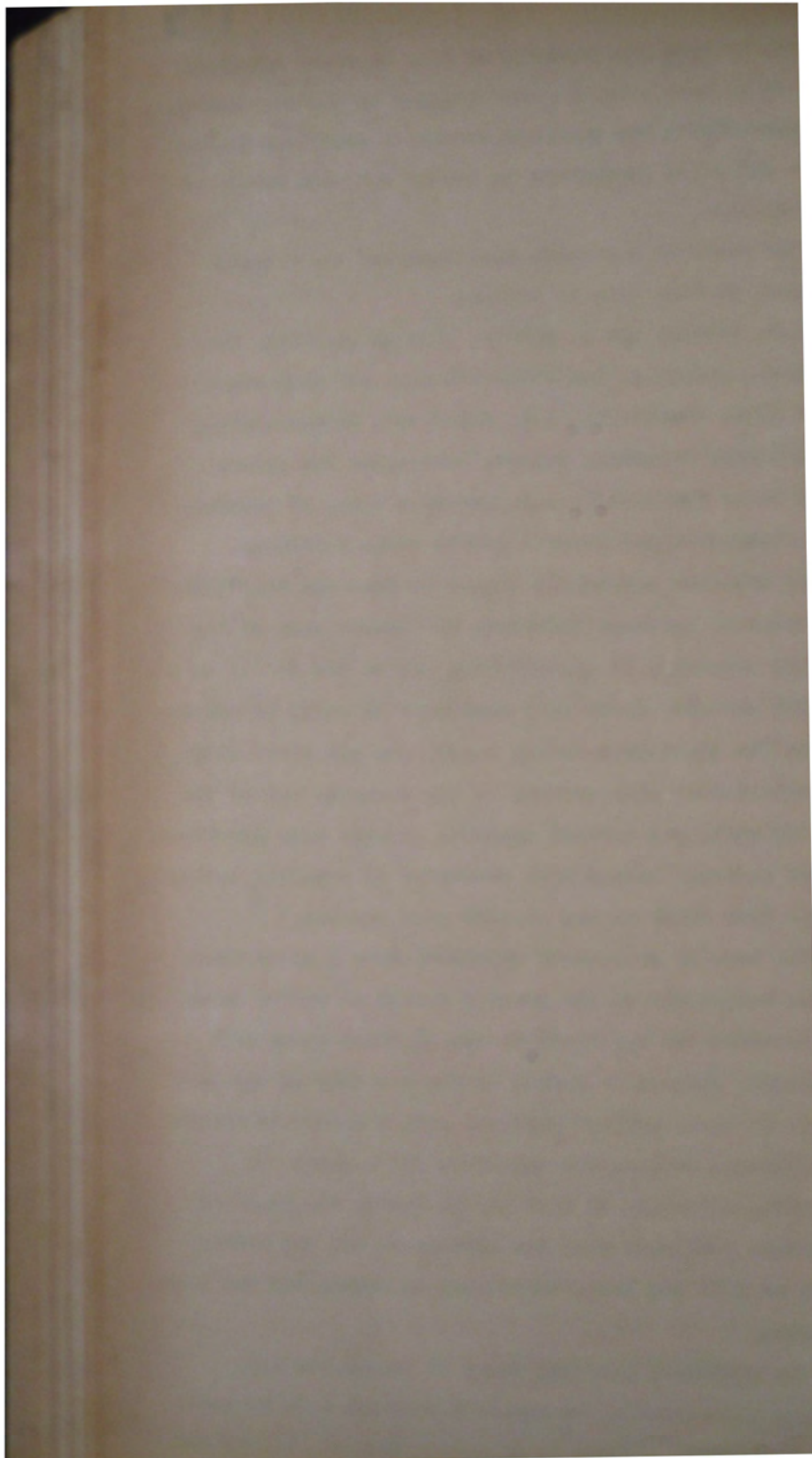
J.A. Stewart and A. Maltby, both of Auckland: the Whangarei, Auckland, Hamilton, Tauranga and Taumarunui public works districts; A.L. Robertson, of Wellington, the Gisborne, Wanganui, Napier, Wellington and Nelson public works districts; C.E. George & Sons, of Dunedin: the Christchurch and Dunedin public works districts.

By separate agreements signed in June and July 1942, each quantity surveyor undertook to 'devote such of his time and attention to the carrying out of his duties as a quantity surveyor under this agreement as shall be necessary for the greatest possible expedition and efficiency not inconsistent with economy in the carrying out of the same and shall not without approval in each case undertake private practice beyond work necessary to complete transactions upon which he has already been engaged.'

The term of engagement commenced from 8 April 1942, and was terminable at one month's notice on either side.

Remuneration was fixed at £62.10.0 per month (£750 per annum), subject to review by the Minister at the completion of three months' service, plus a refund of office and telephone rentals not exceeding £10 a month, a travelling allowance of 25/- daily, fares, the wages of assistants (not more than two seniors at 4/- per hour, others at 3/6) and their travelling expenses, and the cost of typing.

The provision limiting wages of assistants was modified subsequently, to enable higher rates to be paid to the principal assistants of Messrs Stewart, Maltby and



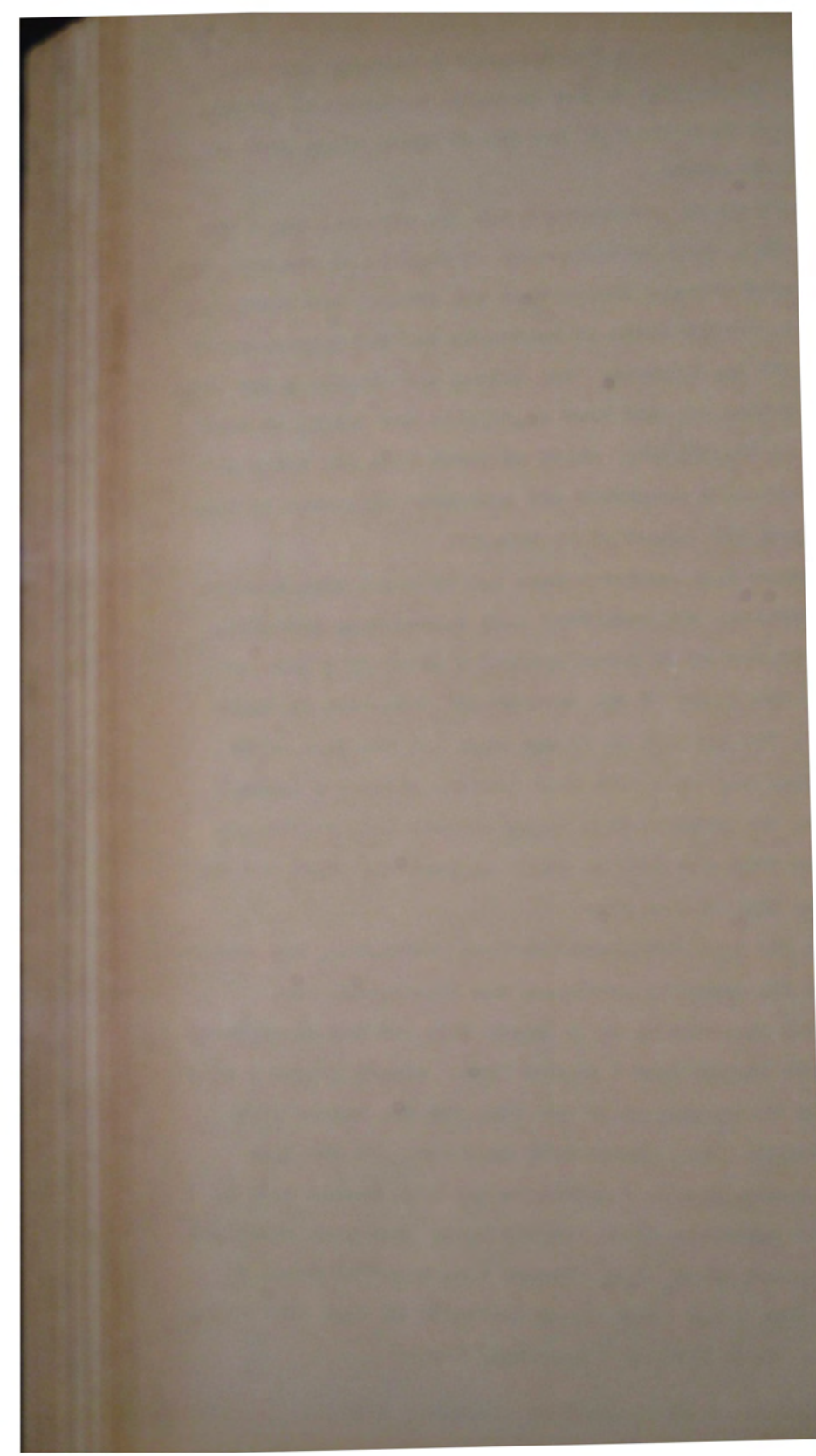
C.E. George & Sons. The Minister's approval was also obtained to payment to the quantity surveyors of mileage allowances in respect of the use of their motor cars on official business.

The rate of remuneration was not reviewed until the end of 1943, when in the course of reports to the Minister the Under-Secretary stated that Mr. Stewart had finalised about £2,700,000 worth of contracts and had approximately £1,500,000 to complete; Mr. Maltby had completed 242 contracts priced at just over £1,000,000 and had 78 in hand valued at £1,530,000; while by March 1944 Mr. Robertson had practically completed all contracts allocated to him, comprising 166 valued at £1,882,362.

Messrs C.E. George & Sons had by March 1944 handled 142 contracts, the completed work aggregating £691,659, with £389,657 still under action, a total of £1,081,316.

In the light of the information furnished in these reports, War Cabinet on 19 May 1944 (in the case of Mr Robertson) and on 4 July 1944 (Messrs Stewart & Maltby) approved the remuneration being increased to £1,000 per annum as from the date of their engagement. This did not apply to the Dunedin firm.

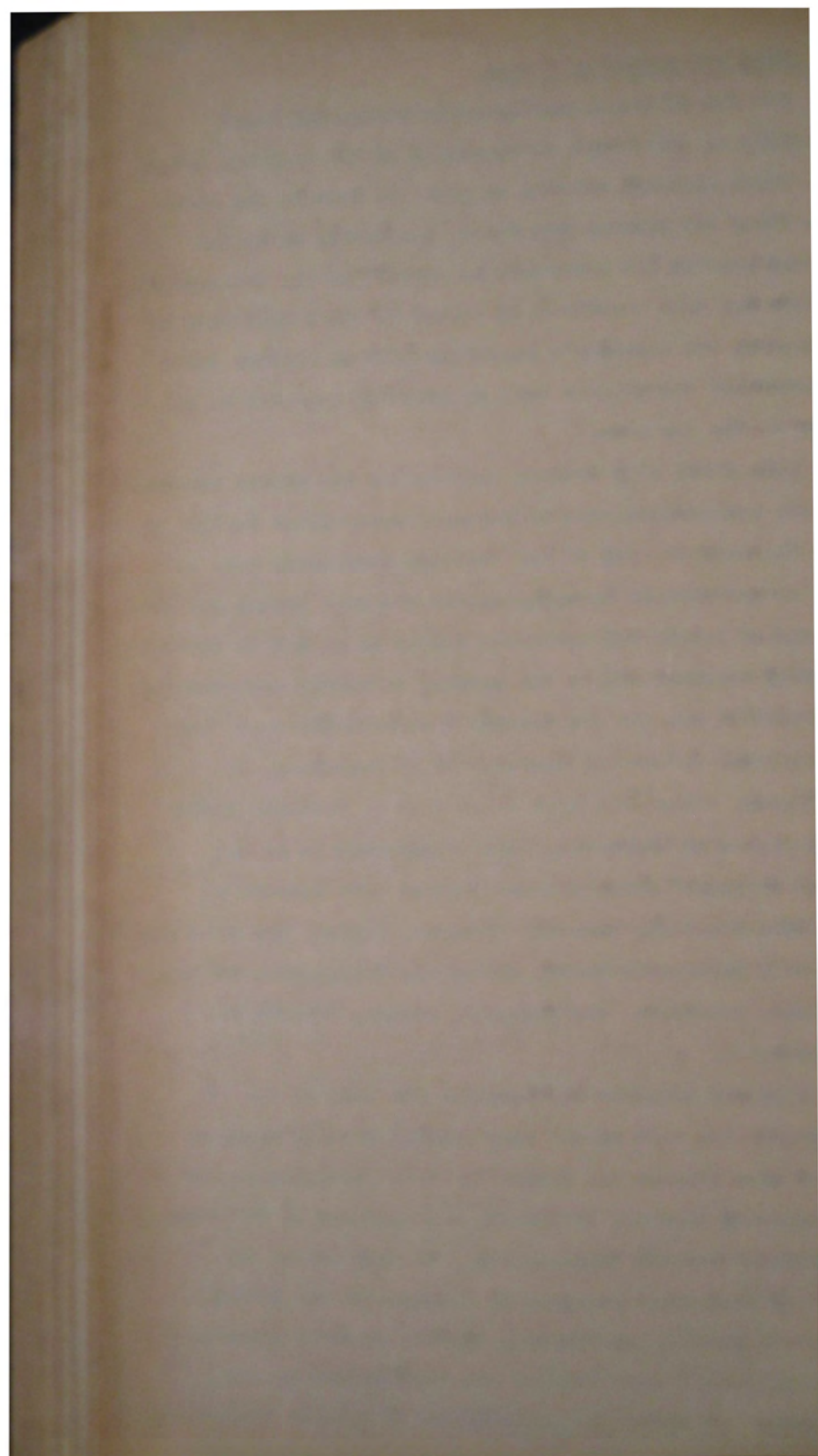
As the need for their services diminished, the engagement of the quantity surveyors was terminated. Mr. Robertson finished up on 31 March 1944 but was re-employed for three months from 1 August 1944. Messrs George & Sons' services terminated on 31 May 1944 and Mr. Maltby's on 30 September 1944, though both were retained for some months thereafter on a part-time basis to enable them to complete contracts which had not up to then been finalised. The services of Mr. J.A. Stewart were retained until 31 March 1946, a few outstanding contracts at that date being likewise dealt with on a part-time basis.



The use of the master schedule system was based primarily on the active co-operation of the building industry, which although willing to play its part in the crisis with which the country was faced, had merely up to the present carried out contracts as awarded by the Government and had not been consulted in regard to the possibility of organising the industry's resources into an all-out drive to construct the defence work so urgently required in all parts of the Dominion.

As a first step towards introducing the master schedule system, the Commissioner of Defence Construction decided to seek the co-operation of the builders themselves with a view to arriving at mutually acceptable unit prices for all classes of labour and materials likely to be met in defence building construction. The central authority representing the builders was the New Zealand Federated Builders' and Contractors' Industrial Association of Employers, of Wellington, affiliated with which were 17 district industrial unions of employers, usually referred to as the Master Builders' Associations. These were located at Auckland, Hamilton, Rotorua, Gisborne, Napier, New Plymouth, Wanganui, Palmerston North, Masterton, Wellington, Nelson, Blenheim, Greymouth, Christchurch, Timaru, Dunedin and Invercargill.

A master schedule was compiled for each of the 17 districts, the unit prices incorporated therein being as agreed upon between the Master Builders' Association and the quantity surveyor concerned, and approved by the Commissioner of Defence Construction. At each centre the quantity surveyors, assisted by officers of the Public Works and Housing Departments, studied evidence produced as to the cost of work carried out locally both by the Government and under the jurisdiction of private architects. From this the schedule rates for labour were determined.



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The rates for materials presented no difficulties, as timber costs were stabilised at a uniform price in the schedule and all other items were based on prices ruling at the time.

Although there were 17 building districts, it was found that 11 different schedules were sufficient, owing to the same rates applying in some cases to contiguous districts.

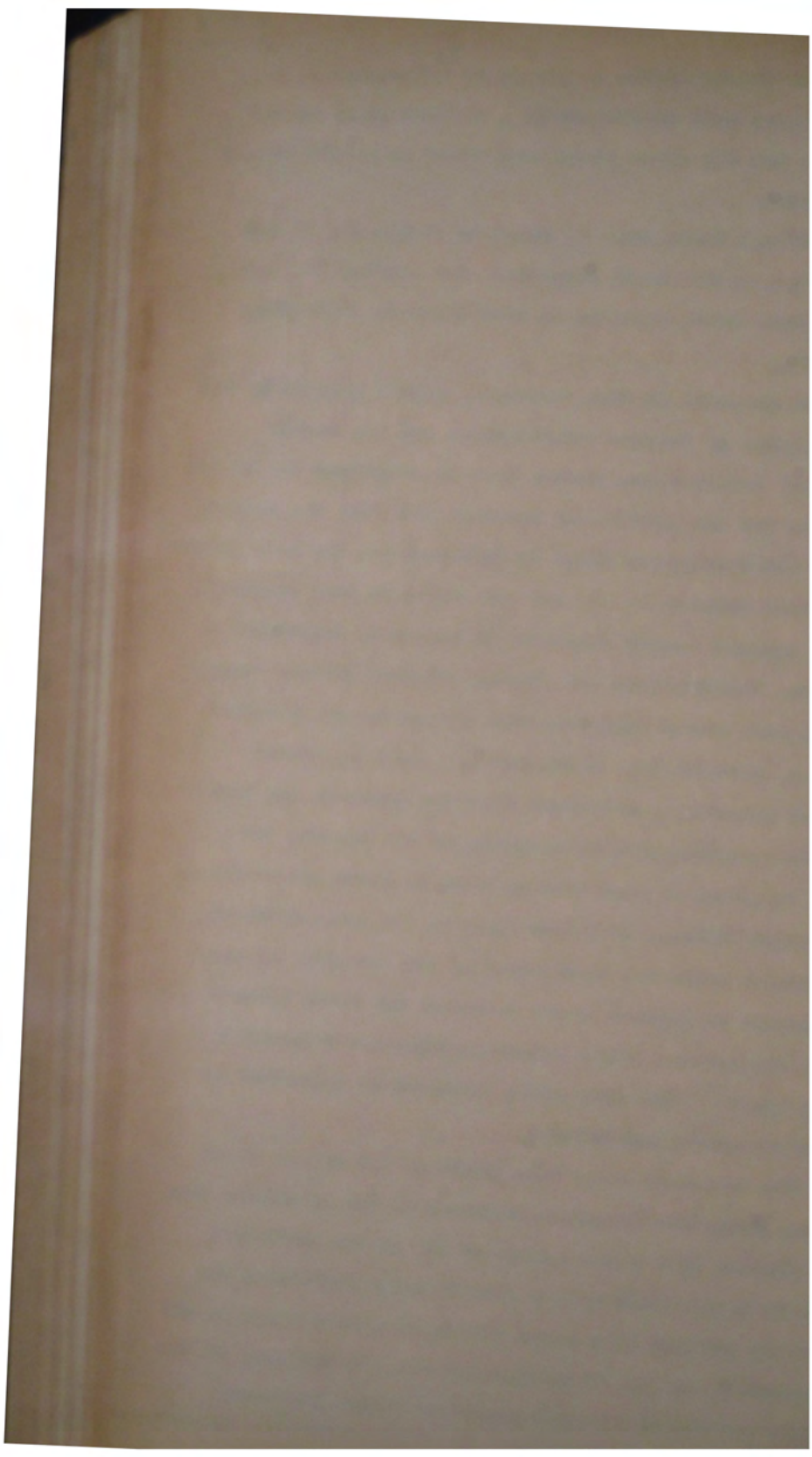
The preamble to each document, signed jointly by the Commissioner of Defence Construction and the Master Builders' Association, stated that it comprised the master schedule for the particular district and that the system as set out thereunder would be followed and the unit prices prescribed adopted on all defence works in that district.

A typical master schedule is appended. (Appendix 3)

The 'Instructions for Fixing Contract Prices' embodied in each master schedule were common to all districts and were divided into three parts. Part 1, headed 'Master Schedule', mentioned that the schedule had been made as comprehensive as possible at the outset, but would be added to from time to time as fresh materials or additional classes of labour came up for consideration. The labour rates had been based on the schedule of wages applicable to defence works (meaning the rates allowed under the Defence Works Labour Legislation Suspension Order 1942)⁽¹⁾ and such rates included an allowance to cover foremen's supervision.

The material rates were based on (a) prices fixed by the Price Investigation Tribunal if the materials were the subject of a price order, or (b) if the materials were to be supplied by the Public Works Department and were not subject to a price order, at prices fixed by the Department, or (c) if neither (a) nor (b) applied, at the prices payable by the contractor by direct purchase

(1) Serial Number 1942/65.

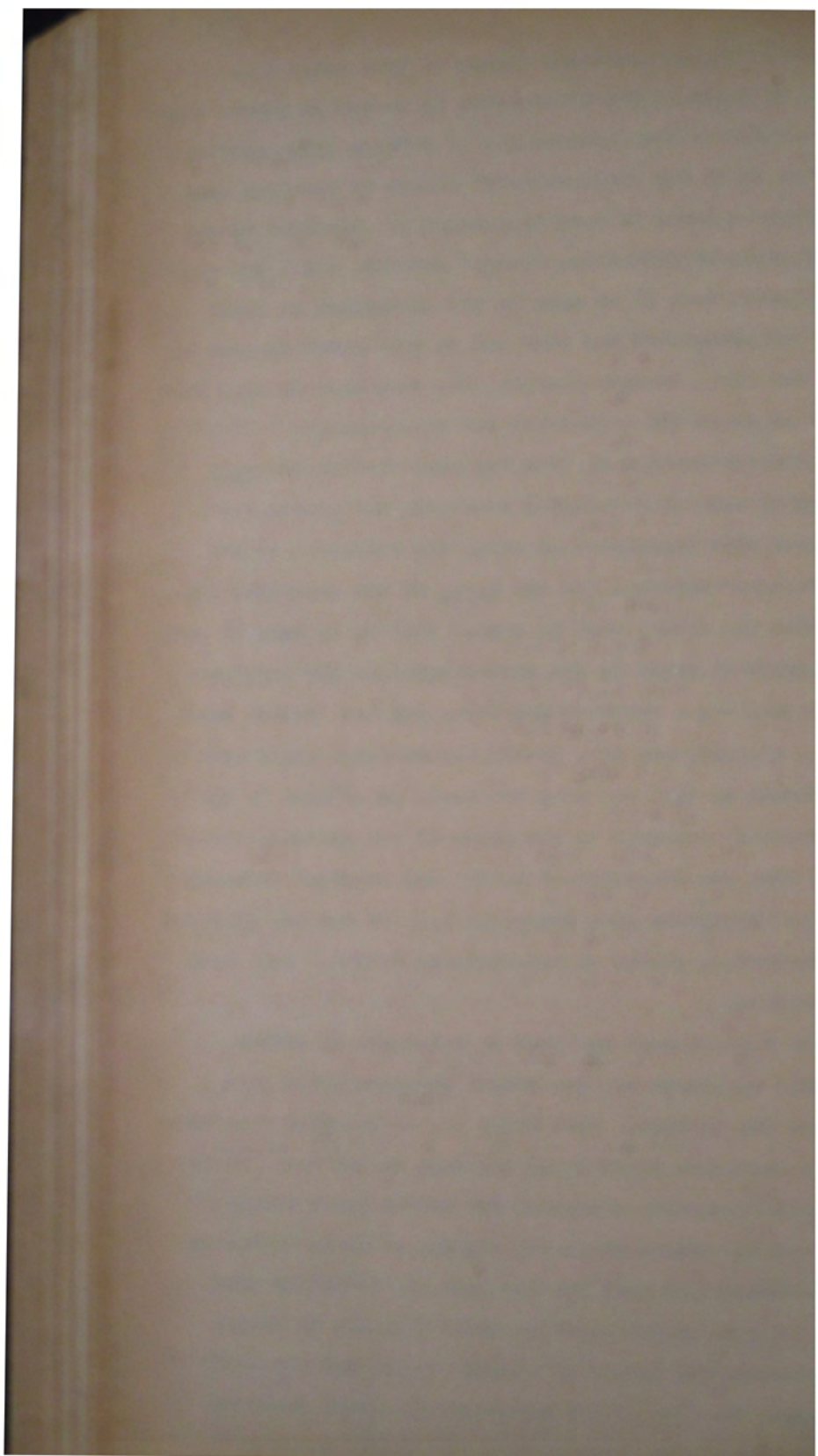


himself. It was expressly stated at this point that 'none of these (unit) prices were to be varied except with the consent of the Commissioner of Defence Construction.' Further on in the 'Instructions' clause 5c provided that adjustments would be made in respect of increased or reduced costs of materials, freight charges, etc. Any such adjustments were to be made on the production of proof that the contractor had been put to additional expense or that the cost, freight charges, etc were more or less than those on which the unit rates had been based.

The explanation of this was that whereas the unit prices of materials remained constant, and profit and overhead were calculated on them, the allowance in the contractors' schedule for the value of the materials represented the actual cost of same. That is to say, if the unit material price in the master schedule for supplying and installing a stopcock was 10/-, and the actual cost of the stopcock was 9/-, profit and overhead would be calculated on 10/- but only 9/- would be allowed in the contractors' schedule as the price of the article. This meant that the incidence of profit and overhead remained uniform throughout each district, i.e. it was not affected by fluctuating prices of materials as between, say, town and country.

It follows that the cost of materials in master schedule contracts was the actual purchase price plus freight and cartage. This being so, no question ever arose of the materials rates being too high or too low. It was the master schedule allowance for labour which really governed the extent of profit capable of being earned on the contracts and left the way open for efficient contractors with good workmen at their disposal to exceed considerably the margin of 5% profit (and 2½% overhead) envisaged when the master schedule rates were approved.

Part 1 of the 'Instructions for Fixing Contract

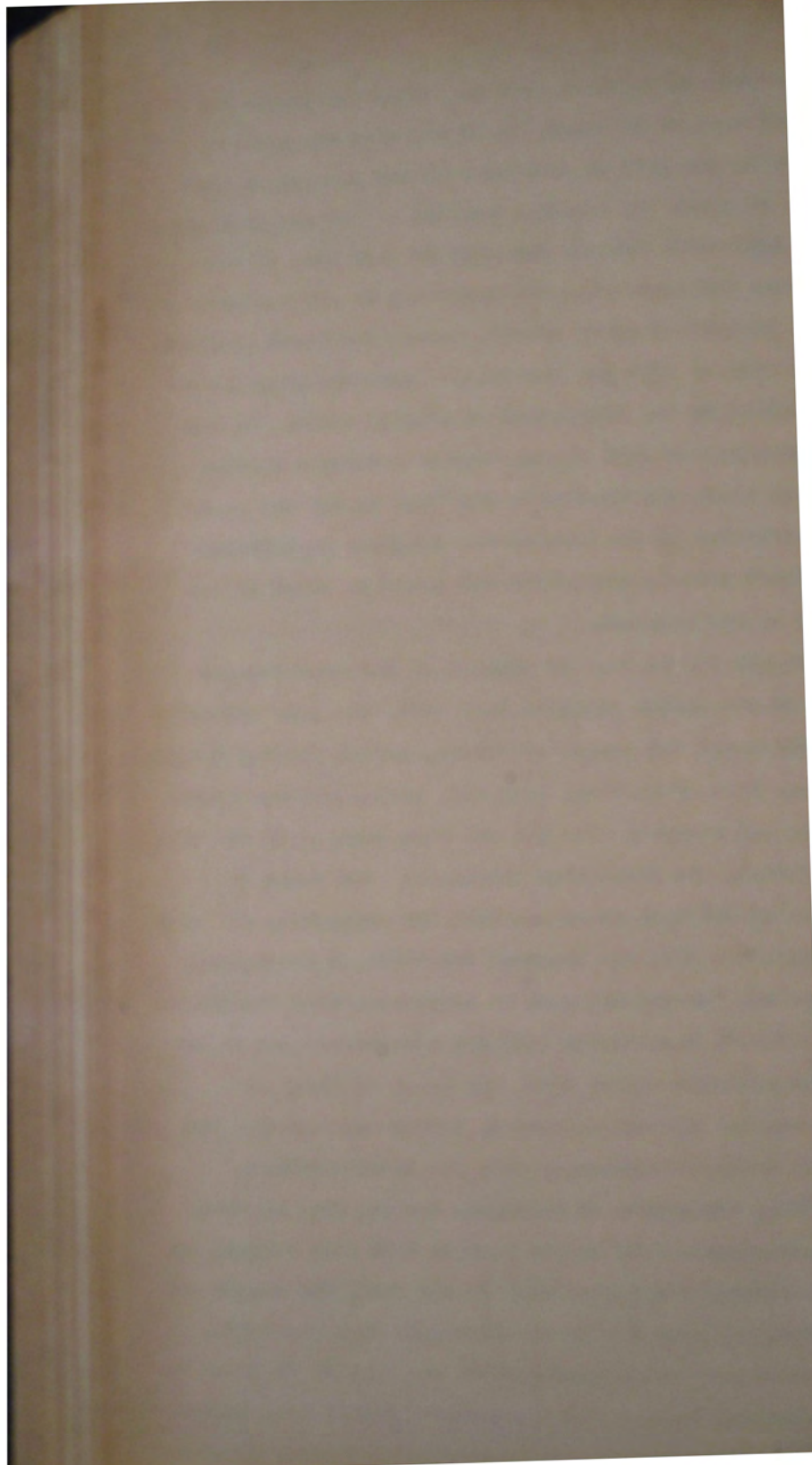


Prices' went on to state that the rates for labour and material were to be based 'as if the work was carried through in the city or town area of the particular districts to which the schedule applies.' If the work were to be undertaken outside the city or town area of the district, the contractor was permitted to add the cost of fares, travelling time, country money, and board allowance at the rate of 30/- per man-week. Accommodation was to be provided by the Department on country works. It was further provided that if wet weather reduced a workman's earnings below the minimum weekly wage in any one week (as prescribed in the Defence Works Labour Legislation Suspension Order), the difference would be added to the amount of the contract.

Except in the case of scantling, the measurements shown in the master schedule were nett, the rate including full allowance for waste, shrinkage, narrow widths, tongues, grooves, laps, mortising, tenoring, nails, clouts, brads, screws, and washers; also all dressing except, in the case of flooring, the final sand surfacing. The rates in respect of sanitary items provided for completing the work in compliance with the Drainage and Plumbing Regulations and By-Laws; electrical work in accordance with the Electrical Wiring Regulations 1935 and amendments; and in regard to asbestos-cement work, the rates included an allowance for all nails, clouts, screws and washers; and 'in all cases in conformity with the specifications.'

Where the length of scantling was ten feet or more, all measurements were to the nearest foot over inches, and to the nearest six inches over inches where the length was less than ten feet - with no allowances made for waste.

In respect of materials which required to be produced in a workshop (e.g. joinery, plumbers' requisites, heating and hot water services, electrical works, fibrous plaster,



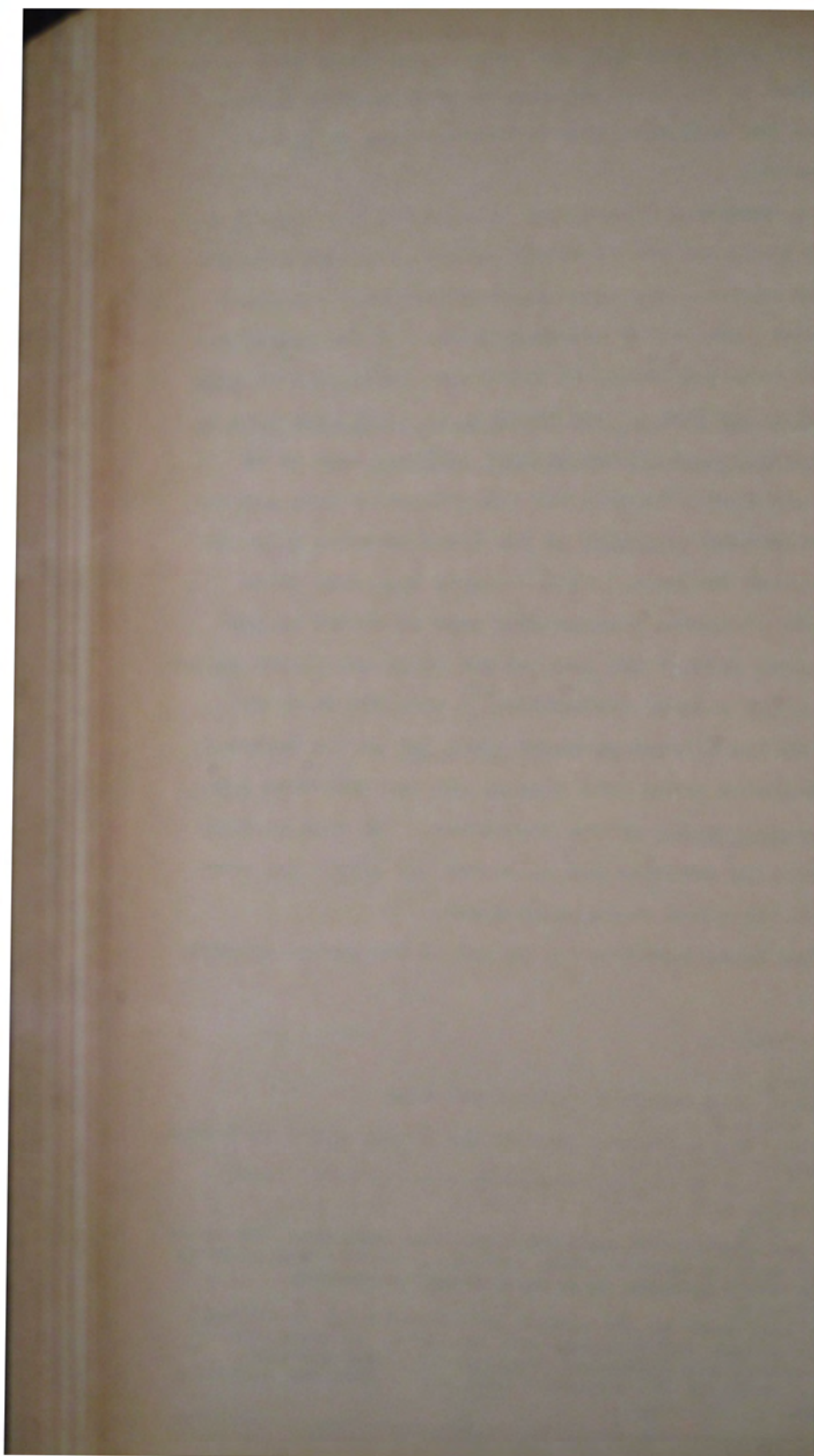
which the nett materials and nett labour rates were to be increased by way of allowances for sub-contract charges, whether the work were done by sub-contract or by the contractor.

An important stipulation (clause 8a) was that if any of the works set out in clause 8b were excluded from the general contract and other arrangements made for their execution, the master schedule prices for the quantities of materials and labour in every such excluded work upon or within six feet of any building or other structure to be constructed under the general contract were to be totalled, with 5% profit and $2\frac{1}{2}\%$ overhead added, and the resultant total included in the fixed contract price for the general contract. This followed the usual trade practice of making a contractor some allowance on sub-contracts, even if not carried out under his direct supervision. By a later instruction⁽¹⁾ only $2\frac{1}{2}\%$ to cover overhead was allowed on works taken out of the contract, the 5% profit being paid also on all sub-contracts under the direct control of the contractor. The same circular specifically excluded any allowance for profit and overhead on any other works carried out.

The works referred to, as set in the master schedule were:

- Excavating
- Brickwork
- Stonework
- All Metal work excepting structural work
- Metal Windows
- All Woodwork, including joinery and fixtures but excluding movable articles.
- Tiles, Asbestos-cement, Patent Fabric and other usual roofing work
- Drainlaying
- Plumbing (Structural and Sanitary) but excluding hot water and heating system, also excluding Ventilating systems and other systems of a specialised character.
- Gas Fitting
- Electrical work in the nature of reticulation including switchgear and fittings not exceeding 10 amps per circuit, and including cooking and water heating apparatus of the domestic type sufficient for not more than 10 persons.

(1) Head Office circular 1942/35 of 28 Oct 1942.



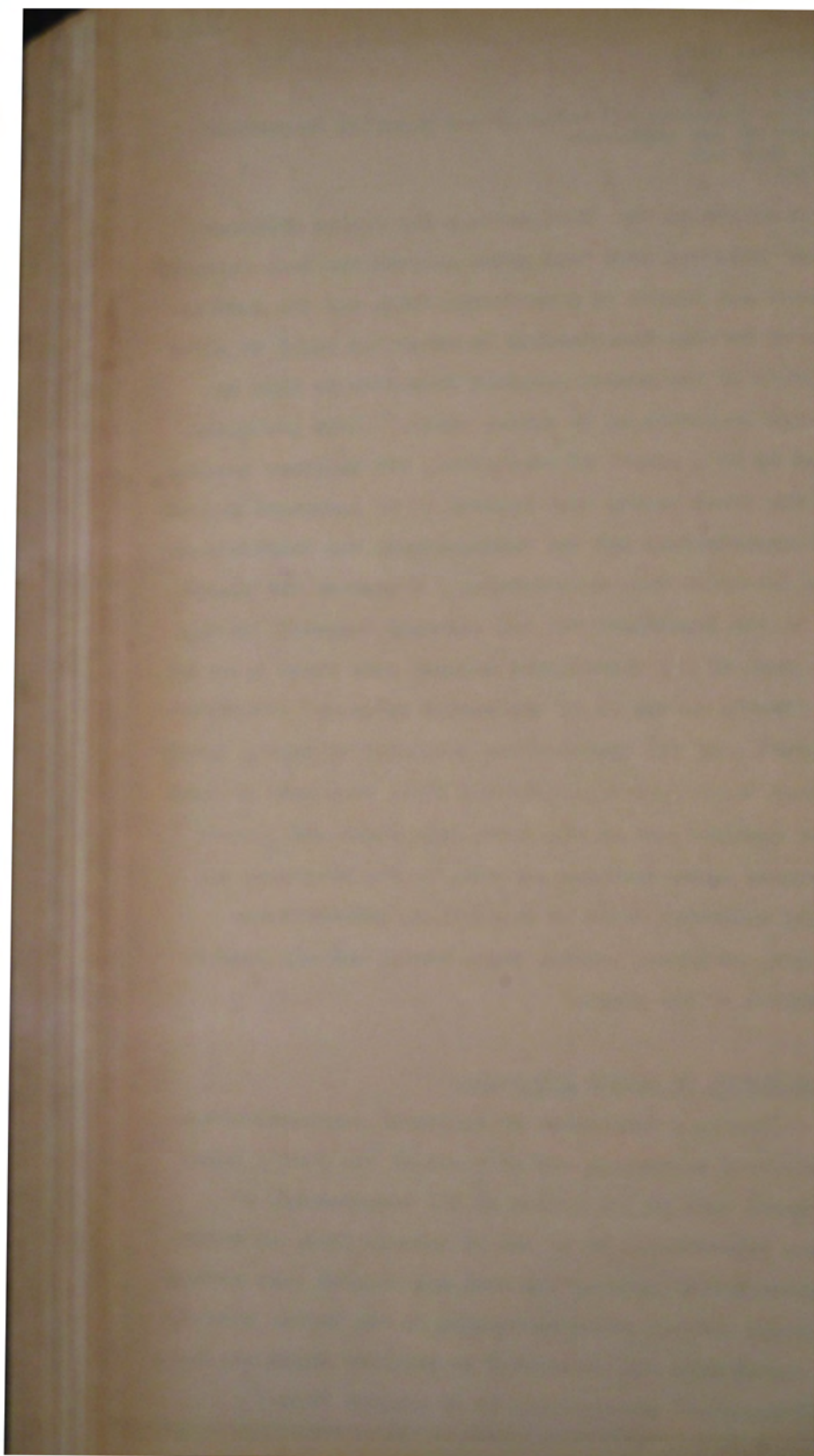
Plastering Work
 Fibrous Plaster
 Ceramic Tiles
 Terrazzo Flooring and other Lithic Flooring essentially
 part of the structure
 Paint Work and
 Glazing

A clause in the 'Instructions for Fixing Contract Prices' provided that 'The price allowed for each class of material and labour is provisional only, and the Commissioner of Defence Construction reserves the right to alter any price of the master schedule from time to time on evidence available as to actual costs.' This provision proved to be a source of contention, the builders arguing that the rates having been arrived at by agreement between their associations and the Commissioner, the Commissioner could not alter them unilaterally - a premise not acceptable to the Government but not strongly disputed; in any case, most of the alterations brought into force later on were firstly agreed to by the Master Builders' Federation.

Part 1 of the Instructions concluded by saying 'every contract based upon this schedule shall be deemed to vest in the Commissioner or his agent full right and liberty to examine every document relating to the contract, including accounts, bills of quantities, calculations, receipts, invoices, orders, wages books, and all records in respect of the works.'

7. AMENDMENTS TO MASTER SCHEDULES.

Following a conference of builders' representatives, the quantity surveyors, and officers of the Public Works Department held in the office of the Commissioner of Defence Construction on 15 and 16 October 1942, at which the principle of grading the work was adopted (see section 12 hereof) certain other amendments to the master schedule were agreed upon and circulated to District Engineers and Master Builders' Associations on 28 October 1942. ⁽¹⁾



(a) As all schedule rates were deemed to include an allowance for plant, no claim for plant would be recognised.

(b) Regarding payment for day work not carried out as part of a larger contract, if no materials were supplied by the contractor, the rates approved were: tradesmen 4/- per hour, labourers 3/6. Where materials were supplied, the cost of same at schedule rates was allowed, together with 3/6 per hour for tradesmen and 3/- for labourers. In either case the actual time and rates paid to foremen were recoverable. All payments for day work under this agreement were plus 5% profit and 2½% overhead.

(c) Profit at 5% and overhead at 2½% were payable on all 'prime cost' sums expended by the contractor except that special agreements would require to be entered into where the p.c. sums were large in proportion to the total value of the contract and the contractor supplied the article or installation concerned.

(d) Special agreements as to profit and overhead were also to be arranged in respect of:

- (1) Sub-contracts not included in those listed in clause 8b of part 1 of the master schedule.
- (2) Prefabricated work, including huts.
- (3) Steel supplied by the Government.

(e) The master schedule rates were not to apply to prefabricated work, including huts.

(f) Communications from builders or quantity surveyors relative to master schedules and conditions of contract were not to be sent directly to the Commissioner of Defence Construction, the correct channel being through the Assistant Under-Secretary of the Public Works Department.

(g) Any proposed amendments to master schedule rates by quantity surveyors or public works overseers must be sent to the Assistant Under-Secretary for approval by him before adoption.

(h) Maintenance was to be the responsibility of the contractor in accordance with the conditions of contract. (This cancelled a clause on page 2 of the master schedule indicating that the Public Works Department would undertake maintenance).

(i) Sales tax was not payable on pre-fabricated hutments.

(j) Wherever possible a fixed price must be submitted to the Department within one week from the date of allocation of the contract. Such price was to be as complete as it was possible to assess, unassessed items to be dealt with as extras or reductions.

'Yellow' Schedule. The district master schedules, as approved by the Commissioner of Defence Construction on behalf of the Defence Construction Council, had green



covers. There was handed to the Commissioner of Defence Construction in July 1942 a master schedule in respect of the Canterbury district with a yellow cover and purporting to have been agreed upon as between the quantity surveyor and the Canterbury Master Builders' Association. This 'yellow schedule' as it was called, differed in several essentials from the official master schedule, and the Canterbury Master Builders' Association was immediately advised that it was not to be brought into use. The association protested, but the Commissioner of Defence Construction ruled that the official schedule with the green cover was the only one which could be recognised.⁽¹⁾

The quantity surveyors at Dunedin had already priced several works in accordance with the 'yellow schedule' and this meant that they had to be gone over again - leading to delay in the finalisation of the contracts concerned.

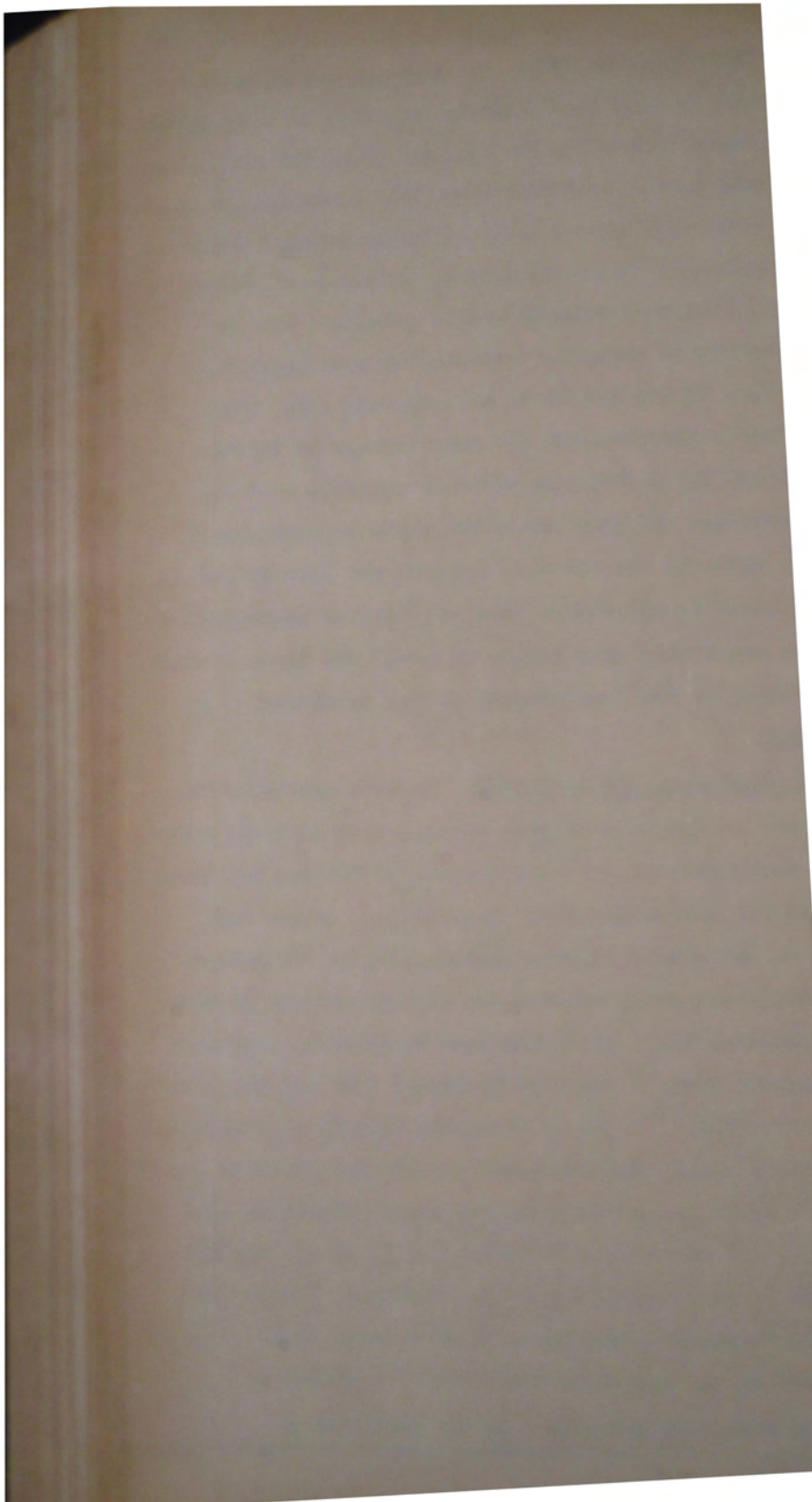
Further Amendments and Additions. Various amendments to the master schedules were made subsequently to their issue, by agreement between the Commissioner of Defence Construction and the Master Builders' Federation. These were mostly in the nature of minor alterations to the labour and maintenance rates allowed for certain classes of work.

Amendment No. 1 was circulated to quantity surveyors on 14 August 1942,⁽²⁾ No. 2 on 24 August 1942 and No. 3 on 3 November 1942.⁽³⁾ No. 2 included, as well as variations to the unit rates, the amendment already mentioned to sub-clause 8(a) of the preamble to the master schedule, substituting 2½% overhead only instead of 5% profit and 2½% overhead on works taken out of the contract. This was conveyed to District Engineers on 28 October 1942. Amendment No. 4, issued in March 1943⁽⁴⁾ related to schedule rates for painting. At the same time a

(1) 32/9025/7, p.1.

(2) Ibid.

(3) 32/9025/7, p.2.



supplementary schedule covering heavy timber construction was released.

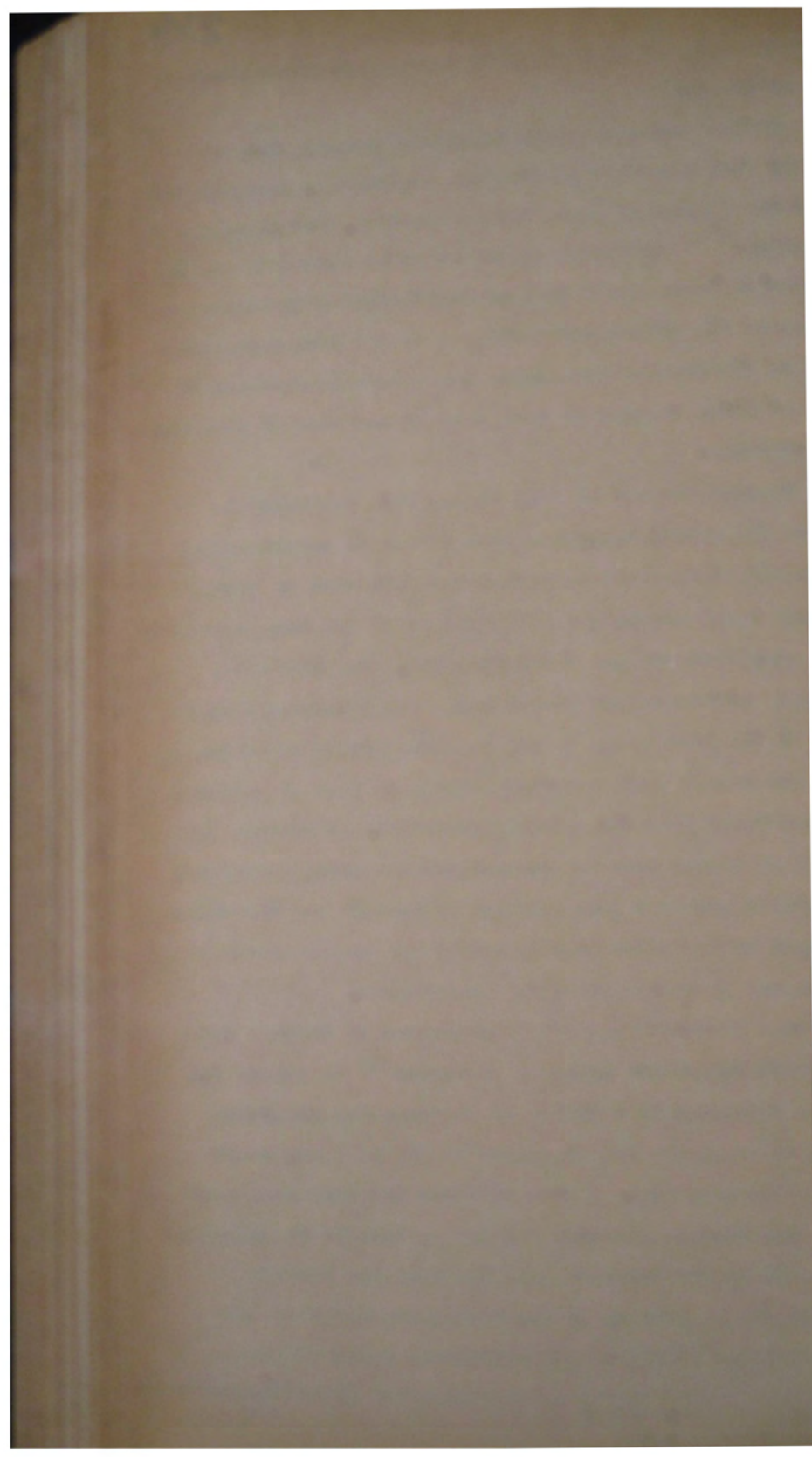
Further amendments and additions brought into effect during 1943 concerned plastering, engineering services and heating, electrical work, fabric roofing, drainlaying, and plumbing. (1) Agreement as to the rates allowable was not reached without a good deal of negotiation with representatives of the trades concerned, as it was much more difficult to standardise the labour and materials contents of some of these classes of work than in the case of straight-out building.

Towards the end of 1943 it was felt desirable to revise the master schedules with a view to consolidating the numerous alterations authorised from time to time, thereby facilitating the finalisation of the many contracts then completed but not fully paid for. The different quantity surveyors had placed their own interpretation on some of the provisions in the existing master schedule, with the result that a certain amount of lack of uniformity had crept into the pricing procedure. Moreover, the extent of profit made by contractors was being criticised in certain quarters (see section 12 hereof) and the whole question of the rates payable under the master schedule system was in course of being investigated.

On 6 November 1943 the Commissioner of Defence Construction instructed quantity surveyors (2) to revise the master schedules as a matter of urgency, the intention being to apply the new schedules to all work commenced after 1 January 1944. This date was put back to 1 April 1944, but despite pressure brought to bear on the quantity surveyors by the Commissioner, the only new schedule adopted was in respect of the Wellington district, and this excluded plumbing. In forwarding a copy of the

(1) 32/9025/7, p. 3 & 4.

(2) 32/9025/7, p. 3.



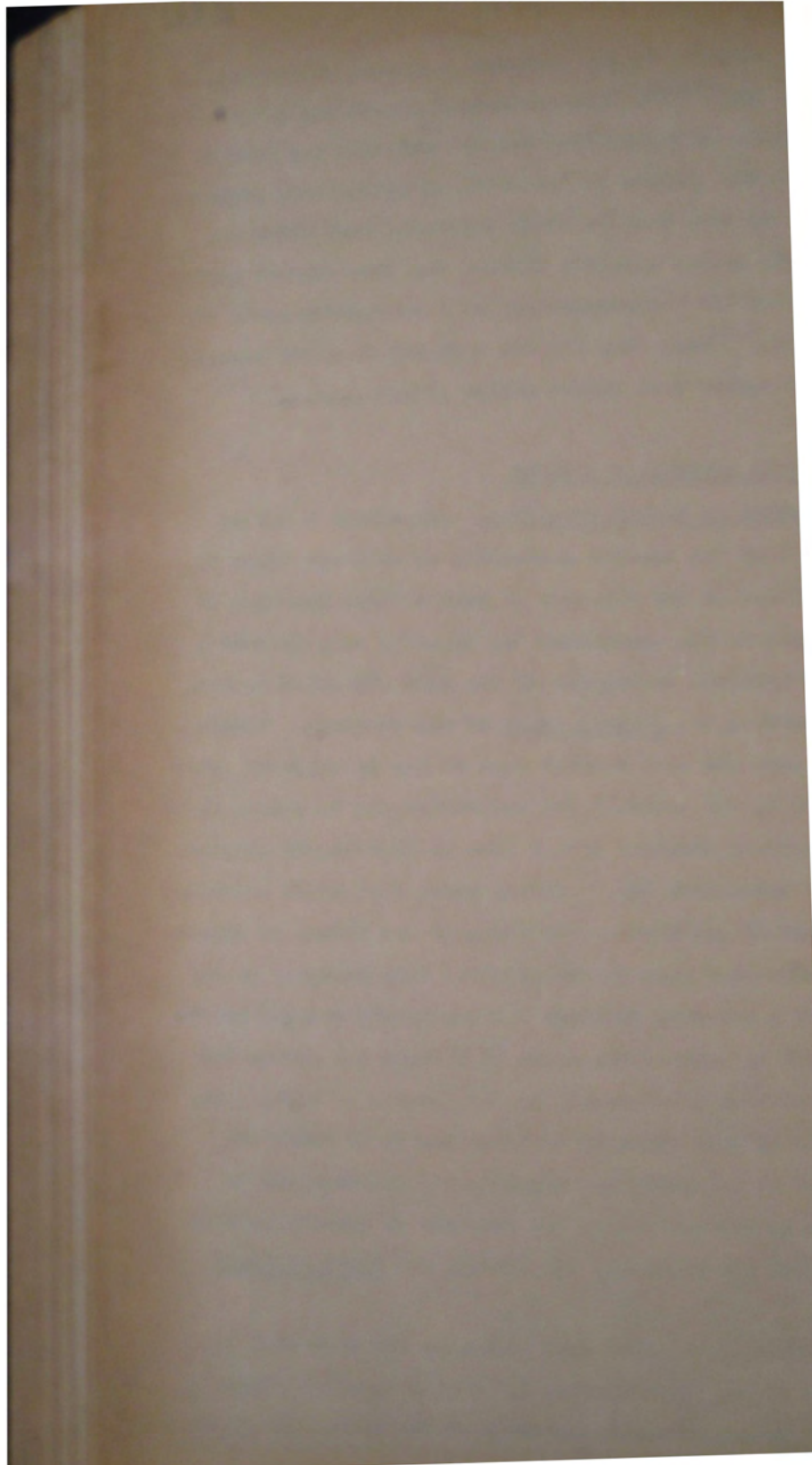
revised schedule to the District Engineer, Wellington, on 18 July 1944⁽¹⁾ the Under-Secretary quoted the Commissioner of Works as ruling that the new schedule was only to be used for the purpose of 'cleaning up outstanding payments.' Indeed, by this time no fresh contracts were being let under the master schedule system, the Commissioner having instructed the Under-Secretary in a memorandum dated 13 July 1944⁽²⁾ that 'For all new work let from now onwards the Department must obtain tender prices.....'

8. MASTER SCHEDULE PROCEDURE.

Preparation of Priced Schedules. Sub-clause 2 (a) of clause 7 of the special conditions of contract (form PW 71X) placed on the Minister of Public Works the onus of supplying to the contractor 'as speedily as possible' a priced schedule in respect of the work allocated to him, i.e. showing the initial price of the contract. Within three days (or such further time as may be allowed) after receipt of the schedule the contractor was to return it to the Minister together with a list of adjustments claimed (under sub-clause 2b). Within seven days after receiving the list of adjustments the Minister was either to advise the contractor that the adjustments were accepted or to appoint a quantity surveyor not previously engaged on the contract to examine the items in dispute and inform the Minister what corrections, if any, should be made. The finding of such quantity surveyor was to be final and binding on all parties. Finally, the Minister was to return to the contractor his schedule of quantities duly completed and adjusted, and showing the fixed contract price.

Substantially the same procedure was laid down in Part 2 of the 'Instructions for Fixing Contract Prices' in the master schedule, except that the words 'quantity

(1) 32/9025/7, p.4.
(2) Ibid



surveyor' were substituted for the word 'Minister'. The quantity surveyor was also authorised, where he thought it necessary, to re-survey the work or any portion of it before releasing the priced schedule of quantities.

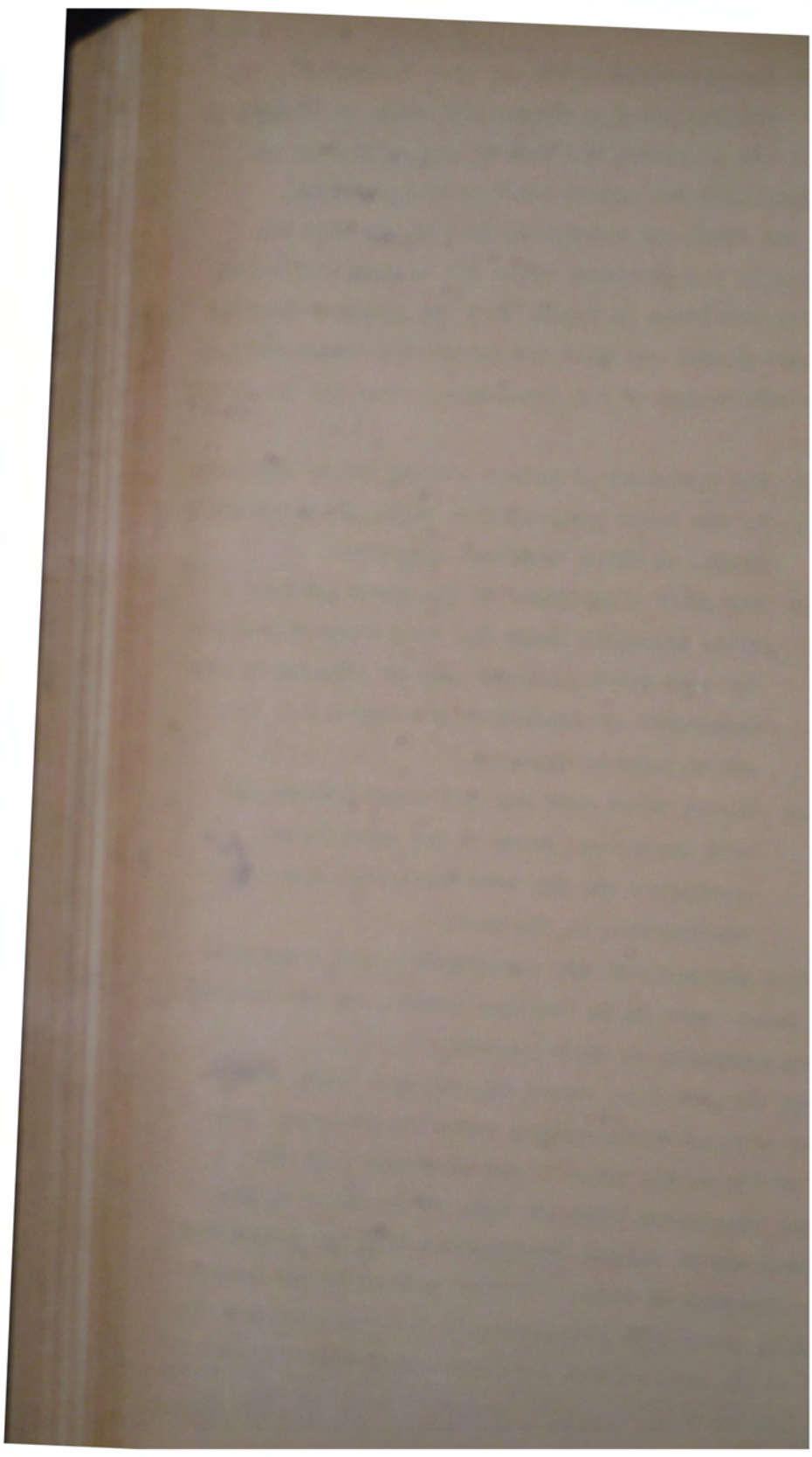
In the third and concluding part of the same instructions it was provided, under the heading 'Variation after Contract Price is Fixed' that the quantity surveyor was to investigate and make his report and recommendation for the information of the Commissioner upon the following claims:

- (a) For variation of prices arising out of decisions by the Price Investigation Tribunal, Arbitration Court, or other competent authority.
- (b) For other alterations to the fixed contract price allowable under the conditions of contract 'if such claim is based upon or affected by the assessment of quantities of materials or the prices payable therefor.'
- (c) Claims based upon any difference between the nett quantities shown in the schedule of quantities and the nett quantities actually incorporated in the work.

Any other applications for variations to the fixed contract price were to be 'settled between the contracting parties according to their contract.'

At this point it should be mentioned that, with regard to minor differences between the procedure laid down in the master schedule and in clause 7 of the special conditions (form PW 71X), it was ruled by the Commissioner of Defence Construction that the latter was to be accepted as correct⁽¹⁾ 'the preface to the master schedule being only explanatory.' What had happened was that in the rush of compiling the master schedules and

(1) Letter of 6 July 1942 from Under-Secty to all quantity surveyors & memo of 10 July 42 from Under-Secty to all engrs, on 32/9025/7.



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having them distributed to the Master Builders' Association the quantity surveyors had omitted to submit the documents to the Public Works Department for perusal of the proposed procedure. This was substantially correct and had been formally approved by the Commissioner, but it was ambiguous in parts through loose wording and did not take fully into account legal considerations and the necessity for precise phraseology which are essential features of any departmental document relating to contracts.

Instructions to Districts. Engineers in charge of Public Works districts were advised of the new system of contracting by a circular memorandum from the Permanent Head dated 20 April 1942. ⁽¹⁾ This stated that competitive tendering had been abandoned and that henceforth all contracts would be 'arranged on schedules of quantities and prices based upon pre-arranged master schedules agreed upon between the Commissioner and the Master Builders' Association.'

The procedure to be followed was detailed as under:

- (1) Whichever office prepared the plans and specifications relating to a work to be carried out by contract would supply them to the appropriate quantity surveyor, who thereupon proceeded to compile a priced schedule of quantities (based on the master schedule for the district) which he returned to the District Engineer along with the plans and specifications. If Head Office had prepared the plans and specifications the priced schedule would be obtained similarly from the quantity surveyor stationed in Wellington, and sent to district office together with the plans and specifications when a contractor had been allocated for the work.
- (11) The District Engineer then submitted to Head Office the plans and specifications and the priced schedule of quantities showing the initial price, indicating also the proposed time for completion of the work. On receipt, Head Office referred the project to the Commissioner of Defence Construction for approval, the fixing of a priority, and the nomination of a contractor. The Commissioner's decisions on these points would be communicated by Head Office to the District Engineer.
- (111) The priced schedule of quantities was handed by the District Engineer to the nominated contractor, who would be required to sign contract documents and to commence the work forthwith, i.e.,

immediately after executing the documents. The final contract price, as distinct from the initial price shown in the priced schedule, was to be settled in terms of the special conditions of contract drawn up for use under the master schedule system. The District Engineer was to notify Head Office immediately if the contractor did not accept the work or if he (the District Engineer) knew of any objection to its being allocated to that particular contractor.

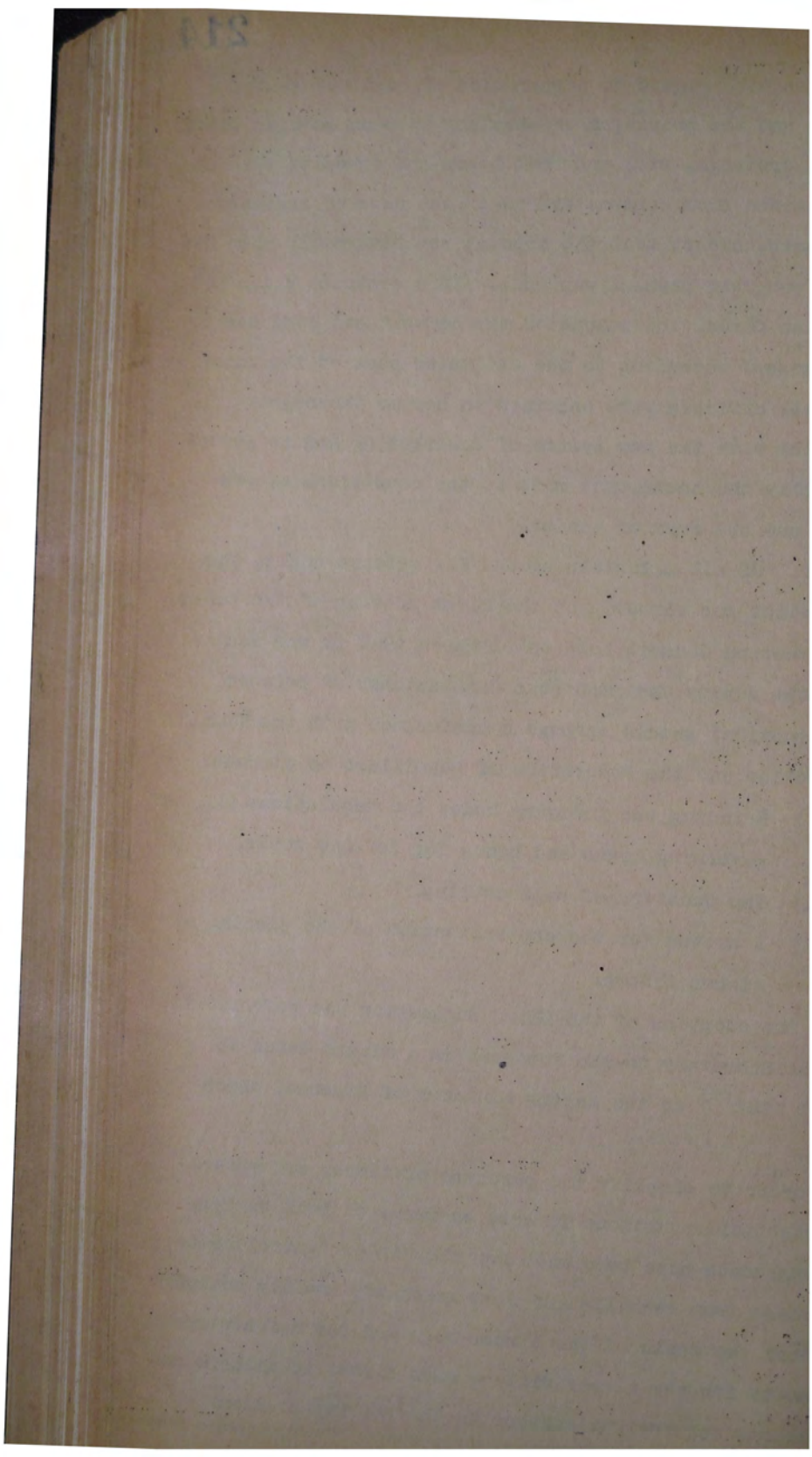
- (iv) The contractor, in conjunction with the quantity surveyor, then prepared his list of adjustments (freight, cartage, travelling time, fares, country allowance, etc), which was to be sent to Head Office for approval and return to the contractor. As soon as the list of adjustments had been agreed upon the quantity surveyor was to supply both the contractor and the District Engineer with a copy of the finalised schedule of quantities showing the fixed contract price.
- (v) After the fixed contract price had been settled, no further adjustments were to be permitted except as allowed in the conditions of contract and no variations to a contract were to be made without Head Office approval.

These instructions, which summarised the procedure laid down in the special conditions (71X) and in the master schedule itself, covered two of the three essential features of the master schedule system, viz:

- (1) Contracts were to commence without waiting for the contract price to be fixed.
- (2) The labour and material content of a work was to be measured beforehand, and the initial price arrived at by applying the bill of quantities to the rates prescribed in the master schedule. With the addition of incidental adjustments, the final price was to be determined by the quantity surveyor in conjunction with the contractor.

The third essential was the allocation of contracts, which will be dealt with fully in the following pages.

The circular instructions concluded by stating that District Engineers were to be responsible for ensuring that every contract was supervised adequately; that shortages of manpower or material likely to cause delay were to be watched for and reported to Head Office if necessary; that Head Office must be advised of the



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nearest the job will also have to be met. Your authority is desired to charge the whole of the cost direct to War Expenses Account.'

The Acting Minister of Finance having approved this recommendation on 16 April 1942, the principle of bulk buying was accordingly incorporated in the master schedule system of contracting.

The procedure to be followed with regard to timber supplies for defence works was outlined in the Head Office circular already referred to. (1) This stated that:

(i) The quantity surveyor, when compiling from the plans and specifications the priced schedule of quantities for a work, prepared also a separate bill of quantities representing the nett timber content of the work. This was forwarded to the contractor, a second copy being sent direct to the Timber Controller.

(ii) On receipt of the bill of quantities, the contractor made out his timber orders based on the agreed percentages for waste and cutting (as set out in the master schedule), and submitted same to the Building Controller, who in turn referred them to the Timber Controller along with instructions as to priority, quantity, and date of supply of each class of timber (type and grade).

(iii) The Timber Controller then placed orders with the mills and/or merchants, and notified the contractor of the name of each supplier. Delivery was called for for the railway station nearest to the work in the case of timber mills and ex yard in the case of merchants, the contractor arranging (and himself paying for) delivery on to the site of the work.

(iv) Timber supplies as ordered were paid for by the Timber Controller on receipt of certified invoices from the contractor. (N.B. Particulars of timber purchased by the Timber Controller were referred to the Public Works Department for checking against the actual quantities used on the work).

(v) In the event of the contractor requiring more timber than allowed for in the bill of quantities, plus the agreed percentages, he was to order and pay for it himself, claiming reimbursement of any such expenditure during finalisation of the contract price.

It should be explained here that the unit material prices in the master schedules for works involving the use of timber were calculated on a uniform nett cost of timber, viz: North Island: 32/- per 100 super feet of scantling and 54/- per 100 super feet of dressed timber:

(1) 1942/21 of 20 April 1942.

South Island: 26/- and 50/- respectively. All timber in a contract, regardless of its actual cost, was valued on this basis, plus allowances to cover cartage, waste, nails, etc, and such value was included in the total contract price for the purpose of arriving at the profit (5% and overhead $2\frac{1}{2}\%$) payable to the contractor. As, however, the timber was ordered and paid for by the Timber Controller, its value was excluded from the contract when making progress or final payments. If, for example, the initial contract price assessed in terms of the master schedule amounted to £5,000, of which £2,000 represented the value of timber ordered through the Timber Controller, the contractor would be entitled to 5% profit and $2\frac{1}{2}\%$ overhead on the £5,000, and not on £3,000 only.

It follows that in measuring work carried out, to enable a progress payment to be made, the nett value of the timber utilised or on the site had to be deducted. This was made clear in the circular.

Where additional timber was ordered (and paid for) by the contractor, the extra cost was allowed in adjusting the final contract price on a nett basis, i.e. no profit or overhead added.

Further Instructions to Districts. Further circulars dealing with the master schedule system of contracting followed that of 20 April 1942. The first was dated 27 April 1942,⁽¹⁾ and consisted of seven parts. Part 1 advised District Engineers that since the appointment of the Commissioner of Defence Construction it had been necessary to 're-organise the Head Office staff and the system of administration and control of all works contracts', and that now associated with the Commissioner were Messrs Patterson (Government Architect), Ball (Assistant Engineer-in-Chief) and Sharp (Inspecting Engineer), representing the Engineer-in-Chief and

(1) 32/9025/3, p.1.

controlling buildings works and engineering, respectively. The Government Architect was to be responsible for all building works and 'the allocation of contracts connected therewith', the Assistant Engineer-in-Chief for Air Force construction and the Inspecting Engineer the works required by the Army and Navy. Part 2 called for the submission of weekly returns to Head Office showing (a) all contracts of any kind for which plans were being prepared in district offices, giving the estimated cost, date ready for allocation to a contractor, and proposed time for completion, and, (b) details of all contracts under construction, including the time still required to complete and the number of men employed on each work.

In Part 3 of the circular, it was stated that a priority schedule had been prepared by the Commissioner of Defence Construction, and that in future all works of any description would be undertaken strictly in accordance with the degree of urgency accorded them. Particulars concerning the smaller works normally carried out by district offices at the direct request of local military districts were in future to be forwarded to Head Office for approval to allocate to the contractor nominated - this to ensure that all works allocated to contractors under the master schedule system were recorded in Head Office.

(Weekly schedules of master schedule contracts allocated were being submitted by the Under-Secretary to the Minister of Public Works for his information and for reference by him to the Minister of Defence for the purpose of having the expenditure authorised - see Part 1, Chapter 6, 'Defence Construction Council.')

District Engineers were requested to ensure that the manpower requirements of minor works allocated by them to contractors were ascertained accurately, as cases had been brought under the notice of Head Office where the

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number of men employed on a work had not borne satisfactory relationship to the time allowed for its completion.

Part 4 reminded District Engineers that contracts which had been allocated during the previous few weeks were to be commenced immediately and the contract price arrived at in accordance with the procedure laid down in circular No. 1942/21. In the case of small works of extreme urgency, where progress payments were likely to become due before a priced schedule had been prepared, such payment could be made on the basis of 90% of wages paid and 50% of materials purchased.

Part 5 instructed that as soon as work had commenced on large buildings involving considerable joinery work, the name of the firm undertaking the joinery, together with the estimated time for completion, was to be forwarded to Head Office for purposes of scheduling. This was because, stated the circular, 'the control of all joinery works and the allocation of work to same is equally as important as the control of contractors for other works.'

Alterations to contracts were dealt with in Part 6 of the circular, which stipulated that no major variations were to be made to any project by district offices after the work had been allocated to a contractor, except with the approval of Head Office - 'any alteration in design or construction must be restricted to those necessitated by local conditions.' It was mentioned that an approved alteration was to be treated in the same manner as the original contract, i.e. a priced schedule in respect of the extra work to be prepared by the quantity surveyor.

Part 7 asked that where contracts embodied refrigeration, Head Office be given three weeks' notice before the works were ready for the installation of 'cell concrete', in order that 'arrangements may be co-ordinated in Head Office to ensure that this service is available

when required.'

Contracts for works subsidised or paid for by the Government but being handled by a private architect or engineer were touched on in Part 8. In such cases the matter was to be referred to the Government Architect for the allocation of a contractor, and advice would be sent by Head Office to the private architect or engineer when it was in order to proceed with the work.

The circular of 27 April 1942 concluded by stressing that the responsibility for seeing that works were completed with the utmost despatch rested entirely with the District Engineer, whose overseers must keep a constant check on the supply of equipment, materials, and manpower, co-ordinate all works, and where necessary make direct contact with sub-contractors to ensure that their services were synchronised with the works involved.

Sub-contractors. By a circular dated 28 April 1942⁽¹⁾ the Under-Secretary instructed District Engineers that plumbing and electrical installations in defence buildings, whether proposed to be carried out by a separate contract or by sub-contract, were to be brought under the master schedule system and dealt with in the same manner as ordinary building work. It was specifically stated that building contractors were not to allocate sub-contracts for these types of installations without prior approval.

The reason for this instruction was that the completion of some buildings was being delayed through some sub-contractors (notably for plumbing) securing more work than they could handle expeditiously with the manpower and equipment at their disposal - one of the principal causes of the breakdown of the whole competitive tendering system.

Insurance. In a circular issued on 20 April 1942⁽²⁾ the

(1) 32/9025/3, p.1.

(2) Ibid.

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Under-Secretary set out at length the position regarding the Crown's bearing fire, earthquake, builders', accident, and public risk on master schedule contracts and outlined the procedure to be followed in dealing with claims received. It was pointed out that notwithstanding the Crown's having assumed these risks, the Minister could in terms of clause 29 of the special conditions of contract (PW 71X) require the contractor to reinstate the damage (by fire, etc), the cost to be paid for as an extra to the contract. Without this provision, the contractor might be able to say that he had erected the building once and was not bound by his contract to proceed with its re-erection, if destroyed, or reinstatement, if damaged. The circular detailed the special steps necessary to facilitate prompt payment by the Department of accident compensation to contractors' employees - compensation which normally would have been met by an insurance company.

Contract Documents. The circular also contained supplementary instructions regarding amendments to contract forms. The form of tender was being amended by deleting reference to (1) an advertisement inviting tenders and (2) a schedule of quantities, and by substituting for the amount of the tender the expression 'for the sum ascertained in accordance with the said conditions.' This expression was likewise incorporated in the acceptance of tender form. An appropriate amendment was also being made to the form of bond.

The three forms, tender (PW 55) acceptance of tender (PW 56) and bond (PW 58) were re-printed bearing an endorsement reading 'Special 29/4/42.' These, along with the cover sheet, PW 54, special conditions, PW 71X, and general conditions, PW 64, became the printed forms authorised for use in preparing documents for master schedule contracts - in substitution for the standard forms referred to in section 1 of this chapter.

The text on this page is extremely faint and illegible. It appears to be a continuation of the handwritten notes from the previous page, but the characters and words cannot be discerned.

Completed documents for a master schedule contract thus consisted of (Appendix 4):

- (1) PW 54 : Cover sheet.
- (2) PW 55 (Special 29/4/42): Tender.
- (3) PW 56 (" "): Acceptance of tender.
- (4) PW 64: General conditions of contract.
- (5) PW 71X: Special conditions of contract (amending form PW 64).
- (6) Specification.
- (7) PW 58: (Special 29/4/42): Bond.
- (8) Plans and drawings.

Finally, the circular touched on the subject of companies and individuals combining for the purpose of jointly undertaking defence contracts, with particular reference to the legal aspects of a company becoming a partner in a business. District Engineers were requested to advise companies concerned to examine their constitutions to see that the necessary power existed to enable them to enter into a partnership, and for all parties interested to come to some suitable arrangement for ordering supplies, giving receipts, and directing the prosecution of the work.

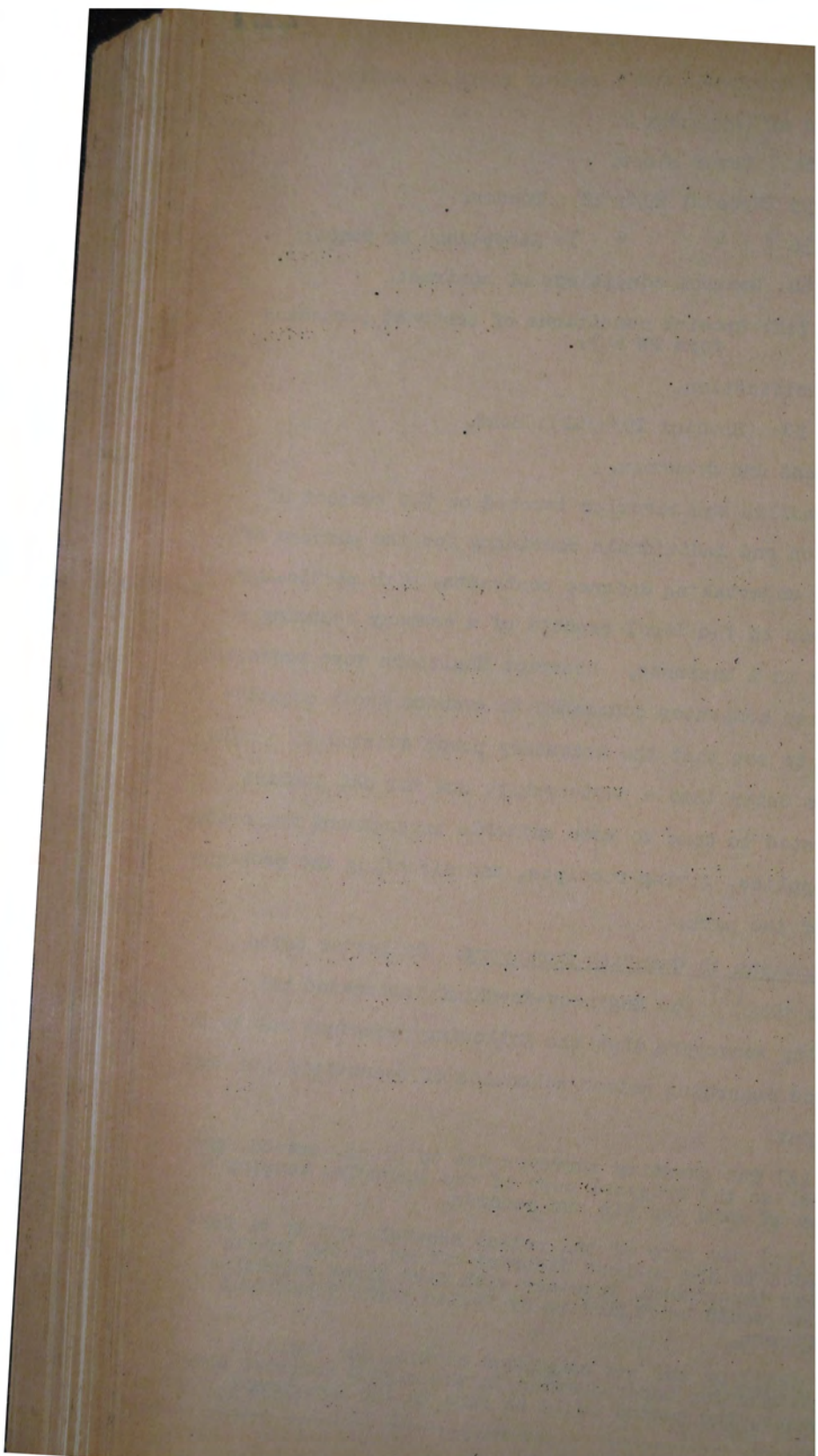
Instructions to Quantity Surveyors. By letter dated

2 June 1942,⁽¹⁾ the Engineer-in-Chief instructed all quantity surveyors that the following procedure was to be adopted regarding priced schedules of quantities for each contract:

(i) The quantity surveyor was to price, extend, and finalise the original copy of the schedule, keeping a copy of same for his own records.

(ii) One copy of the priced schedule was to be forwarded to the nearest district office of the Public Works Department, together with five blank schedules. These would be filled in by Public Works Department officers.

(iii) Of the six completed copies, one would be retained for incorporation in the signed contract documents, the second would be sent to the Government



Architect, the third held by the District Engineer, the fourth handed to the clerk of works, the fifth to the contractor, and the sixth forwarded to the Commissioner of Defence Construction.

(iv) One further copy of the schedule, unpriced, was to be supplied by the quantity surveyor to the contractor's foreman, with an abstract showing the timber requirements of the contract submitted to the Timber Controller.

9. ALLOCATION OF CONTRACTS.

In the transition period from competitive tendering to master schedule contracting, and before District Allocation Committees and a Central Allocation Committee in Wellington were set up in June 1942, the allocation of work to contractors was dealt with by the Government Architect, the Assistant Engineer-in-Chief, and an Inspecting Engineer, all of whom, as mentioned in part 1 of Head Office circular memorandum of 27 April 1942, were associated with the Commissioner of Defence Construction. The engineering work carried out under the master schedule system was negligible, except where it formed an integral part of a building, so that virtually all allocations were made by the Government Architect. The Government Architect's authority in the matter was given in a memorandum dated 8 April 1942⁽¹⁾ from the Commissioner of Defence Construction to the Engineer-in-Chief and Under-Secretary, wherein he instructed that 'all contracts shall be let through the Government Architect, who shall have the final say as to the contractor to whom the work is to be allocated.'

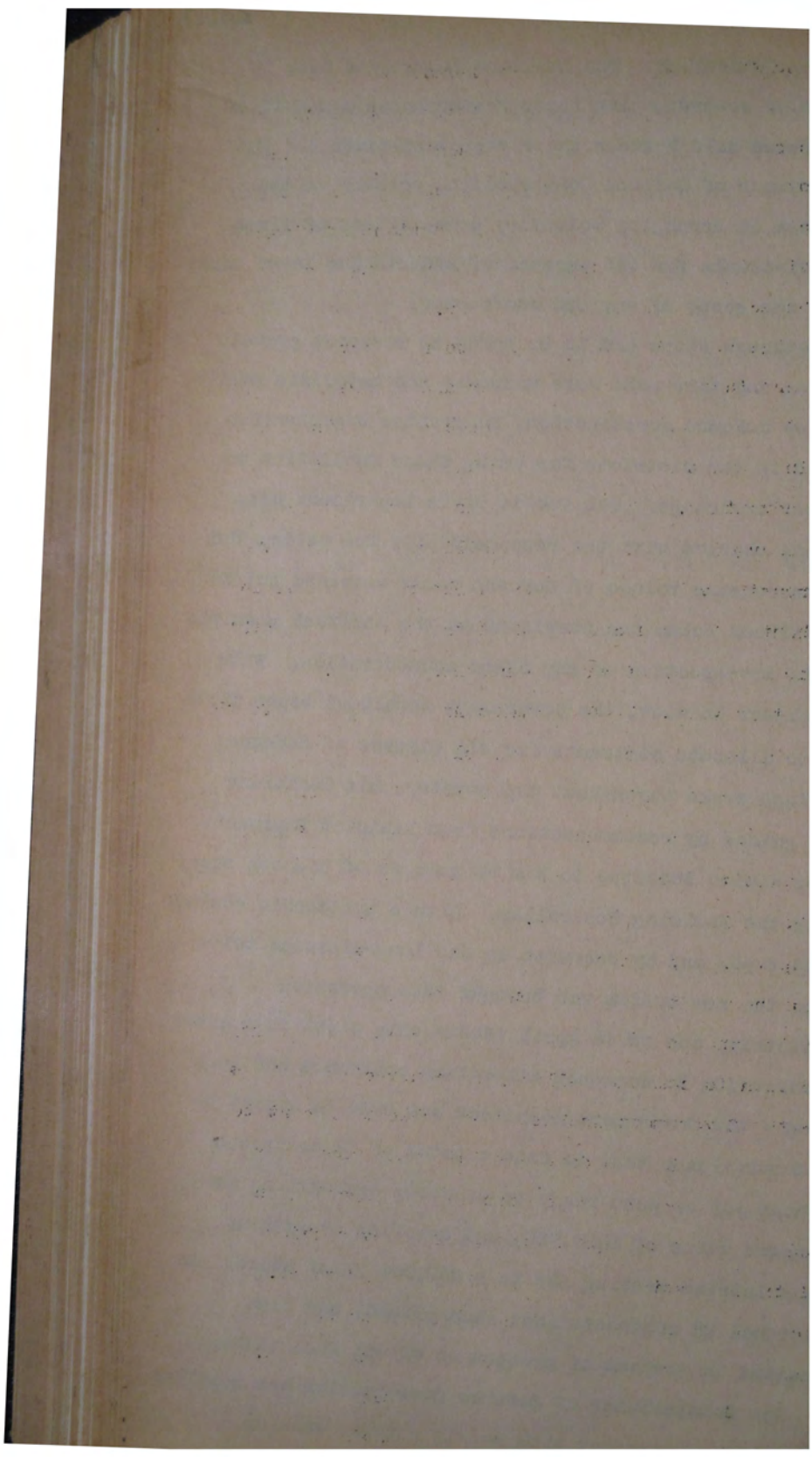
At this early stage no definite procedure for allocating contracts had been laid down. Defence contracts already awarded under the competitive tendering system had not been interfered with, but many non-essential public works had been suspended and private building brought almost to a standstill by the cancellation of permits by the

The first part of the paper is devoted to a general
discussion of the problem. It is shown that the
problem is of great importance in the theory of
the differential equations of the second order.
The second part of the paper is devoted to a
detailed study of the problem. It is shown that
the problem is of great importance in the theory
of the differential equations of the second order.
The third part of the paper is devoted to a
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the problem is of great importance in the theory
of the differential equations of the second order.

Building Controller. The builders themselves were in process of co-ordinating their resources as a result of conferences held between their representatives and the Commissioner of Defence Construction, notably in the direction of arranging voluntary combinations of firms and individuals for the purpose of undertaking large works beyond the scope of any one contractor.

Although steps had to be taken to restrict private building and thus make more manpower and materials available for defence construction, no precise organisation existed in the districts for using these facilities to the best advantage. The Public Works Department was, however, charged with the responsibility for having the ever-increasing volume of defence works required put in hand without delay and completed at the earliest possible moment, irrespective of any other consideration. With this object in view, the Government Architect began forthwith to allocate contracts for all classes of defence buildings works throughout the country, his decisions being guided by recommendations from District Engineers and by advice tendered to him by members of his own staff and by the Building Controller. With a noticeable absence of red tape, and by recourse to the long-distance telephone, the new system was brought into operation immediately, and on 16 April 1942 - only eight days after the direction to commence allocating contracts had been issued - the Government Architect was able to report to the Commissioner that to date a total of 82 contracts had been let or were ready to proceed, aggregating an estimated value of £461,920, and covering everything from a latrine costing £45 to a 260,000 RNZAF store. An additional 28 contracts (not then priced) had been allocated in respect of protection of oil fuel tanks.

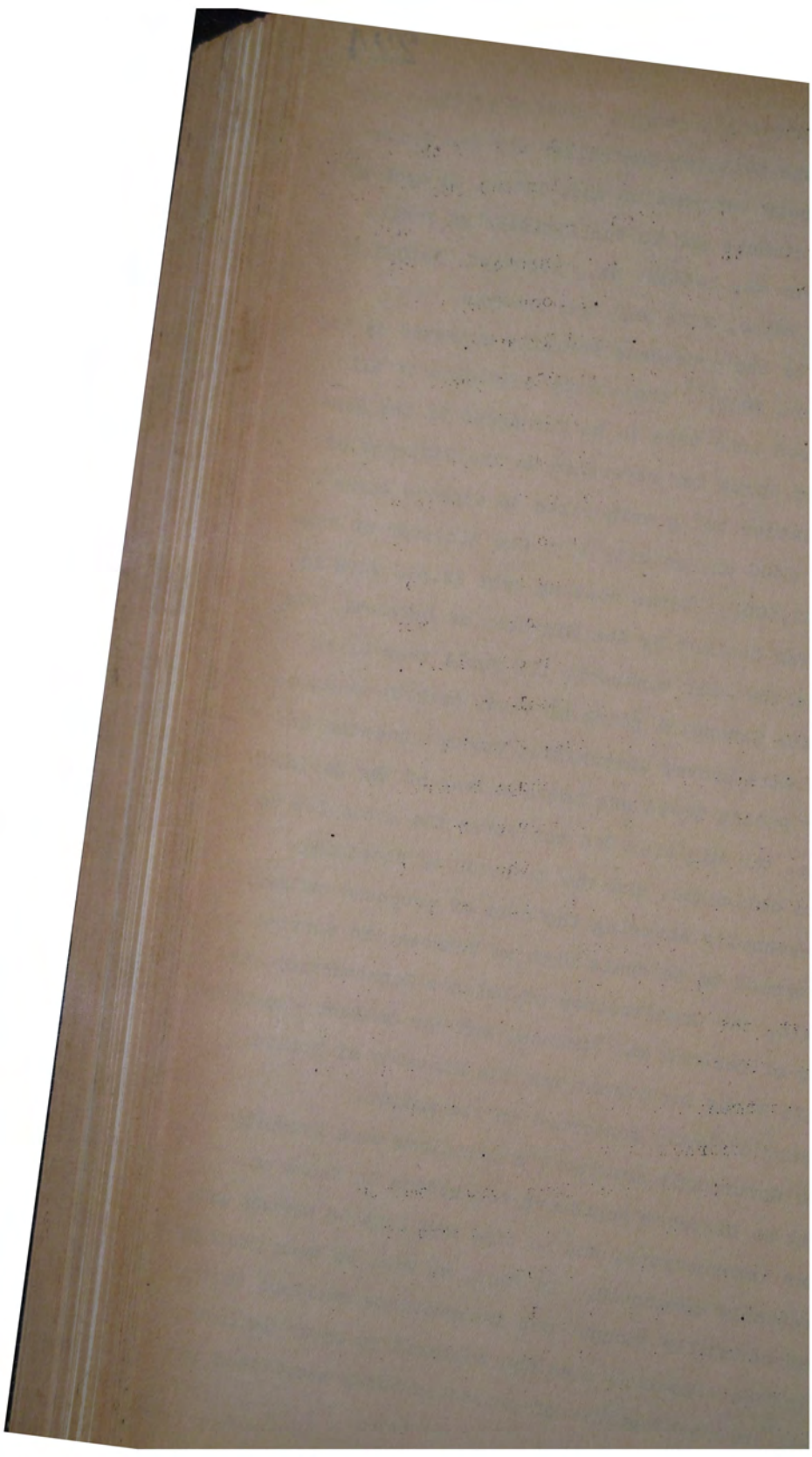
The Commissioner of Defence Construction was supplied by the Under-Secretary with weekly returns showing



particulars of contracts arranged. Copies of the return were minuted to the Building Controller and the Timber Controller for their information and, later, to each of the Service Departments and to the Minister of Public Works. The return was headed: No., Location, Nature of Work, Estimated Value, File No., and Remarks.

According to the procedure formally approved by War Cabinet on 1 June 1942,⁽¹⁾ the weekly schedules of all contracts entered into were to be forwarded to the Minister of Public Works for reference to the Minister of Defence, the latter being authorised to approve works costing up to £500 or, jointly with the Minister of Finance, up to £2,500. Works costing over £2,500 were to be taken to War Cabinet by the Minister of Defence. The intention was that all contracts let would thus be in order from the financial point of view, week by week, but in practice this proved unworkable, perhaps because the Minister of Public Works was not a member of War Cabinet. In any case, the Minister did not refer the schedules to his Defence colleague, and the question of obtaining monetary authority covering the cost of proposed defence works continued to be dealt with as between the Service Departments, the Commissioner of Defence Construction, the Ministers of Defence and Finance, and War Cabinet - neither the Public Works Department nor the Minister of Public Works being directly concerned in the matter.

The Government Architect's decisions were promptly conveyed to District Engineers for action in terms of circular instructions, and no time was lost in having the work actually commenced. In fact, as will be seen further on, the carefully thought out instructions outlined in the Head Office circulars were not followed in their entirety, several important points of procedure being sacrificed in the interests of urgency.



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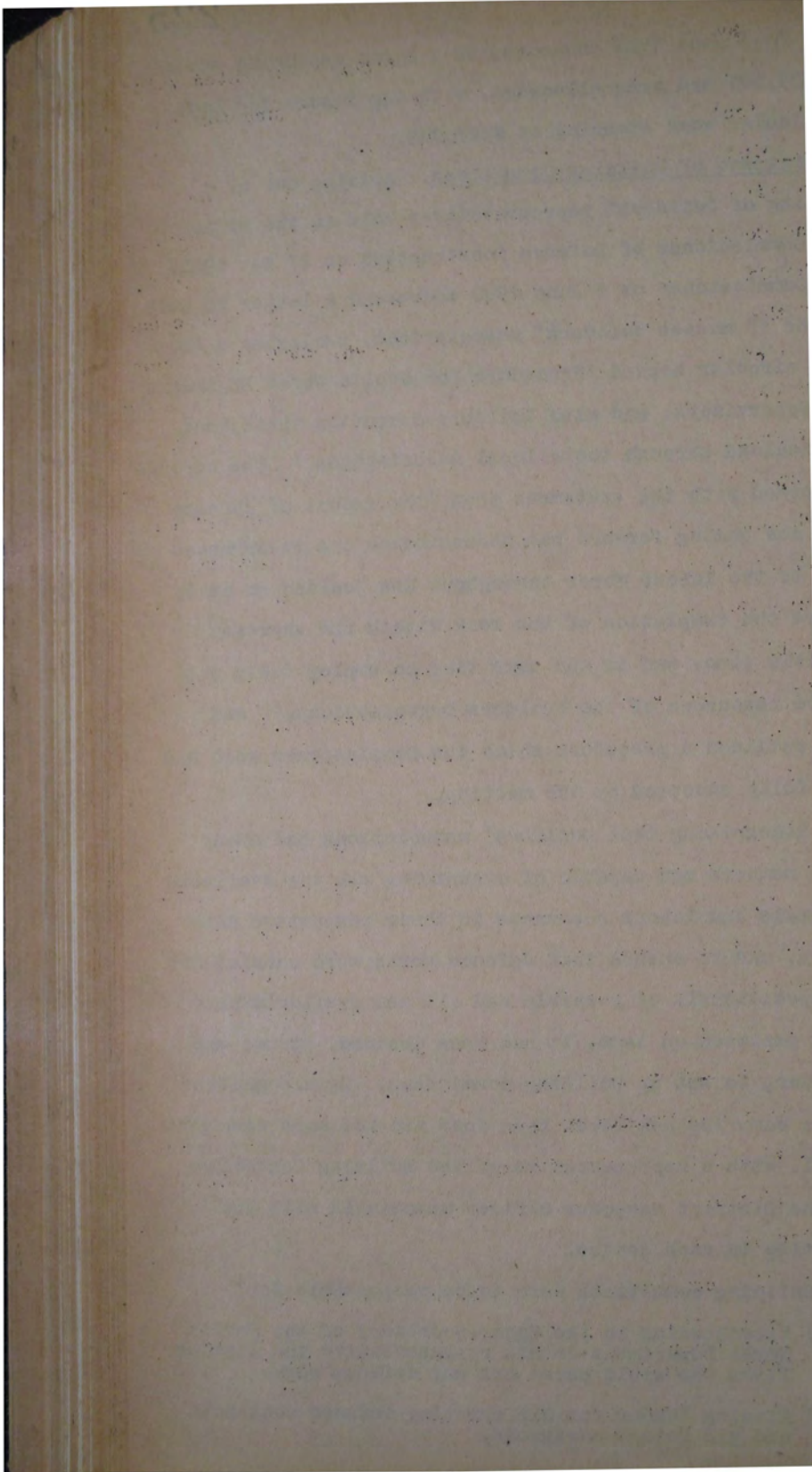
By 5 June 1942 contracts of a total estimated value £1,379,521 had been allocated, with the figure for that particular week standing at £127,949.

Appointment of Building Committees. Arising out of a meeting of builders' representatives held in the office of the Commissioner of Defence Construction on 27 May 1942, the Commissioner on 5 June 1942 addressed a letter to each of the 17 master builders' associations, enclosing a copy of a circular headed 'Procedure for Public Works Engineers and Supervisors: and also Builders operating throughout New Zealand through their local Associations.' The circular opened with the statement that 'The amount of defence work now coming forward has necessitated the re-arrangement of the labour force throughout New Zealand so as to ensure the completion of the work within the shortest possible time, and at the same time to employ fully the entire resources of the builders organisations.' and then outlined a procedure which the Commissioner said had been fully endorsed by the meeting.

Recognising that builders' associations had among their members men capable of organising all the available materials and labour resources in their respective districts, and to ensure that defence works were carried out as expeditiously as possible and all men available were fully employed on same, it had been decided, stated the circular, to set up building committees. Each committee was to comprise not fewer than four and not more than five in all, with a representative of the Building Controller and the District Manpower Officer associated with the committee in each centre.

Building committees were to be responsible for

- (a) Recommending to the Under-Secretary of the Public Works Department or his representative the firm or firms who would carry out any defence work.
- (b) Finding labour for all existing defence contracts and all future contracts.



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- (e) Organising the available materials and becoming the medium through which all communications in connection with supplies were conveyed to the individual controllers.

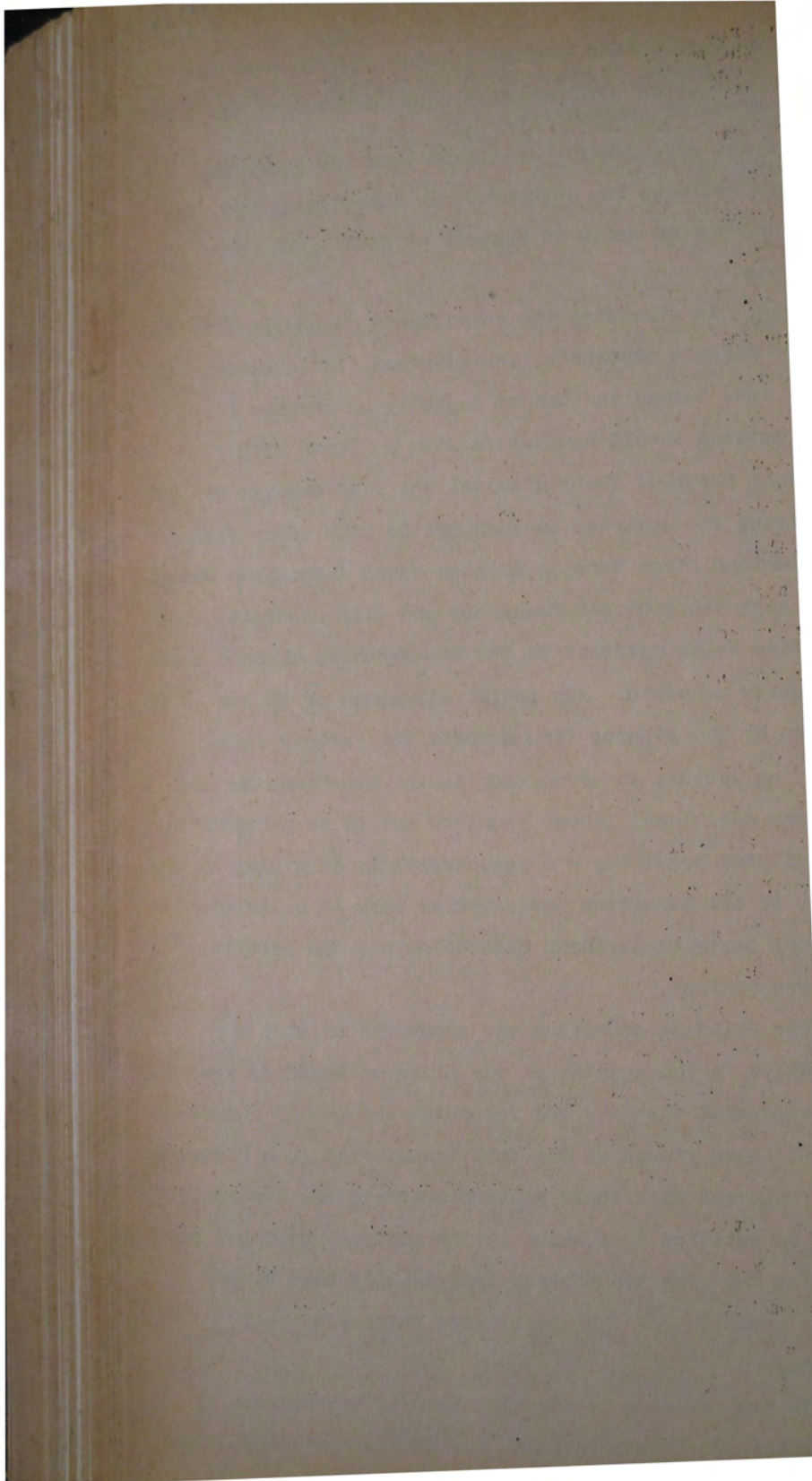
It was specifically mentioned that the District Engineer would be the authority for determining the relative urgency of works in respect of both labour and materials.

Manpower. In stressing the committee's responsibility for manning defence contracts, the circular indicated that if a work were beyond the labour capacity of any one firm, the committee should nominate a firm or firms with the necessary plant at their disposal who were capable of organising the contract in conjunction with other firms. The combined firms were to arrange among themselves which would sign the contract documents and give receipts, etc, such firm to be entitled to the 2½% overhead allowed under the master schedule. The profit allowance of 5% was to be divided by the signing firm amongst the various firms supplying labour, in proportion to the man-hours worked.

Any additional labour required was to be provided by the building committee - a responsibility devolving on one member of the committee nominated to work in collaboration with the District Building Controller and the District Manpower Officer.

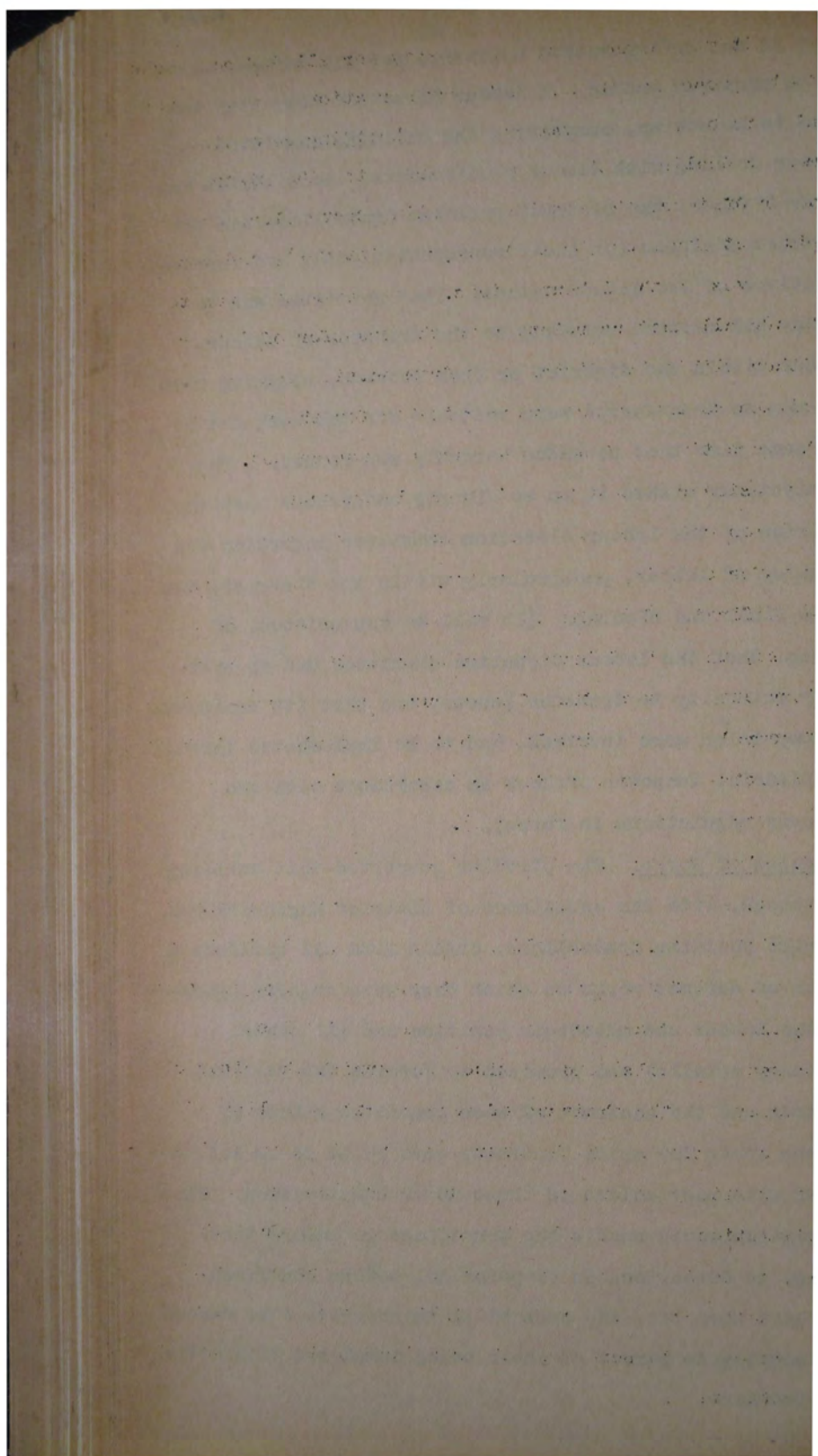
The building committee was empowered to stop any work which in the opinion of the District Engineer was less essential than the one for which the labour was required. When groups of men were transferred to a district by arrangement with their contractor-employer, the latter would be entitled to a share in the contract profits, but if a few men were transferred individually they would become employees of the contractors requiring their services.

In his covering letter addressed to secretaries of master builders' associations, the Commissioner emphasised



that it was an imperative necessity for all defence works to be properly manned. A labour direction committee was also to be set up, comprising the building committee member dealing with labour requirements, the District Manpower Officer, the District Building Controller, and the District Engineer (or their representatives), and representatives of the labour unions. This committee was to decide all matters relating to the transfer of labour, either within the district or from outside, assuming that all men so transferred were suitable for the work and at the same time that no undue hardship was caused. The Commissioner wished it to be clearly understood that the decision of the labour direction committee regarding the transfer of labour, particularly within the district, was to be final and binding. (It will be appreciated, of course, that the labour direction committee had no statutory authority to transfer labour, and that its decisions, if compulsion were involved, had to be implemented through the District Manpower Officer in accordance with the manpower regulations in force).

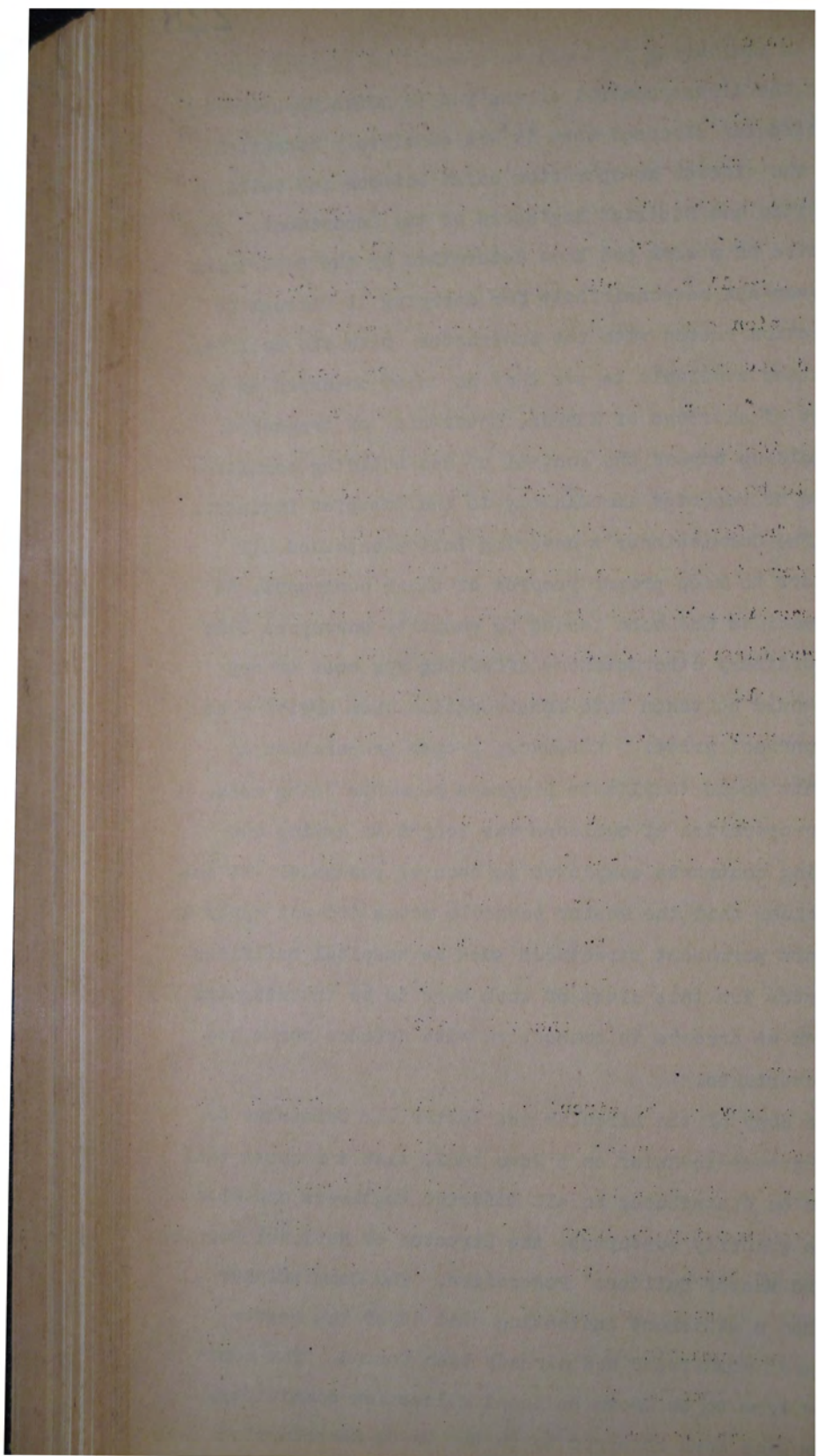
Schedules of Works. The circular requested that building committees, with the assistance of District Engineers and District Building Controllers, obtain from all builders a return of defence works on which they were engaged (showing the labour and materials position and all other necessary details) and promised to furnish the District Engineer and the chairman of each committee a list of defence works for which contracts were still to be let together with particulars of those under construction. This information would enable the committees to ensure that, subject to directions as to priority, before any fresh contracts were let, the ones still in progress were manned sufficiently to permit of their being completed within the allotted time.



In commenting that all work would be carried out under the direct control of the Public Works Department, the circular stressed that it was absolutely essential that the closest co-operation exist between the building committee and District Engineers of the Department. Once the site of a work had been determined by the Department the over-all responsibility for carrying it through to completion rested with the contractor, with the building committee available to see that no delay occurred as a result of shortage of labour, materials, or transport. Any hold-up beyond the control of the building committee was to be reported immediately to the District Engineer.

The Commissioner's covering letter enjoined all builders to keep proper records of their contracts, as instructions had been issued to quantity surveyors that extraordinary circumstances affecting the cost of any work would be taken into consideration when arriving at the contract price. Moreover, proper preparation of accounts would facilitate progress payments being made. The co-operation of builders was sought in having outstanding contracts completed as soon as possible. It was made clear that the master schedule rates did not apply to the more permanent structures such as hospital buildings: the rates for this class of work were to be investigated as soon as arrears in connection with defence works had been overtaken.

A copy of the circular and letter was forwarded to the Engineer-in-Chief on 5 June 1942, with a request that copies be distributed to all District Engineers and also to the quantity surveyors, the Director of National Service, and the Master Builders' Federation. The Commissioner attached a statement indicating that 12 of the master builders' committees had already been formed. The committees came to be known as local allocation committees, and as such were referred to in the Under-Secretary's



Memorandum of 15 June 1942 to all districts, (1) which instructed that the allocating of contracts must be referred to the local committee, and that when forwarding the committee's recommendation to Head Office the District Engineer should state whether it met with his approval and whether he had any comments to make.

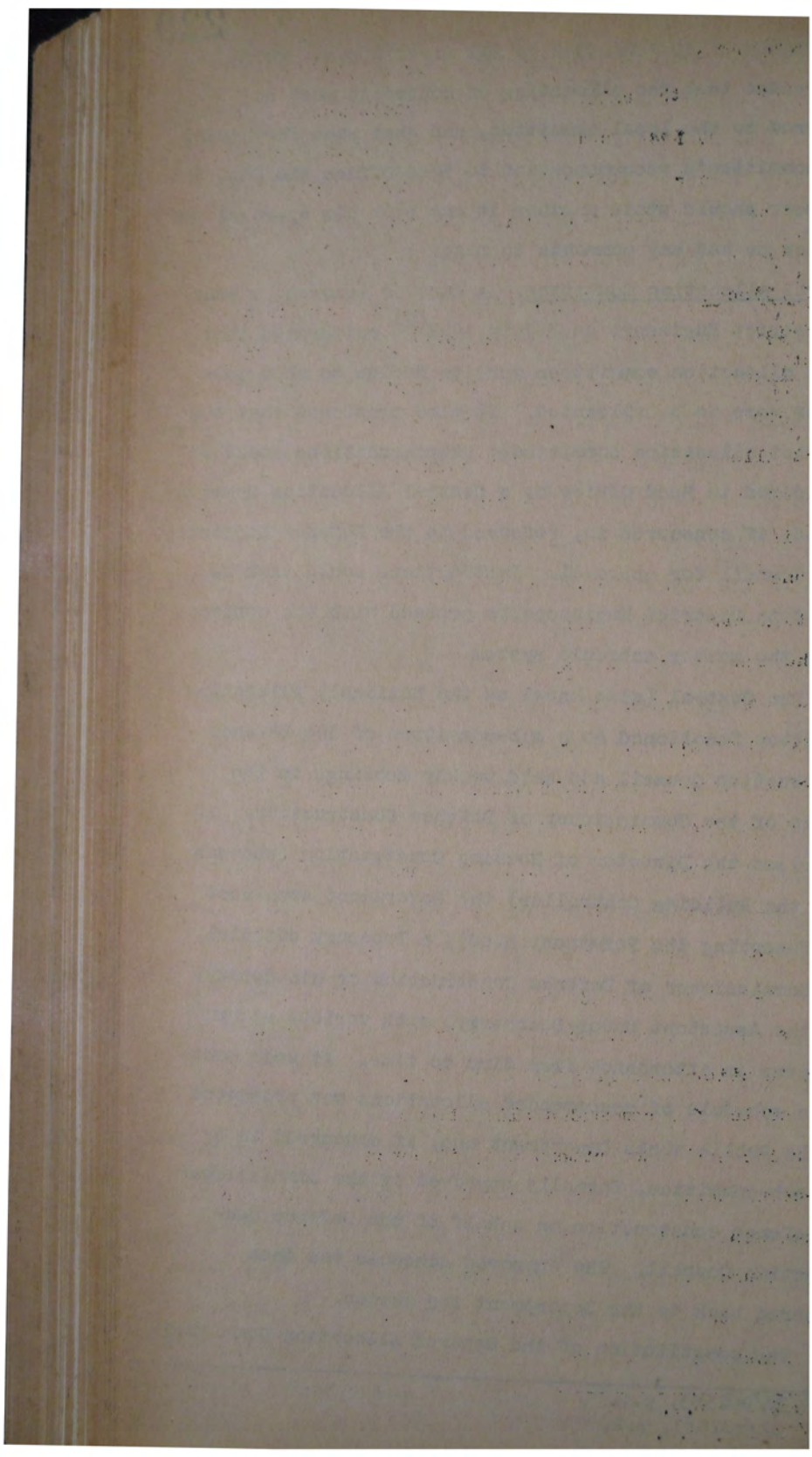
Central Allocation Committee. A further memorandum sent to District Engineers on 3 July 1942⁽²⁾ reiterated that local allocation committees were to decide to whom contracts were to be allocated. It also mentioned that the district allocation committees' recommendations would be considered in Head Office by a Central Allocation Committee and, if concurred in, referred to the Defence Construction Council for approval. Instructions would then be issued to District Engineers to proceed with the contract under the master schedule system.

The Central (also known as the National) Allocation Committee functioned as a sub-committee of the Defence Construction Council and held weekly meetings in the office of the Commissioner of Defence Construction. It comprised the Director of Housing Construction (who was also the Building Controller) the Government Architect (representing the Permanent Head), a Treasury official, the Commissioner of Defence Construction or his deputy, and the Assistant Under-Secretary, with various other officers in attendance from time to time. At each meeting a schedule of recommended allocations was presented by the Public Works Department and, if concurred in by the sub-committee, formally approved by the Commissioner of Defence Construction on behalf of the Defence Construction Council. The approved schedule was then referred back to the Department for action.

The constitution of the Central Allocation Committee

(1) 32/9025/3, p.1.

(2) 32/9025/3, p.2.

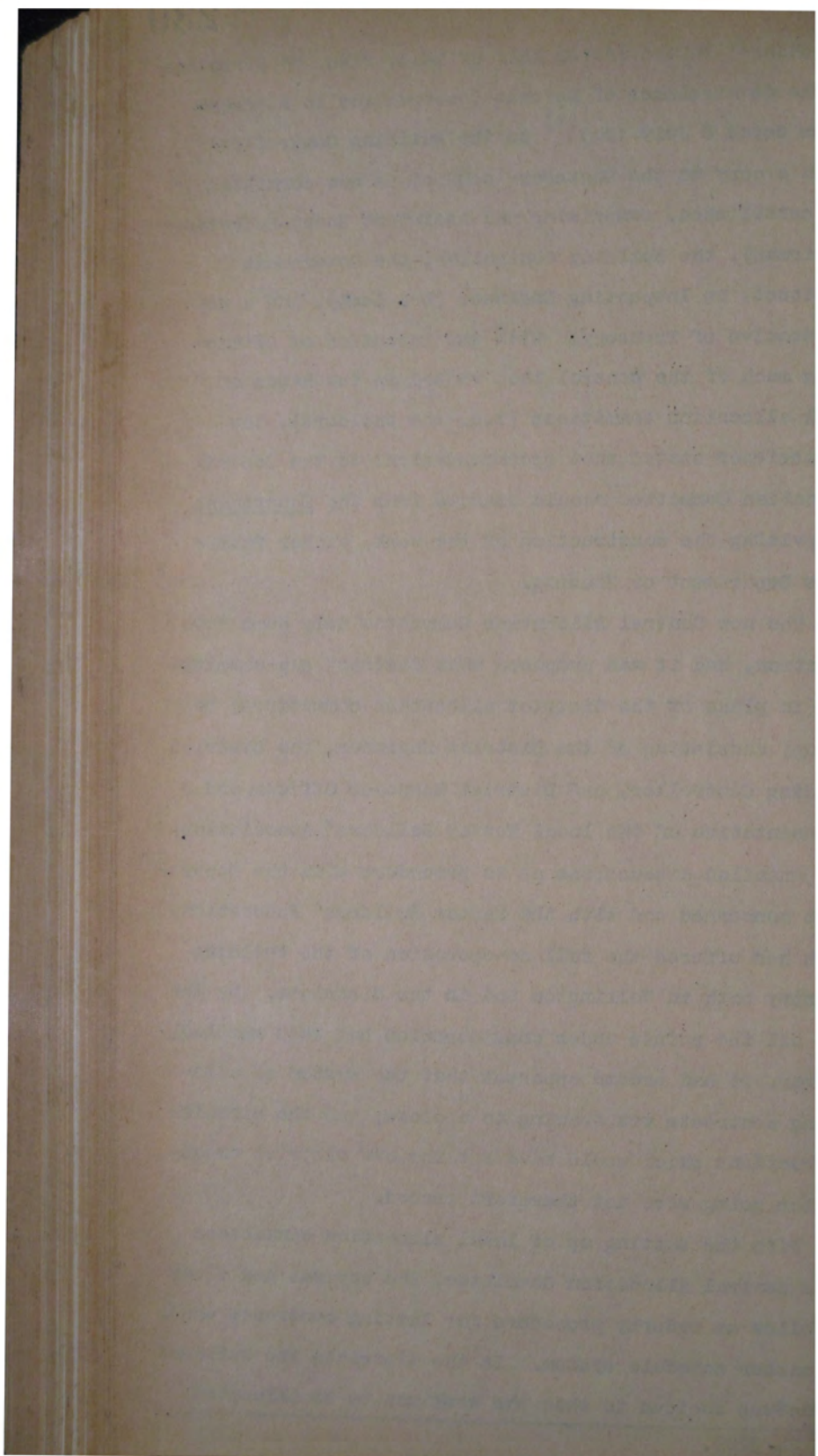


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was changed in the latter half of 1943, when, by direction of the Commissioner of Defence Construction in a memorandum dated 8 July 1943⁽¹⁾ to the Building Controller (with a copy to the Engineer-in-Chief), a new committee was established, comprising the Assistant Under-Secretary (chairman), the Building Controller, the Government Architect, an Inspecting Engineer (Mr. Beck), and a representative of Treasury. With the intention of eliminating much of the control then vested in the hands of local allocation committees (i.e. the builders), the Commissioner stated that recommendations to the Central Allocation Committee should emanate from the Department supervising the construction of the work, either Public Works Department or Housing.

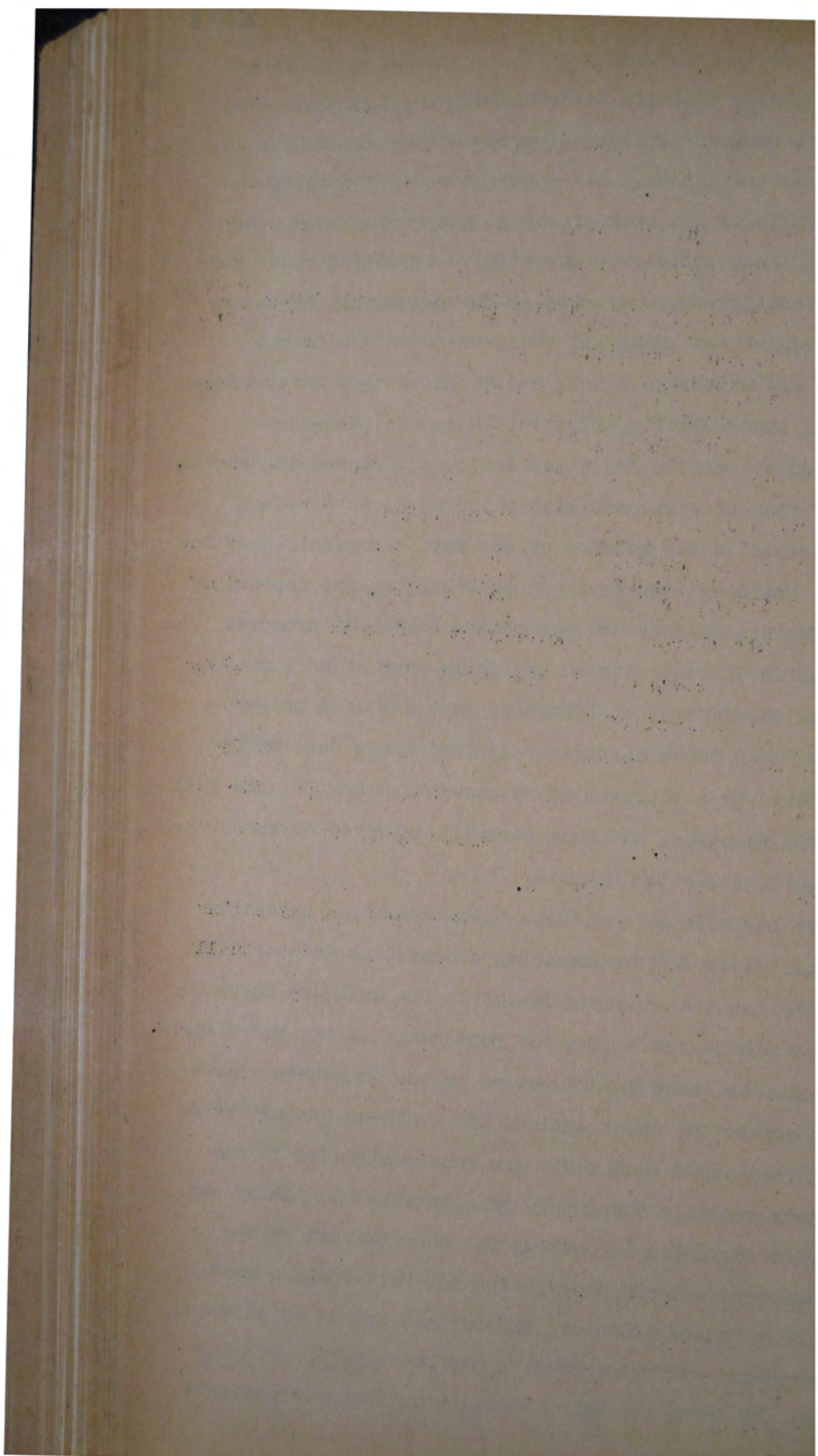
The new Central Allocation Committee duly came into operation, and it was proposed that district sub-committees (in place of the district allocation committees) be set up, consisting of the District Engineer, the District Building Controller, and District Manpower Officer, and a representative of the local Master Builders' Association. This entailed discussions as to procedure with the Departments concerned and with the Master Builders' Federation, which had offered the full co-operation of the building industry both in Wellington and in the districts. By the time all the points under consideration had been settled, however, it had become apparent that the system of allocating contracts was drawing to a close, and the circular instructions which would have set the new district organisation going were not therefore issued.

With the setting up of local allocation committees and a Central Allocation Committee, the way was now clear to follow an orderly procedure for letting contracts under the master schedule system. In the districts the builders themselves decided to whom the work was to be allocated,



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subject to the District Engineer's concurrence, and by collaborating with the District Building Controller the District Manpower Officer assured an adequate supply of materials and labour. All contractors were enabled to share fully in the work offering, and wastage and overlapping inseparable from competitive tendering under war-time conditions were averted as far as humanly possible. Any disagreement among the builders as to who or who should not undertake a work had to be settled among themselves, thus relieving District Engineers, already harassed by greatly increased duties and decreasing staffs, of a burden of responsibility which might have become intolerable in the absence of the full co-operation of the entire building industry. In Head Office, the improvised arrangements whereby the Government Architect approved allocation of contracts in the early rush of work following the abandonment of tendering gave way to a proper system under which district recommendations were fully considered by a representative committee charged with that specific function, and then formally approved by the Defence Construction Council.

It may here be mentioned that as well as accepting responsibility for recommending allocations and actually carrying out the construction work, the builders threw their whole weight behind the Department in the war effort. For instance, when brigade camps in the Warkworth area had to be erected at short notice, the Auckland Master Builders' Association sent their own representatives to the sites to organise the supply of materials and labour and to avoid confusion in getting the work started by the various contractors, thus saving the Department a good deal of time and trouble. Expenditure by way of salaries and expenses was reimbursed by the Department. Similar action was taken regarding other urgent defence projects



Hospital Board Contracts. Building contracts controlled by hospital boards were brought under the master schedule system by direction of the Commissioner of Defence Construction, his memorandum of 27 July, 1942⁽²⁾ to the Director-General of Health setting out the following procedure, which he requested be communicated to hospital boards accordingly:-

(a) The architect to the board was to approach the local allocation committee, which would allocate a contractor or combination of contractors for the work.

(b) The contractor so allocated was to base his contract price on the master schedule rates, and

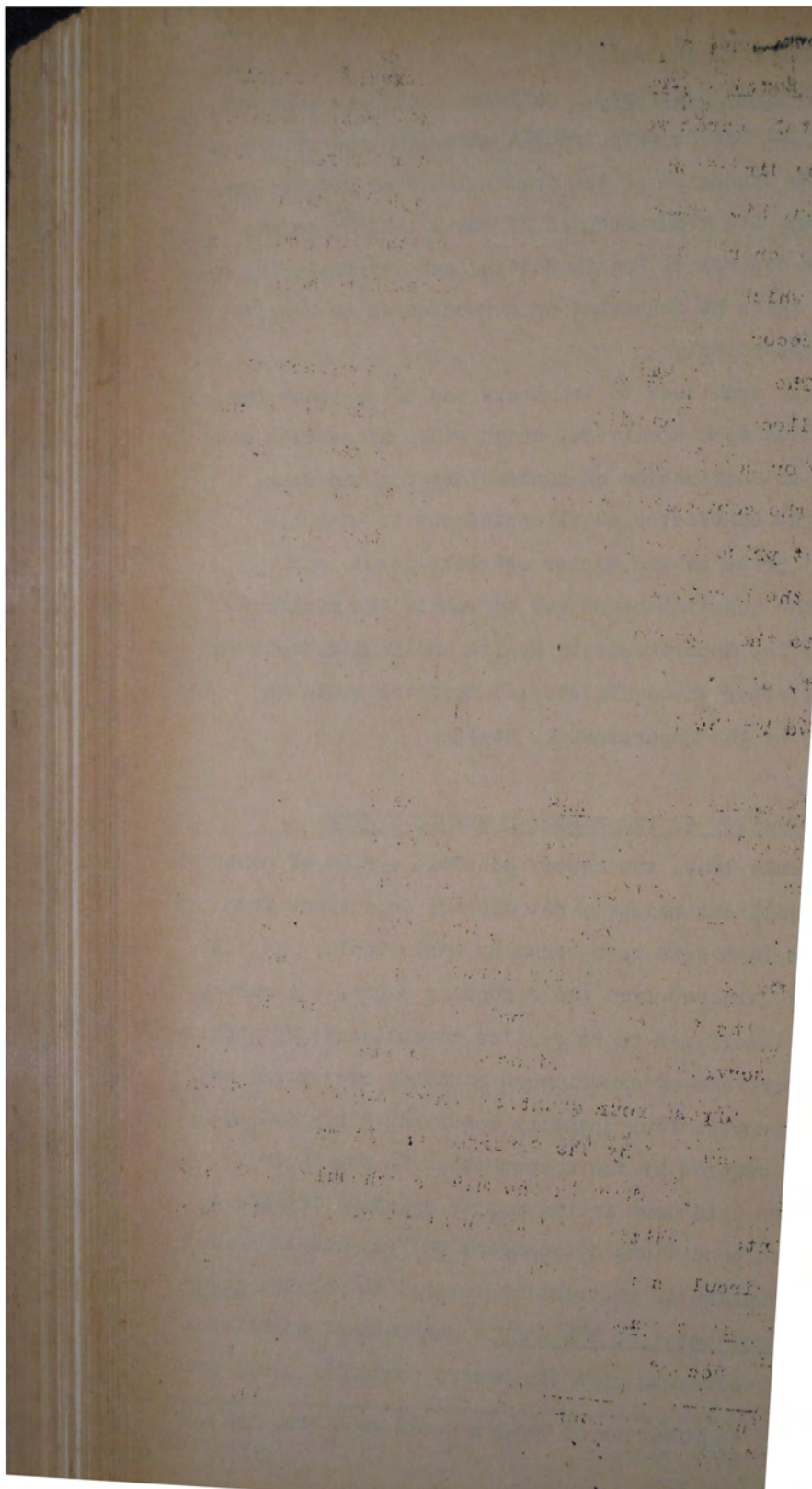
(c) the hospital board was to submit the contract price to the Departments of Health and Public Works for comment, after which Ministerial approval would be obtained by the Department of Health.

10. APPLICATION OF THE MASTER SCHEDULE SYSTEM.

By July 1942, the master schedule system of contracting was well established, but already departures from the procedure laid down were becoming unavoidable. As will have been gathered from the foregoing pages, the master schedule itself was to be applied to contracts by utilising the services of experienced quantity surveyors, and for this purpose four quantity surveying firms had been specially engaged by the Government. It was their function as laid down in the master schedule itself, in the printed conditions of contract PW 71X, and in Head Office circulars to District Engineers, to prepare prior to the commencement of the work a schedule of quantities priced in accordance with the master schedule. This gave

(1) Minute to Minister of Public Works on 6 Jan, 1943,
32/9025/7, p.2.

(2) 32/9025/3, p.2.



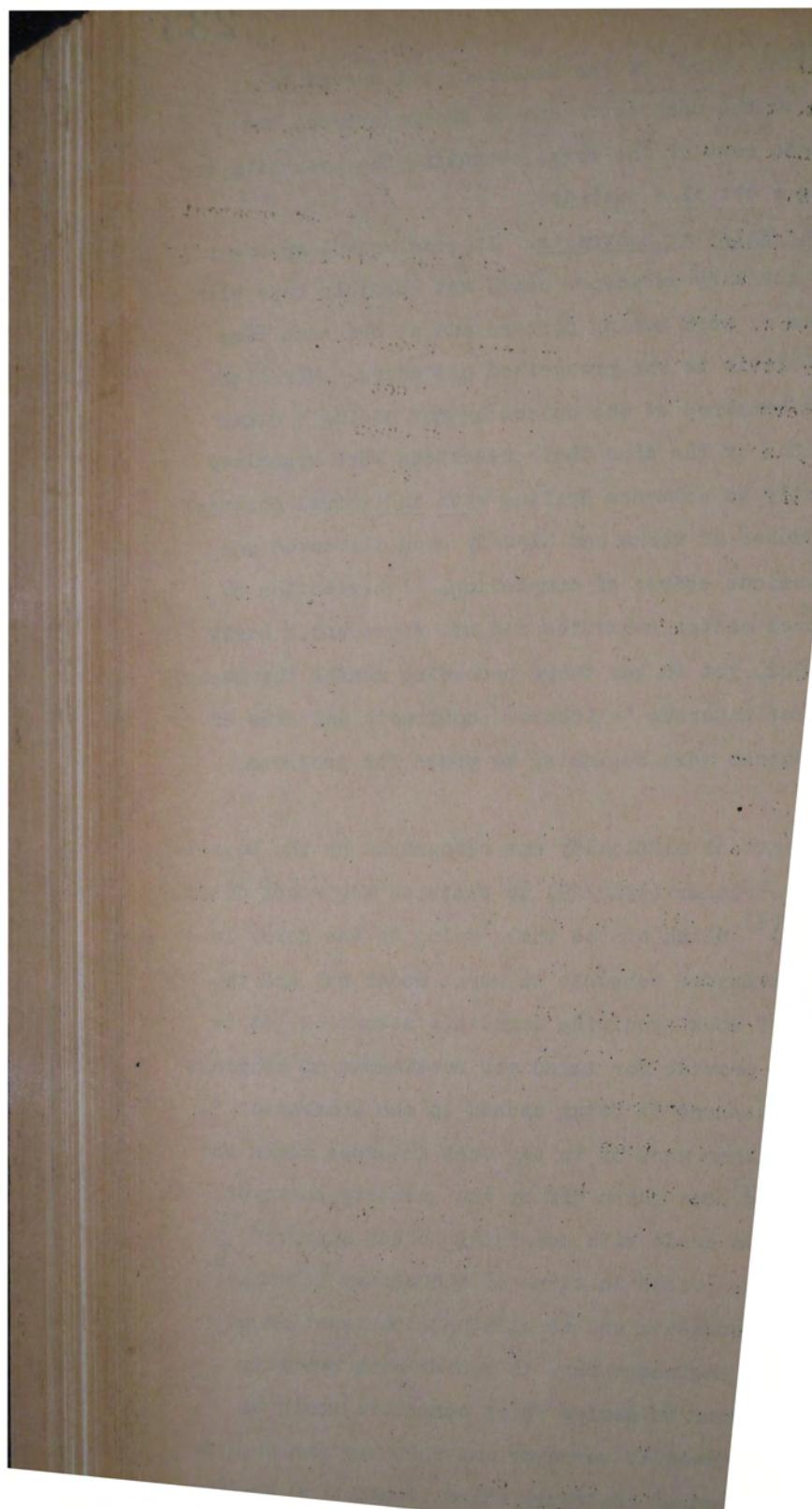
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the 'initial price' of the contract, and served to indicate to the contractor and to the Department the approximate cost of the work, obviating the necessity for preparing a detailed estimate.

Finalising Existing Contracts. It soon became apparent that the quantity surveyors could not possibly cope with the volume of work coming forward and at the same time adhere strictly to the prescribed procedure. Moreover, they were hampered at the outset by not having a clear start, since by the time their resources were organised sufficiently to commence dealing with individual contracts a large number of works had already been allocated and were in various stages of completion. Distribution of the approved master schedules did not start until early in July 1942, yet in the three preceding months the Department had let numerous 'allocated' contracts and some of the contractors were beginning to press for progress payments.

This initial difficulty was recognised by the Department, in a circular (1942/29) to District Engineers dated 4 July 1942,⁽¹⁾ which stated that 'owing to the delay in applying the master schedule to works under way and to the amount of work requiring immediate attention, it is necessary to provide for immediate settlement of accounts where embarrassment is being caused to the contractor.' The circular then went on to say that in cases where the quantities had been taken off by the quantity surveyor these should be dealt with according to the approved procedure, i.e. priced in terms of the master schedule. To avoid any confusion and to eliminate duplication of work, District Engineers were to confer with quantity surveyors in order to decide which contracts would be handled by the quantity surveyor and which by the Department. In the case of contracts which it had been decided

(1) 32/9025/3, p.2.



were to be dealt with by the Department, the District Engineer was to negotiate with the contractor a fixed price acceptable to him and to the Department. The circular continued: 'In arriving at such prices you will use your discretion; in many jobs such as aerodromes and camps there is a sufficiency of existing buildings of similar kinds to act as a reliable guide to prices, as it can be safely assumed that the rates in the master schedule are substantially the same as the actual cost figures of works of this nature.

'Should the contractor be able to furnish a bill of quantities it can in your discretion be accepted as a basis, but it must be borne in mind that whereas the master schedule is based on nett measurements many contractors use gross measurements and often unorthodox systems of their own. In the master schedule allowances for waste, etc are written into the rate for each item

'Do not spend time discussing minor points, as the essence is to reach finality with all dispatch; should the contractor be inclined to argue over trifles you may close the argument by intimating that the job will be measured by a quantity surveyor and priced in accordance with the machinery set up, but caution him that such progress will take time and the Department cannot undertake to state any date by which such finality can be reached and must retain 10% of any interim assessed price; the inducement of a quick final settlement will doubtless dispose of trifles.'

After a fixed price had been arrived at, the contractor and his sureties were to be required to complete an agreement in the following form:

'I } (Name of contractor) of (Address)
We

Contractors, being the contractors under and by virtue of a contract dated the day of 1942, undertaking for His Majesty the King the works therein more particularly described comprising of the first part and (name of District Engineer) the engineer appointed under the said contract, acting for and on behalf of the Minister of

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Public Works, of the second part; and Messrs being the sureties under a Bond dated the and day of 1942 in respect of the same works of the third part; in consideration of the advantages thereby gained by each of us DO HEREBY AGREE that the "fixed contract price" referred to in paragraph (a) of sub-clause (3) of clause 7 of the special conditions of the said contract, is for all purposes of the said contract and of the said Bond the sum of £

The circular mentioned that Head Office approval must be obtained to the fixed price before the District Engineer added his signature to the agreement. After this had been done, the signed agreement was to be sent to Head Office for attachment to the original contract documents.

It may here be interpolated that in a further circular memorandum addressed to District Engineers on 29 October 1942⁽¹⁾, the Assistant Under-Secretary, after referring to the fact that it had been brought to his notice that a great many contracts had been completed without documents having been signed, stated that sureties could be dispensed with in the case of master schedule contracts and that the document could consist simply of a tender and acceptance. The insertion in the tender of the departmental number of the plans and specifications identified the work for which the contractor was tendering, and the general conditions (PW 64) and special condition (PW 71X) were specifically mentioned in the tender but did not need to be attached to the documents. (The fixed contract price was, of course, given in both the tender and the acceptance).

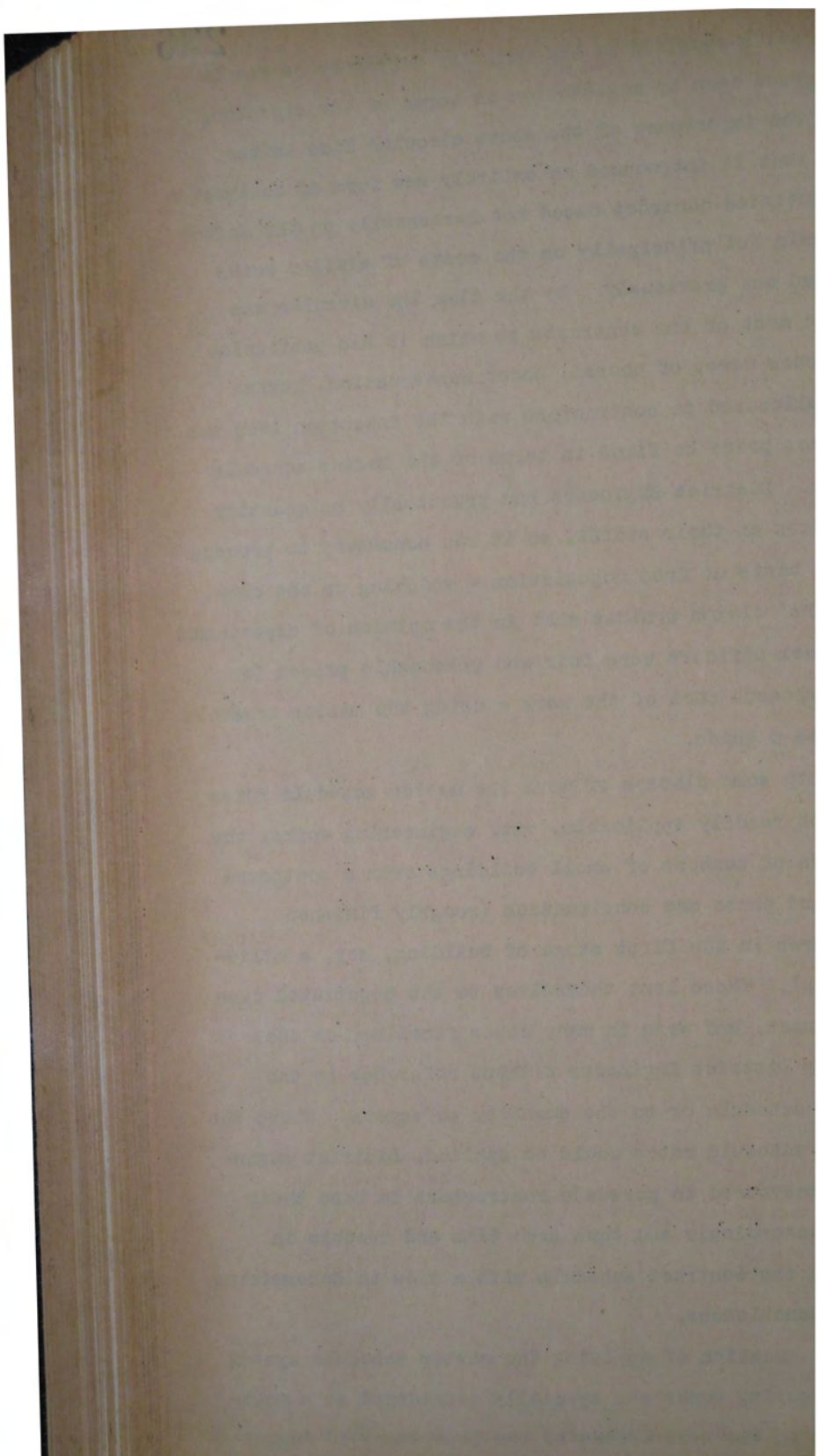
The circular of 4 July 1942 concluded by stating that the same procedure might, with Head Office approval, be adopted in respect of future works of an urgent nature 'where the conditions are similar to past work.' District Engineers were therefore requested, when submitting nominations for new work, to indicate whether the fixed contract price was to be determined upon schedules of

quantities supplied by the quantity surveyors or was to be agreed upon by negotiation in terms of the circular.

The importance of the above circular lies in the fact that it introduced an entirely new form of contract - a negotiated contract based not necessarily on the master schedule but principally on the costs of similar works carried out previously. By the time the circular was issued most of the contracts to which it had particular reference were, of course, under construction, having been allocated to contractors with the intention that the contract price be fixed in terms of the master schedule system. District Engineers had practically no quantity surveyors on their staffs, so it was necessary to proceed on the basis of free negotiation - weighing up the contractors' claims against what in the opinion of experienced technical officers were fair and reasonable prices for the component part of the work - using the master schedule rates as a guide.

With some classes of work the master schedule rates were not readily applicable, viz. engineering works, the erection of numbers of small buildings over a scattered area, and phase one construction (roughly finished structures in the first stage of building, say, a military camp). These lent themselves to the negotiated type of contract, and were in many cases finalised on that basis by District Engineers without reference to the master schedule or to the quantity surveyors. Where the master schedule rates could be applied, District Engineers endeavoured to persuade contractors to base their prices accordingly and thus save time and trouble in checking the contract schedule with a view to determining its reasonableness.

The question of applying the master schedule system to engineering works was specially considered at a meeting held in the Head Office of the Department ^{on} 10 August



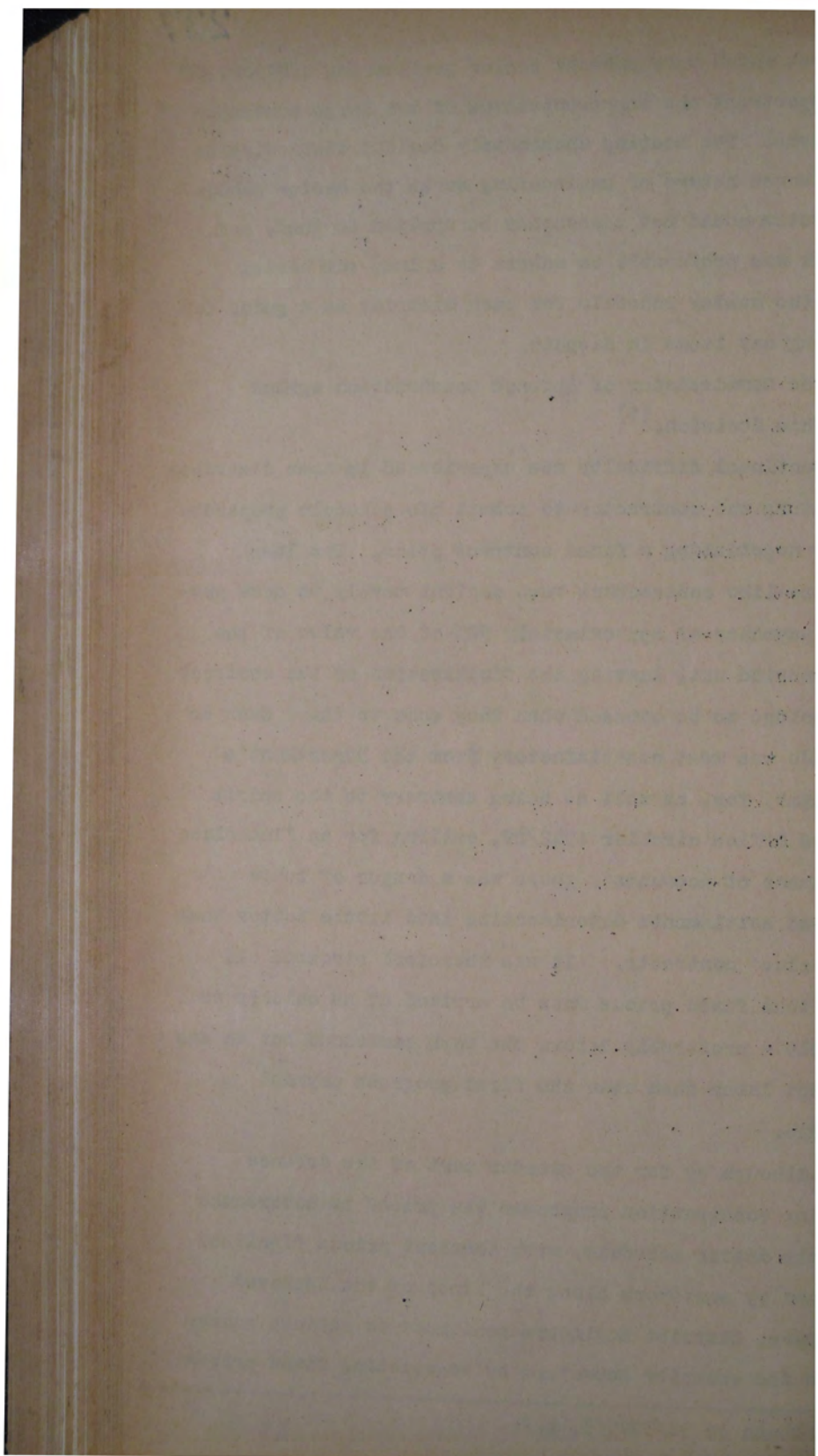
1942, at which were present senior engineering officers of the Department and representatives of two large contracting firms. The meeting unanimously decided that owing to the diverse nature of engineering works the master schedule system could not reasonably be applied to them, and that it was preferable to adhere to a lump sum basis, using the master schedule for each district as a guide for settling any items in dispute.

The Commissioner of Defence Construction agreed with this decision. (1)

Continual difficulty was experienced in some districts in getting the contractor to submit his schedule preparatory to negotiating a fixed contract price. The less business-like contractors were content merely to draw progress payments of approximately 90% of the value of the work carried out, leaving the finalisation of the contract as a bridge to be crossed when they came to it. Such an attitude was most unsatisfactory from the Department's viewpoint, for, as well as being contrary to the spirit of Head Office circular 1942/29, calling for an 'immediate settlement of accounts', there was a danger of long-deferred settlements deteriorating into little better than 'cost-plus' contracts. It was therefore stressed all along that fixed prices must be arrived at as quickly as possible - preferably before the work commenced but in any case not later than when the first progress payment fell due.

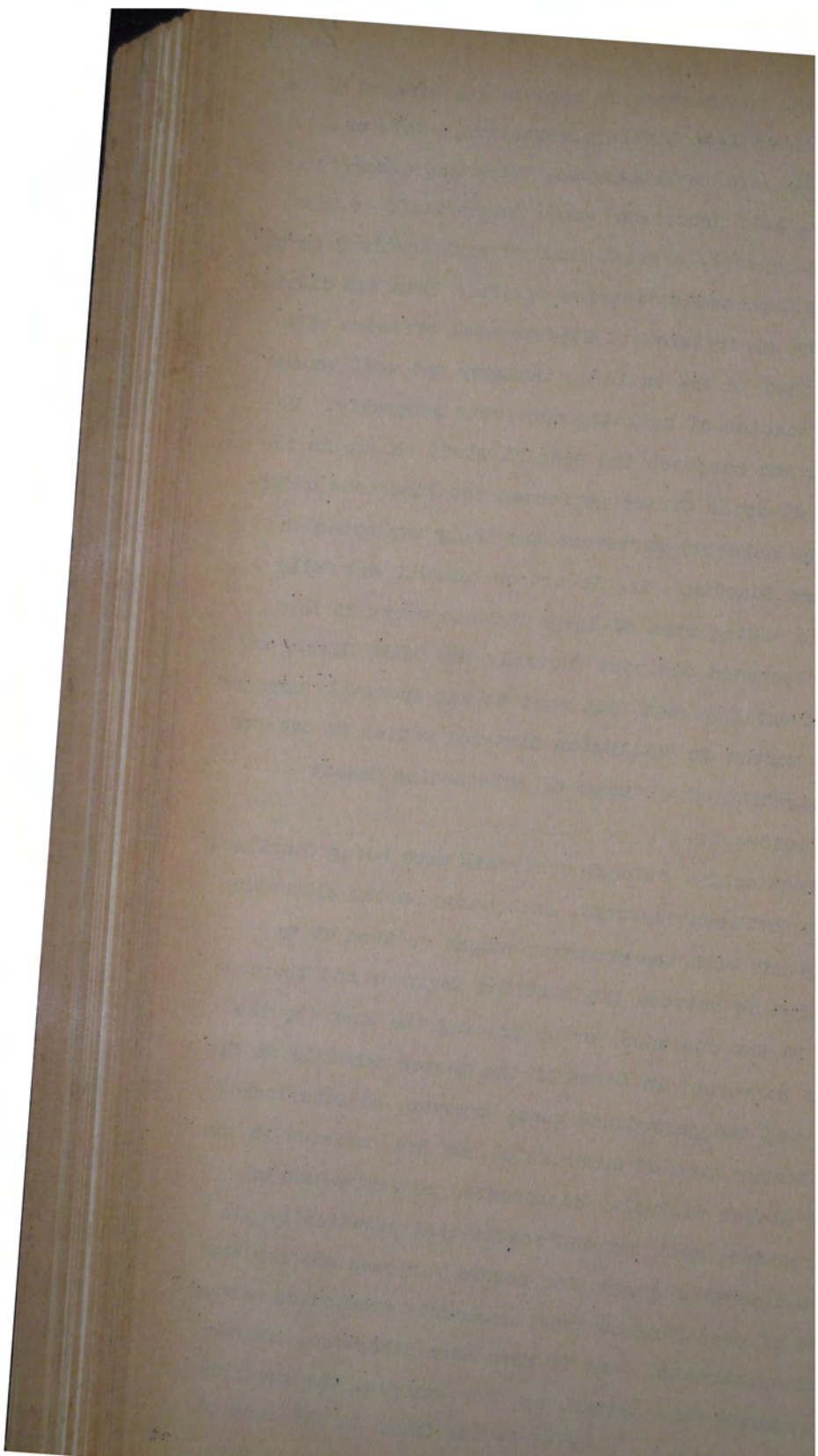
Although by far the greater part of the defence building construction programme was priced in accordance with the master schedule, with contract prices finalised by quantity surveyors along the lines of the approved procedure, District Engineers continued to relieve pressure on the quantity surveyors by negotiating fixed prices

(1) Minute on 32/9025/3, p.2.



direct with the contractors as opportunity offered or if the circumstances left little alternative. This was especially the case in Wellington, where the quantity surveyor (Mr. A.L. Robertson) employed no staff of his own, and consequently a great deal of work devolved on the Public Works Department district office. This was carried out under the supervision of departmental officers with long experience in the building industry and well versed in the intricacies of building contracts generally. To all intents and purposes the special staff set up in the Wellington district office performed the functions undertaken by the quantity surveyors and their employees in Auckland and Dunedin. Mr. Robertson himself was fully occupied in taking care of large defence works in the Nelson-Marlborough district (notably the Delta Camp), and it was not until August 1944 that he was specially engaged for three months in Wellington district office to oversee the finalisation of a number of outstanding master schedule contracts.

Theoretically, defence contracts were being finalised under two different systems, each based on the allocation principle but with the contract amount arrived at by negotiation as between the District Engineer and the contractor on the one hand, or by pricing the work (by the quantity surveyor) in terms of the master schedule on the other. The two procedures were, however, so interlocked that whatever line of demarcation may have existed in the initial stages virtually disappeared as the volume of work expanded, with the end result that practically all allocated contracts were for record purposes and for the purpose of preparing contract documents treated as master schedule contracts. Had it have been otherwise, complications would have arisen, as, for example, the question of insurance risks - carried by the Crown in the case of master schedule contracts but by the contractor in respect



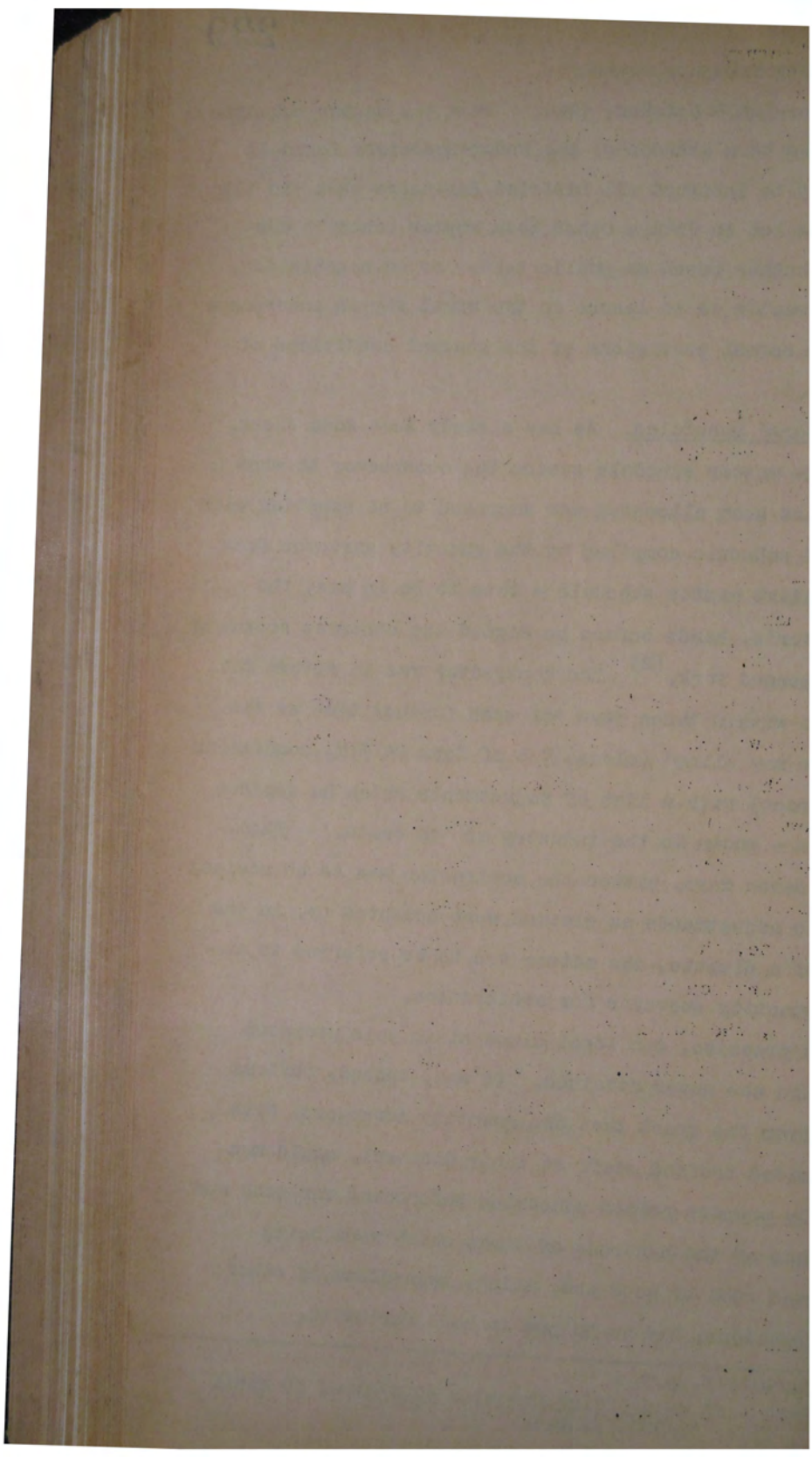
Later, on 9 October, 1944,⁽¹⁾ when the master schedule system had been abandoned, the Under-Secretary found it necessary to instruct all District Engineers that 'in all contracts let in future other than master schedule contracts, whether based on public tender or on negotiation, the contractor is to insure in the usual way in accordance with the normal provisions of the general conditions of contract.'

Contractors' Schedules. As has already been made clear, under the master schedule system the contractor to whom a work had been allocated was supposed to be supplied with a priced schedule compiled by the quantity surveyor from the relative master schedule - this to be in his, the contractor's, hands before he signed the contract documents and commenced work.⁽²⁾ The contractor was to return the schedule within three days 'or such further time as the Minister may allow' (clause 7 b of form PW 71X, conditions of contract) with a list of adjustments which he desired to claim - known in the industry as 'on costs.' Then, within seven days, either the contractor was to be advised that his adjustments as claimed were accepted or, in the event of a dispute, the matter was to be referred to another quantity surveyor for arbitration.

In practice, the ideal aimed at in this proposed procedure was never attained. It was, indeed, obvious right from the start that the quantity surveyors, with the limited trained staff at their disposal, could not possibly prepare priced schedules beforehand for each and every one of the hundreds of works which were being allocated week by week and, which, regardless of other considerations, had to be put in hand forthwith.

(1) 32/9025/7, p.5.

(2) Part 7 of Head Office Circular 1942/21 of 20 April 1942, 32/9025/3, p.1.



It is not surprising, therefore, that when preparing a Head Office stock memorandum for the purpose of advising District Engineers of the Defence Construction Council's approval to allocate a contract, the onus of supplying the all important priced schedule was diverted from the quantity surveyor to the contractor. After giving the name of the contractor to whom the work was to be allocated, the stock letter said: 'Please advise the above firm accordingly and obtain from them a detailed contract price compiled strictly in accordance with the rates shown in the master schedule.....' This contract price had to be accompanied by two copies of a schedule of quantities showing how it had been arrived at, and it was to be made clear to the contractor that the work was not to be commenced until acceptance of his price and confirmation of the allocation of the contract had been communicated to him direct by Head Office. A copy of such confirmation would be sent to the District Engineer.

The contractor's price and schedules of quantities were to be forwarded to Head Office along with a report from the District Engineer stating definitely whether or not he considered the contractor had the manpower and organisation necessary to complete the work within the specified time.

The contractor's ability to carry out the work satisfactorily would be, or should already have been, taken fully into account by the district allocation committee before recommending the allocation, but presumably Head Office desired the District Engineer's considered opinion also by way of verification.

It is noteworthy that the stock memorandum made no reference to the quantity surveyors, and, in fact, the procedure laid down diverged widely from that prescribed in the earlier instructions issued. At the risk of oversimplification, it might be stated that the procedure now

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to be followed was essential as under

i. The proposed contractor, i.e. the one to whom the work had been tentatively allocated, was himself to prepare from the plans and specifications a schedule of quantities showing the 'initial price' compiled in accordance with the master schedule.

ii. The schedule and 'initial price' were submitted to Head Office by the District Engineer, together with a report on the contractor's manpower resources and 'organisation necessary to complete the work within the specified time.'

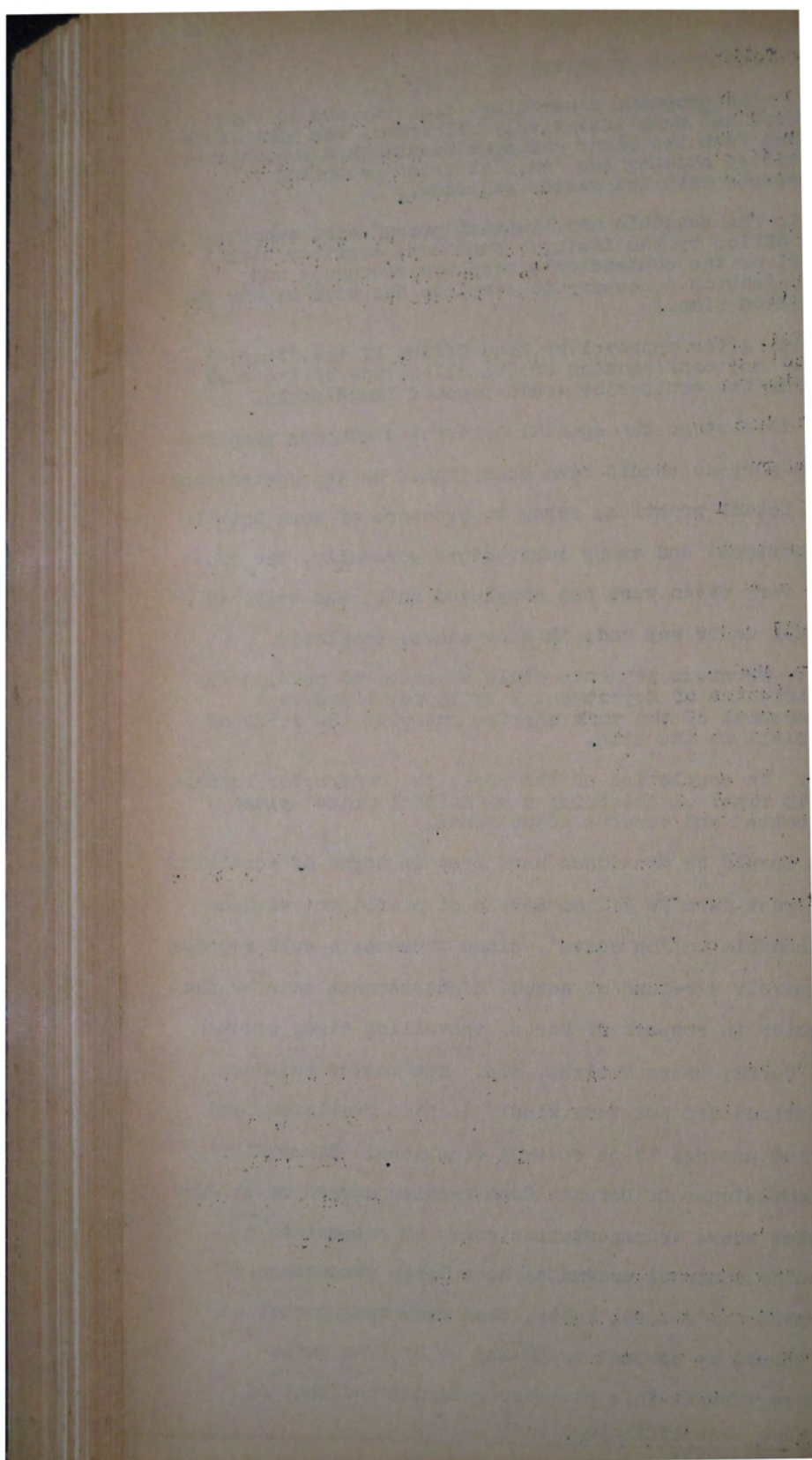
iii. After approval by Head Office of the 'initial price' and confirmation of the allocation of the work to him, the contractor would proceed immediately.

NB. At this stage the special contract documents prepared for the purpose should have been signed by the contractor, but in actual practice, owing to pressure of work both in the Department and among contractors generally, the documents very often were not completed until the work had been well under way and, in many cases, completed.

iv. Progress payments would be made and paid on the certificates of departmental officers, based on a measurement of the work carried out plus the value of materials on the site.

v. On completion of the work, the contractor rendered his final claim, being the 'initial price' plus 'on costs' and various adjustments.

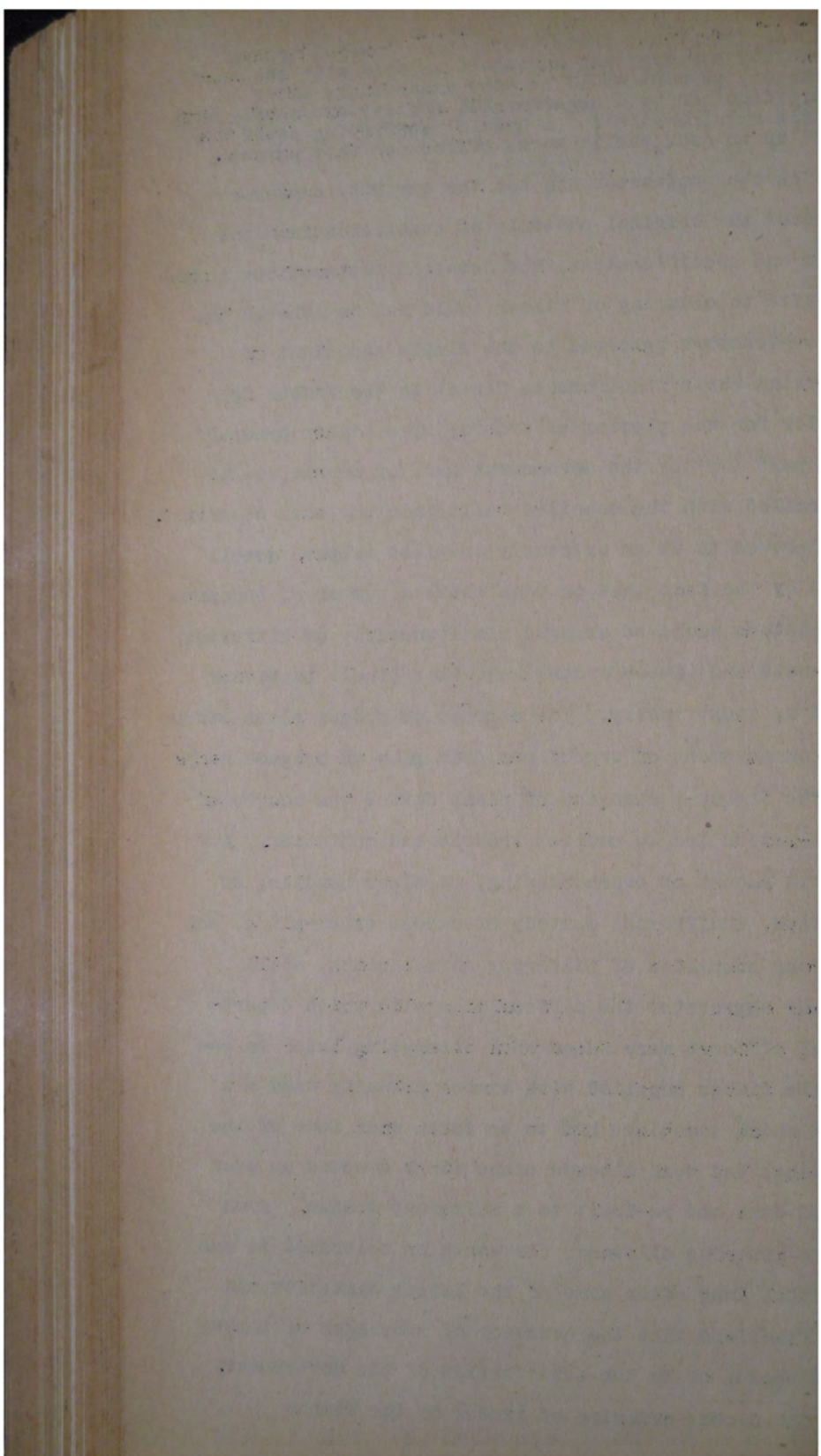
NB. It should be mentioned here that in terms of conditions of contract form PW 71X no margin of profit or overhead was allowable on 'on costs', since these as a rule represented merely a refund of actual disbursements made by the contractor in respect of fares, travelling time, country money, board, extra freight, etc. The master builders' associations did not take kindly to this provision, and protested against it on several occasions. Eventually, the Commissioner of Defence Construction agreed on 11 June 1943 that where transportation costs in respect to a particular contract proved to be a large percentage of the contractor's total costs, then such transportation costs should be subject to 5% and 2½%. (The Under-Secretary thought this was over-generous and that 2½% would have been sufficient). (1)



vi. The final claim having been checked by the quantity surveyor and agreement reached with the contractor, payment would be made accordingly after certification by a departmental officer (to comply with Audit requirements). A special certifying staff was set up in each public works office for this purpose.

As the contractor and not the quantity surveyor prepared the original schedule of quantities from the plans and specifications, the detailed instructions issued relative to ordering of timber could not be adhered to, and contractors resorted to the simple expedient of referring their requirements direct to the Timber Controller for the placing of orders. The timber ordered (and paid for) by the Government had, of course, to be reconciled with the quantity built into the work concerned. This proved to be an extremely involved matter, complicated by the fact that on some sites a number of separate contractors would be engaged simultaneously on different contracts and timber orders were thus liable to become mixed up inextricably. The absence of proper plans before the commencement of urgent projects such as brigade camps and the frequent changing of plans during the course of construction led to endless trouble and confusion. A certain amount of over-ordering, careless handling of supplies, indifferent custody of excess stock-piles, and a strong suspicion of pilfering on occasions, still further aggravated the difficulties with which departmental officers were faced when attempting later to reconcile timber supplied with timber actually used - a check which sometimes had to be taken when some of the buildings had been altered since first erected or even pulled down and re-built to a different design. Even with a generous allowance for waste or tolerance it was not until long after some of the larger contracts had been finalised that the question of shortages of timber was disposed of to the satisfaction of the Government.

The direct ordering of timber by the Timber



Controller undoubtedly effected a substantial saving in the cost of defence buildings and, still more important, obviated hold-ups in supplies which would have been inevitable if hundreds of individual contractors had endeavoured to satisfy their own requirements. The weakness of the system was that contractors had little if any incentive to make the best use of the timber supplied or to exercise sufficient supervision and control over deliveries. It is true that the value of shortages could be and were deducted from contract payments, but it was almost impossible for the Department to produce definite proof of the contractor's culpability in all such cases, and substantial discrepancies had eventually to be written off after prolonged arguments and inconclusive negotiations.

The System Criticised. In May 1943 the Commissioner of Defence Construction convened a meeting at which were present the Wellington quantity surveyors and members of Wellington district office and the Head Office architectural staffs primarily concerned with the defence building programme. Lest it be thought that the imperfections of the master schedule system of contracting - or rather of the way in which it was being applied and the actual results achieved - had escaped the notice of the Department, the views of those present at the meeting, as given in a report dated 6 May 1943⁽¹⁾ to the Government Architect, are here recorded.

The meeting recommended that 'control of all sections of building operations should be co-ordinated under one head; that the conditions of contract, both special and general, should be revised; and that if the master schedule system were to be retained a 'proper' master schedule should be drawn up and interpretations and rulings

(1) 32/9025/3, p.4.

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...referred to. The existing master schedule
was described as suffering more from sins of omission
than commission.

After remarking that, generally, the work was well
in hand without any overlapping, the report indicated
that there were several features about the administration
of building contracts which gave cause for concern.

Among these were:

1. Confusion through instructions, often conflicting,
emanating from different sources. (If complete control
from inception to the final certificate were entirely in
the hands of the Government Architect, 'the worst troubles
would disappear.')

2. Unsatisfactorily constitution of the local allocation
committees. (The meeting suggested that such
committees should comprise (a) a representative of the
Public Works Department, (b) a representative of the
builders, and (c) a disinterested third party, possibly
a private architect).

3. Inefficiency amongst builders.

4. Inefficient clerks of works.

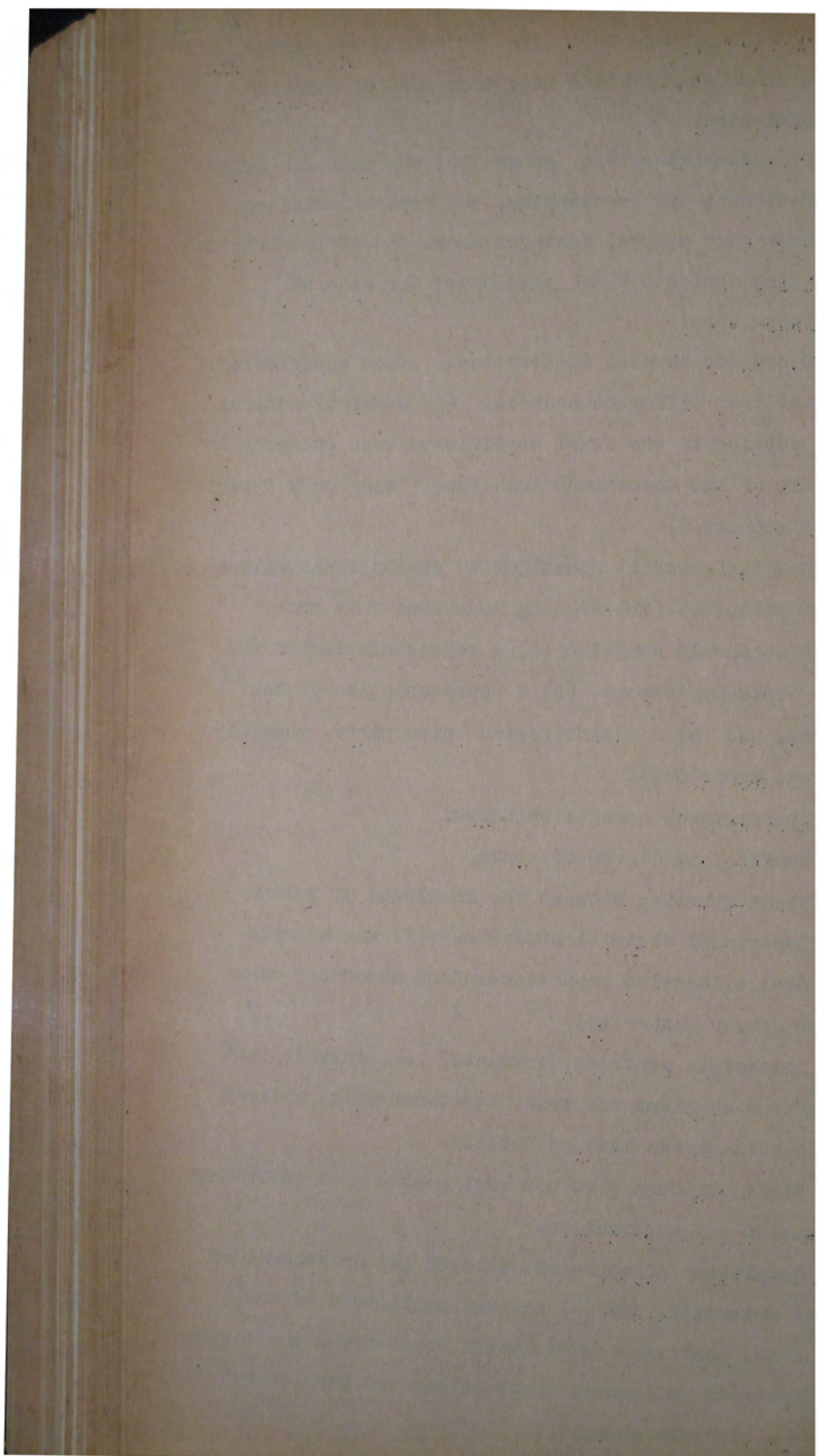
5. Works starting without the knowledge of Public
Works Department district officers. (It was alleged
that local allocation committees often commenced works
without proper authority).

6. Incomplete contract documents, i.e. insufficient
information on plans and specifications; plans without
specifications; and lack of details.

7. Field officers were not kept posted with up-to-date
information and instructions.

8. Completion of works was delayed (a) on account of
lack of materials, and (b) through negligence of the
contractor, sometimes in his haste to secure a new contract.

9. Contractors ignored instructions and carried out
work in a slovenly manner.



10. Excessive alterations, many unnecessary, were authorised after the contract was let (this, stated the report, took a lot of time in adjusting).

11. The addition of buildings to a contract after it was let.

12. The functions of the clerks of works should be defined in writing.

13. Decisions of men in the field should be supported by higher authority.

14. Many clerks of works, builders, and engineers were unfamiliar with the fundamentals of (a) standard building practice (b) law of contract (c) sundry rules and regulations - or, if familiar, deliberately ignored same.

15. Services and roads were often carried out after the buildings had been erected, with unsatisfactory results as to levels, layout, etc.

16. There was still uncertainty as to what rates to apply, and lack of uniformity in applying the rates.

This was by no means the only criticism levelled at the master schedule system of contracting by departmental officers, but it was one of the few recorded in writing.

All through the period a close watch was kept on the progress of the building construction programme by the Government Architect and his staff, in close collaboration with the Commissioner of Defence Construction. Meetings and conferences were held frequently to iron out difficulties as they arose, to suggest improvements, and to discuss ways and means of dealing with special problems and unusual circumstances. Much of the control centred in the Commissioner of Defence Construction was delegated to the Department and to Government Architect, in particular, with regard to building works, and all officers concerned with defence activities had to exercise unceasing vigilance over the manner in which the new, somewhat unwieldy, and administratively troublesome system was

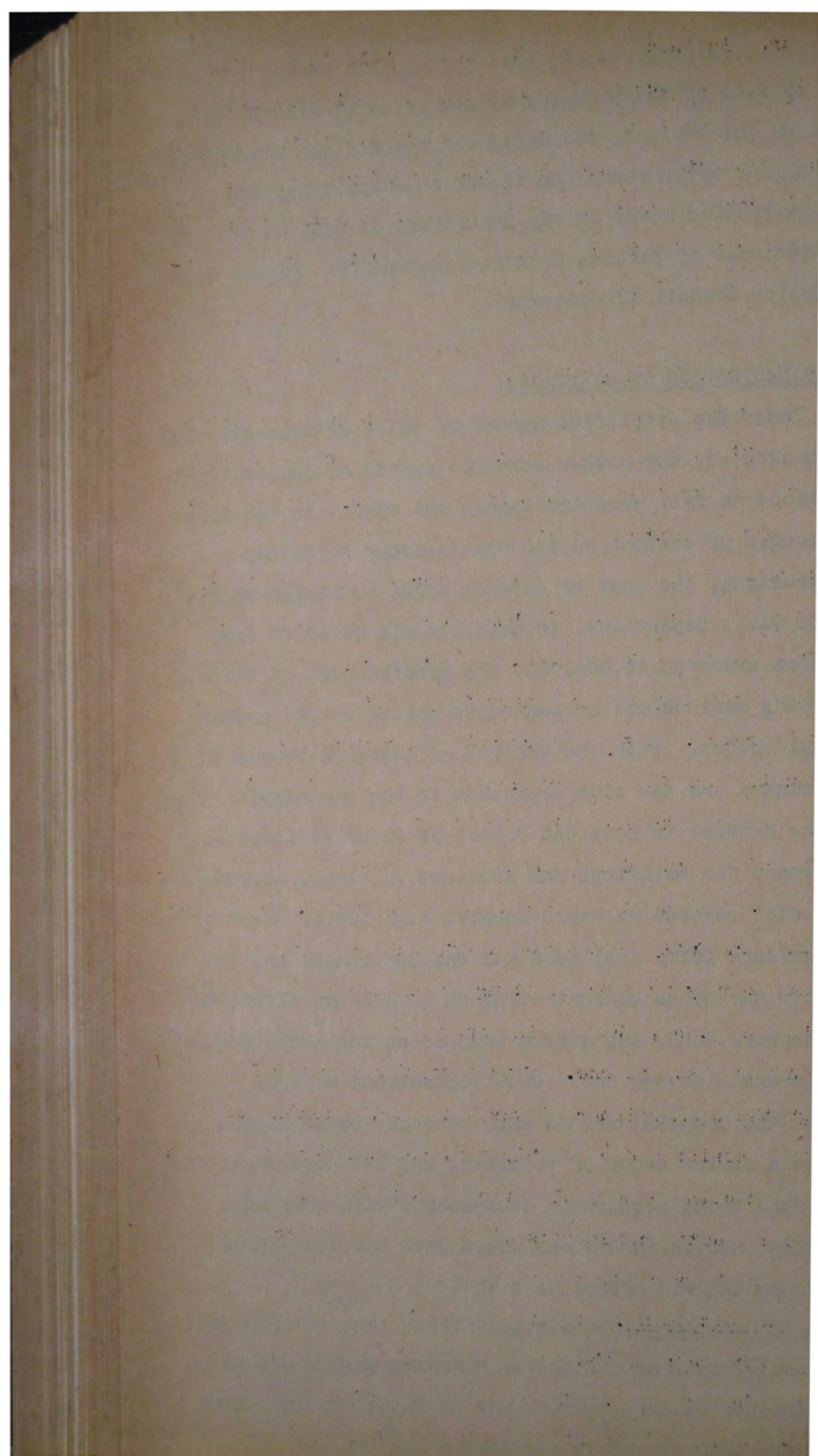
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working. In this respect the meeting held in May 1943 was typical of the many formal and informal discussions held on the subject, the decisions reached and recommendations made being passed on to, and considered by, the administrative heads of the Department as well as the Commissioner of Defence Construction and the Defence Construction Council if necessary.

11. FINALISATION OF CONTRACTS.

Under the simplified procedure which of necessity had to be adopted, the master schedule system of contracting continued at full pressure throughout 1942. In the first six months of control by the Commissioner of Defence Construction, the cost of defence works completed by the Public Works Department, in hand, or allocated to contractors exceeded £8,000,000, the greater part of which was being carried out by contracts priced on the master schedule rates. With the arrival of American troops in the country and the wide expansion of the Dominion's defence network to meet the threat of Japanese invasion, the demand for buildings and services in camps, aerodromes, forts etc. reached an unprecedented high level. Even with the builders fully mobilised and the Department and the quantity surveyors concentrating on an all-out effort to get the work done, the strain imposed on the whole organisation was a severe one. With centralised control through the Commissioner it was, however, possible to observe a strict order of priority, and the Department was saved from being hopelessly over-loaded with work at a time when chaotic conditions might have had disastrous results on the war effort as a whole.

Delays in Settlement. It was inevitable that the procedural requirements of the master schedule system had to be still further relaxed. There was no let-up in the allocation of contracts or in the prosecution of the work

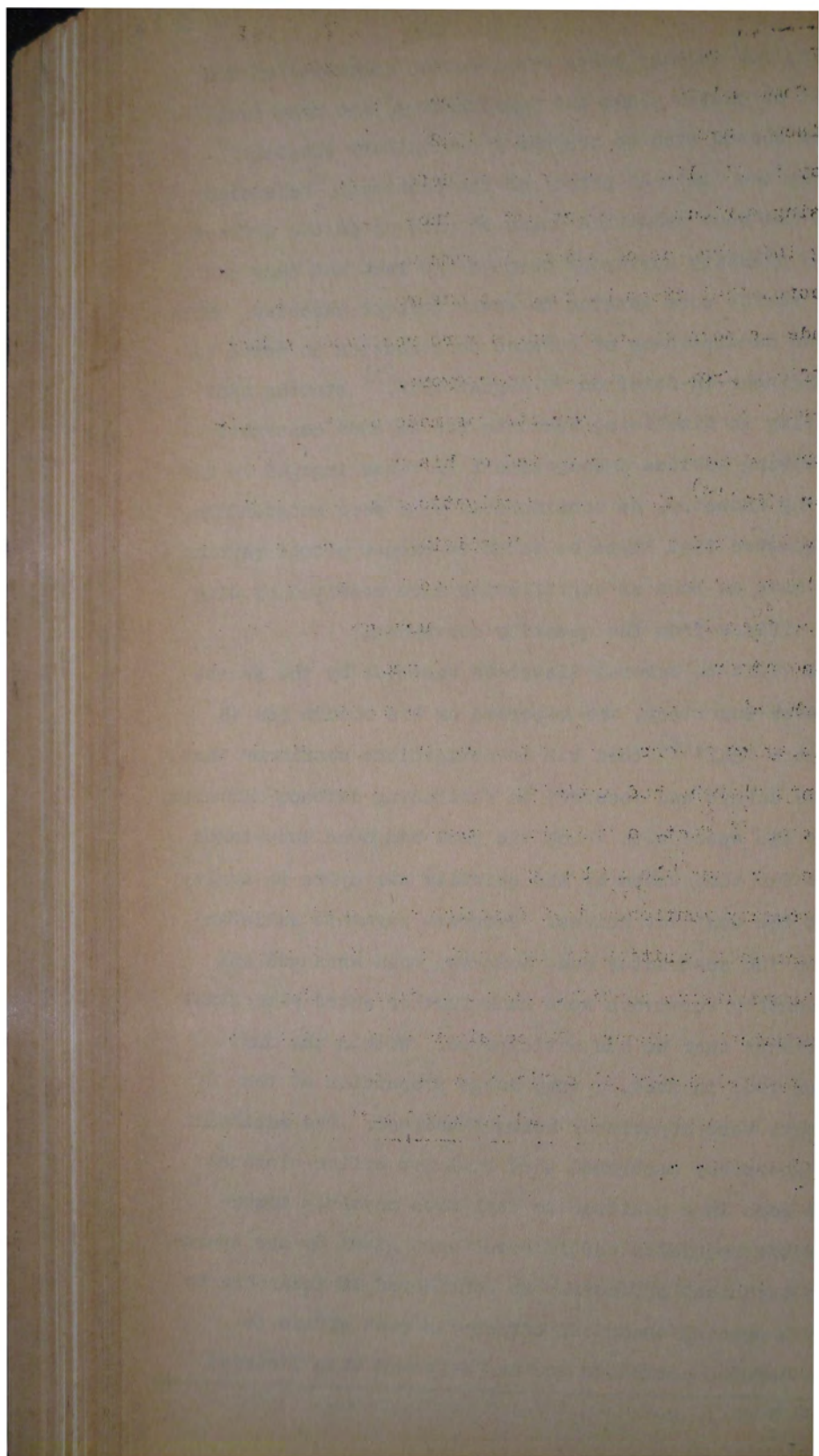


itself, but in many cases construction commenced on the barest of sketch plans and specifications, and time could not be spared even to prepare a preliminary schedule showing the 'initial price' of the contract. Schedules which had been submitted began to pile up in the offices of the quantity surveyors despite the fact and they and their staffs were working to their fullest capacity. This led the Commissioner of Defence Construction to write to the Engineer-in-Chief on 19 August 1942,⁽¹⁾ stating that the delay in finalising accounts for defence contracts was causing serious embarrassment to those engaged in the building industry, as considerable sums were outstanding. He requested that steps be taken to ensure prompt payment being made as soon as certificates were received by district offices from the quantity surveyors.

A visit to several districts was made by the Assistant Under-Secretary, who reported on his return (on 18 September 1942)⁽²⁾ that his investigations confirmed that serious delays had occurred in finalising defence contracts, due to the speed with which the work had been undertaken and to the time taken by the quantity surveyors in arriving at the contract prices. Progress payments satisfactory to the contractor had, however, been arranged and the quantity surveyors were much further ahead with final adjustments than he had anticipated. Within the next week or two, in fact, a very large proportion of the contracts were capable of being finalised. The Assistant Under-Secretary mentioned that district office clerical staffs were in a position to deal with payments immediately the requisite certificates were given by the appropriate technical officers. He considered it desirable to detail a special technical officer in each office to handle defence contracts and had arranged with District

(1) 32/9025/3, p.2.

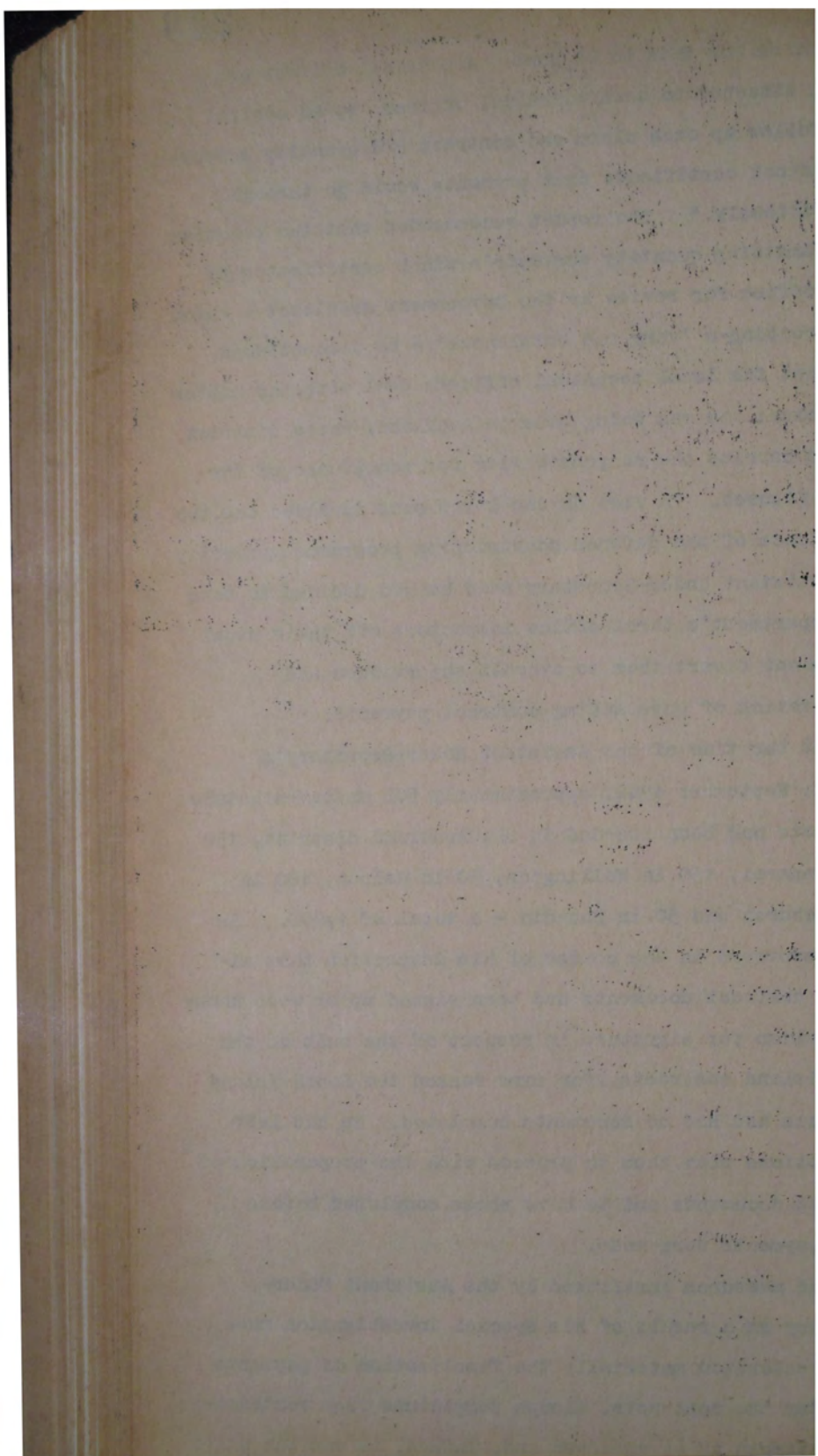
(2) Ibid.



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Engineers for this to be done. A clerical officer was being attached to each technical officer 'to so control and follow up each claim and contract and quantity surveyor's final certificate that payments would go through expeditiously.' The report recommended that the practice of submitting quantity surveyor's final certificates to Head Office for review by the Government Architect - which was creating a 'very bad bottleneck' - be discontinued, and that the local technical officers deal with the matter themselves, as was being done in Auckland, where district office carried the responsibility for acceptance of the final figures. In view of the large sums involved and the importance of the defence construction programme generally, the Assistant Under-Secretary said he had decided to take the Department's three office inspectors off their usual duties and divert them to overall supervision and finalisation of outstanding contract payments.

At the time of the Assistant Under-Secretary's report, September 1942, approximately 500 master schedule contracts had been awarded in the Auckland district, 150 in Whangarei, 150 in Wellington, 50 in Nelson, 100 in Christchurch and 50 in Dunedin - a total of 1,000. He had discovered in the course of his inspection that although contract documents had been signed up or were under preparation for signature in respect of the bulk of the North Island contracts, for some reason the South Island districts had had no documents completed. He had left instructions with them to proceed with the preparation of contract documents and to have these completed before final payments were made.

The measures instituted by the Assistant Under-Secretary as a result of his special investigation must have accelerated materially the finalisation of payments due under the contracts, though complaints from contractors continued to be received and, indeed, it was not until

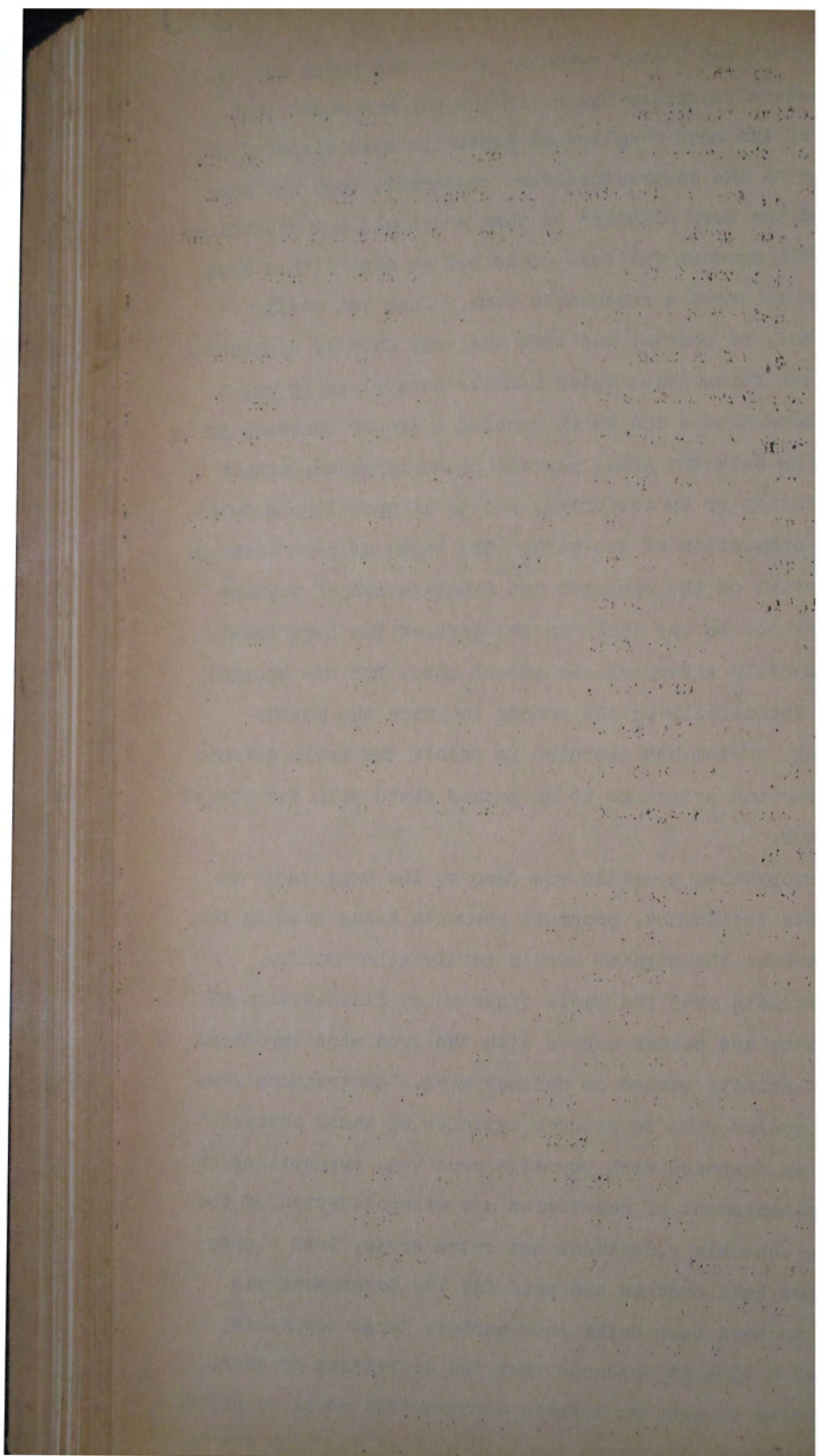


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long after the master schedule system had given way to complete tendering again and the war had ended that some of the more complicated contracts were disposed of. So far as the contractors were concerned, they had completed the work allotted to them and could not understand why full payment for same could not be made within what they considered a reasonable time. What had really happened, of course, was that the very fact of dispensing with the formalities which usually took place before a work commenced - and which enabled a proper contract to be drawn up with the price payable pre-determined, either by negotiation or by tendering, led to an unavoidable delay after completion of the work. The lapse of time between completion of the contract and finalisation of payment was not due to any fault on the part of the Department, the quantity surveyors, or anyone else, but was brought about essentially by the manner in which the master schedule system had operated to enable the whole defence construction programme to be pushed ahead with the utmost despatch.

Everything possible was done by the Department to expedite settlement, progress payments being made in the meantime to the highest margin safely permissible.

By late 1943 the whole question of finalisation of contracts had become merged with the even more important one of profits earned on defence work. Contractors were being called upon to produce evidence of their actual costs as compared with payments received, suggestions of over-measurement of quantities and misapplication of the master schedule conditions and rates arose, less timber than had been ordered and paid for the Government was found to have been built into certain large contracts, and for a time it appeared that the activities of each contractor engaged on defence construction would be probed by a Contract Adjustment Commission which had been set up



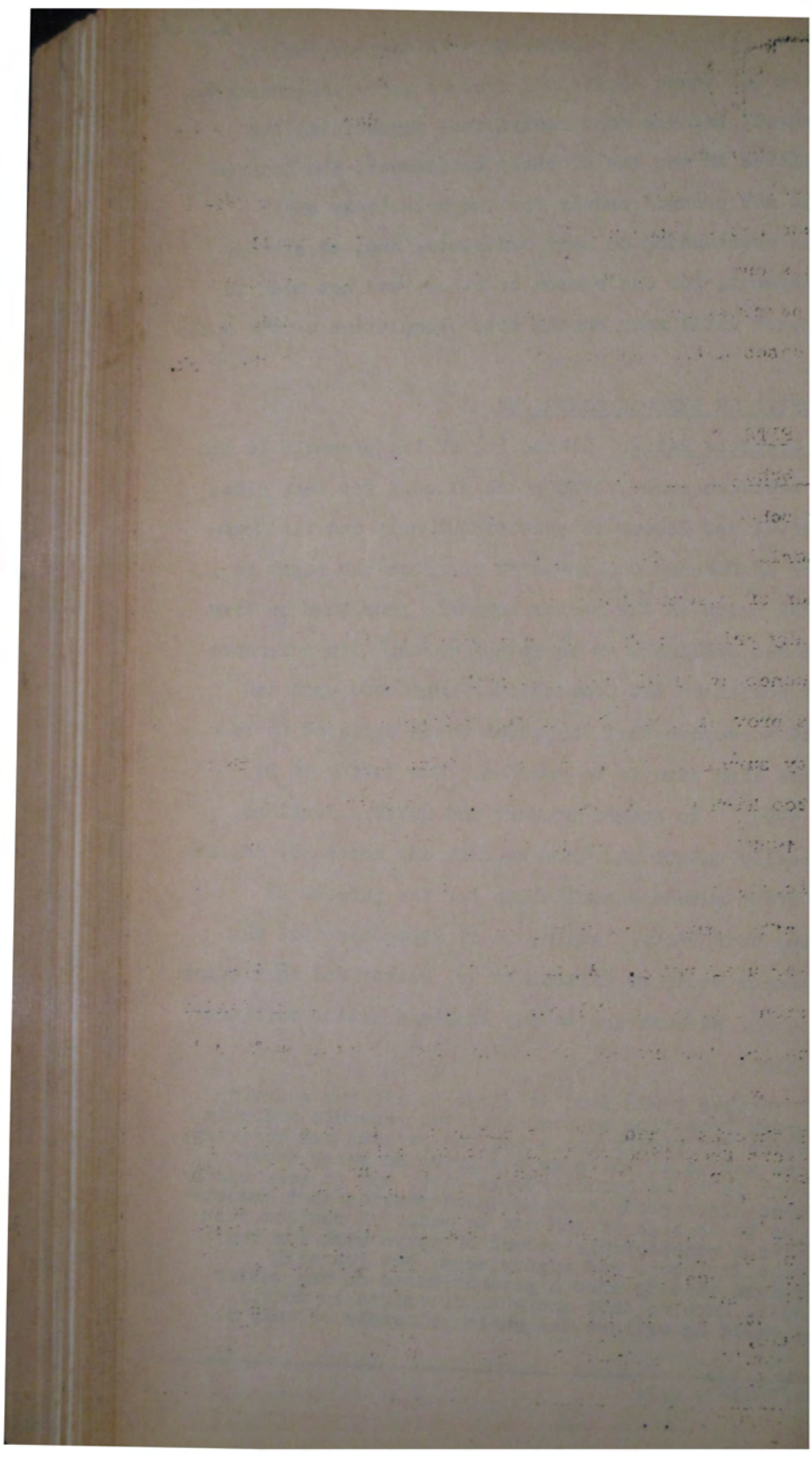
negotiations of over-payment or profiteering. With all these additional factors under consideration, and, indeed, because most contractors appreciated the difficulties in the way of early settlement, the Department was not pressed unduly for the relatively small balances outstanding on many contracts, and, as stated, final payment, for one reason or other, was not made in some cases until many months after completion of the work.

12. PROFITS ON DEFENCE CONTRACTS.

Master Schedule Rates. Clause (9) of the preamble to the master schedule read: 'The price allowed for each class of material and labour is provisional only and the Commissioner of Defence Construction reserves the right to alter any price in the master schedule from time to time on evidence available as to actual costs.' In pursuance of this provision the Commissioner impressed upon the quantity surveyors that any rates which appeared to them to be too high were to be amended. His letter of 31 August 1942⁽¹⁾ to Messrs Stewart and Maltby, Auckland, specifically authorised them to make any necessary adjustments, after mutual consultation for the purpose of achieving uniformity. Again, on 11 September 1942 the Commissioner wrote as follows to Mr. Maltby and in similar terms to Mr. Stewart and to the Auckland Master Builders' Association:

'I thought I had made it clear to all you quantity surveyors from time to time that the schedule rates in all cases are simply the basis for pricing and checking, and are not to be taken as the price on which every contract is to be based. Works vary, and in some cases evidence has already been produced showing that reductions up to as high as 15% can be made. I realise this involves a considerable amount of extra work for the District Engineers and supervisors, but you will appreciate that to make a payment based on the master schedule, knowing that the rate of profit is unduly high, would be against the whole principle of only 5% plus 2½%.'

(1) 32/9025/7, p.1.



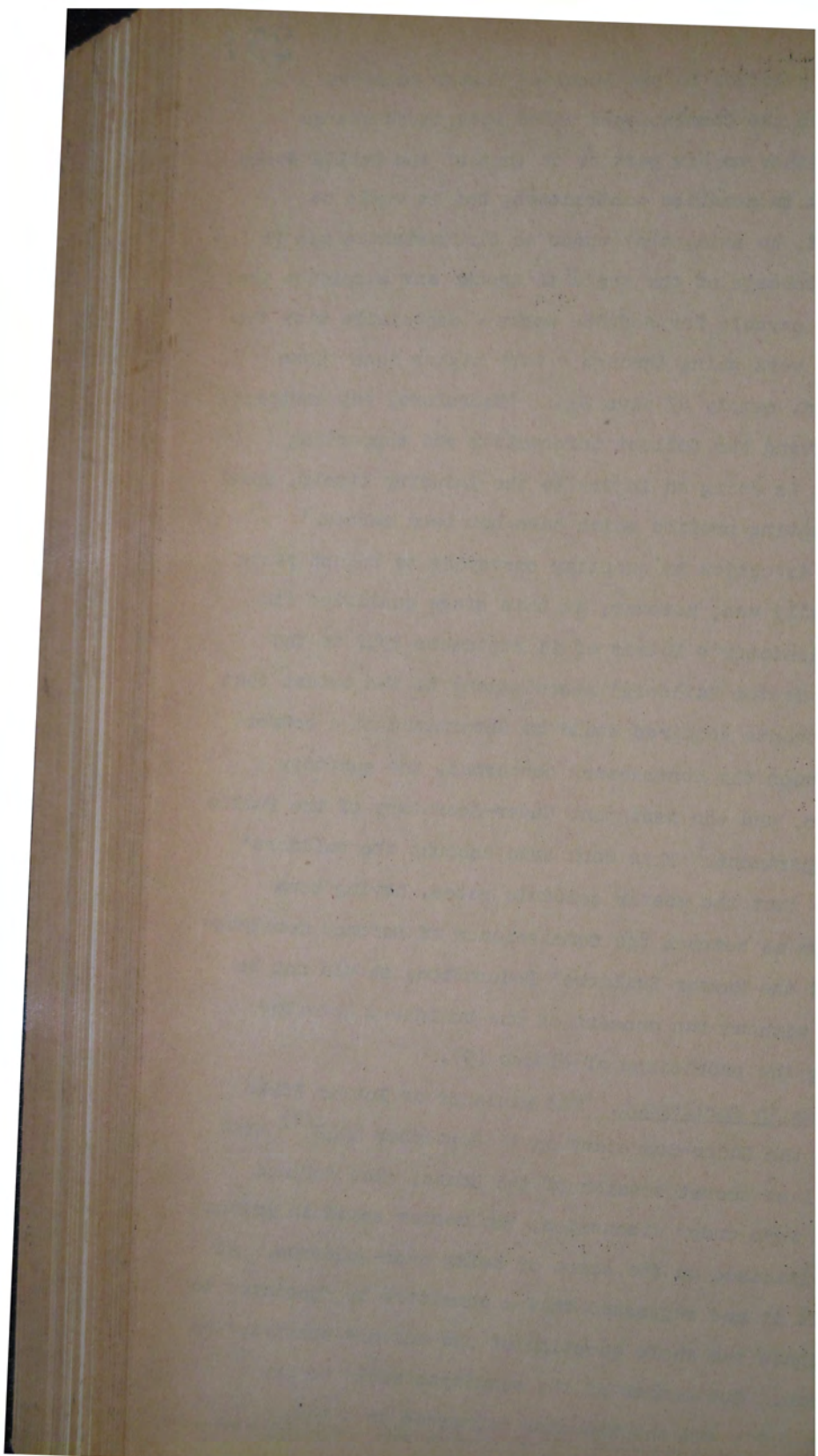
In his letter to the Auckland Master Builders' Association the Commissioner added that there was no

attempt either on his part or on that of the Public Works Department to penalise contractors, but it would be recognised, he said, that under no circumstances was it in the interests of the trade to arouse any suspicion that the rates payable for defence works - especially with the amount of work going through - were higher than those proscribed, namely 5% plus 2½%. 'Therefore, any contractor not giving the fullest information and supporting documents is doing an injury to the industry itself, apart from accepting profits which have not been earned.'

The direction to quantity surveyors to adjust rates unilaterally was, however, at this stage qualified (in the Commissioner's letter of 11 September 1942 to the Auckland Master Builders' Association) to the extent that any amendments required would be determined at a conference between the contractors concerned, the quantity surveyors, and the Assistant Under-Secretary of the Public Works Department. This took into account the builders' attitude that the master schedule rates, having been agreed to as between the Commissioner of Defence Construction and the Master Builders' Federation, should not be altered without the consent of the builders, notwithstanding the provisions of clause (9).

Criticism in Parliament. The Minister of Public Works advised the Under-Secretary on 17 September 1942⁽¹⁾ that at the last secret session of the House, when defence matters were under discussion, the master schedule prices were criticised on the score of being over-generous. As a result it was suggested that a committee be appointed to investigate the whole question of the defence construction programme. One member of the committee would be Mr. Meachon M.P., and the Minister requested that the

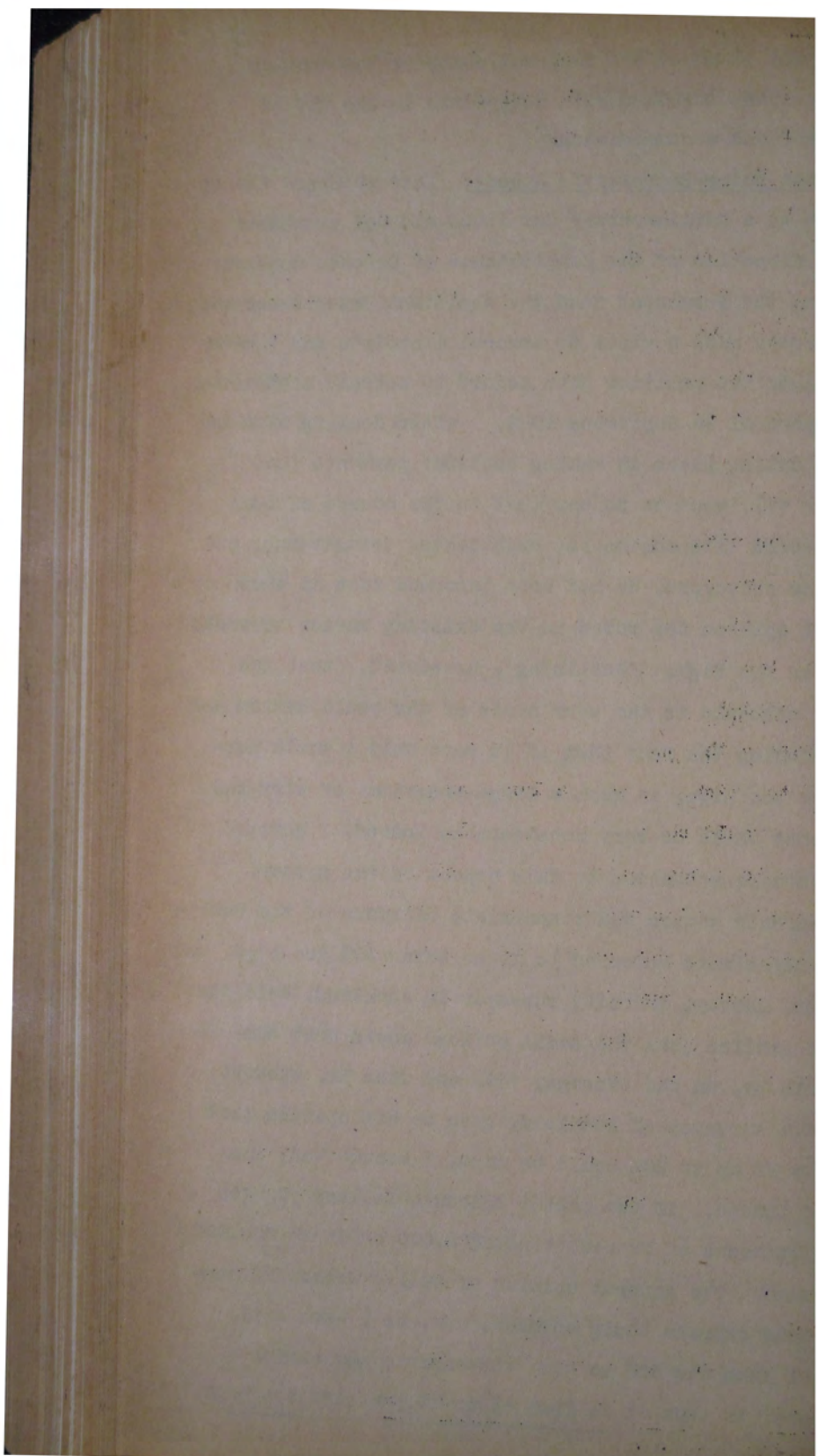
(1) 32/9025/3, p.2.



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Department place at his disposal whatever information was required, together with assistance in the way of personnel and accommodation.

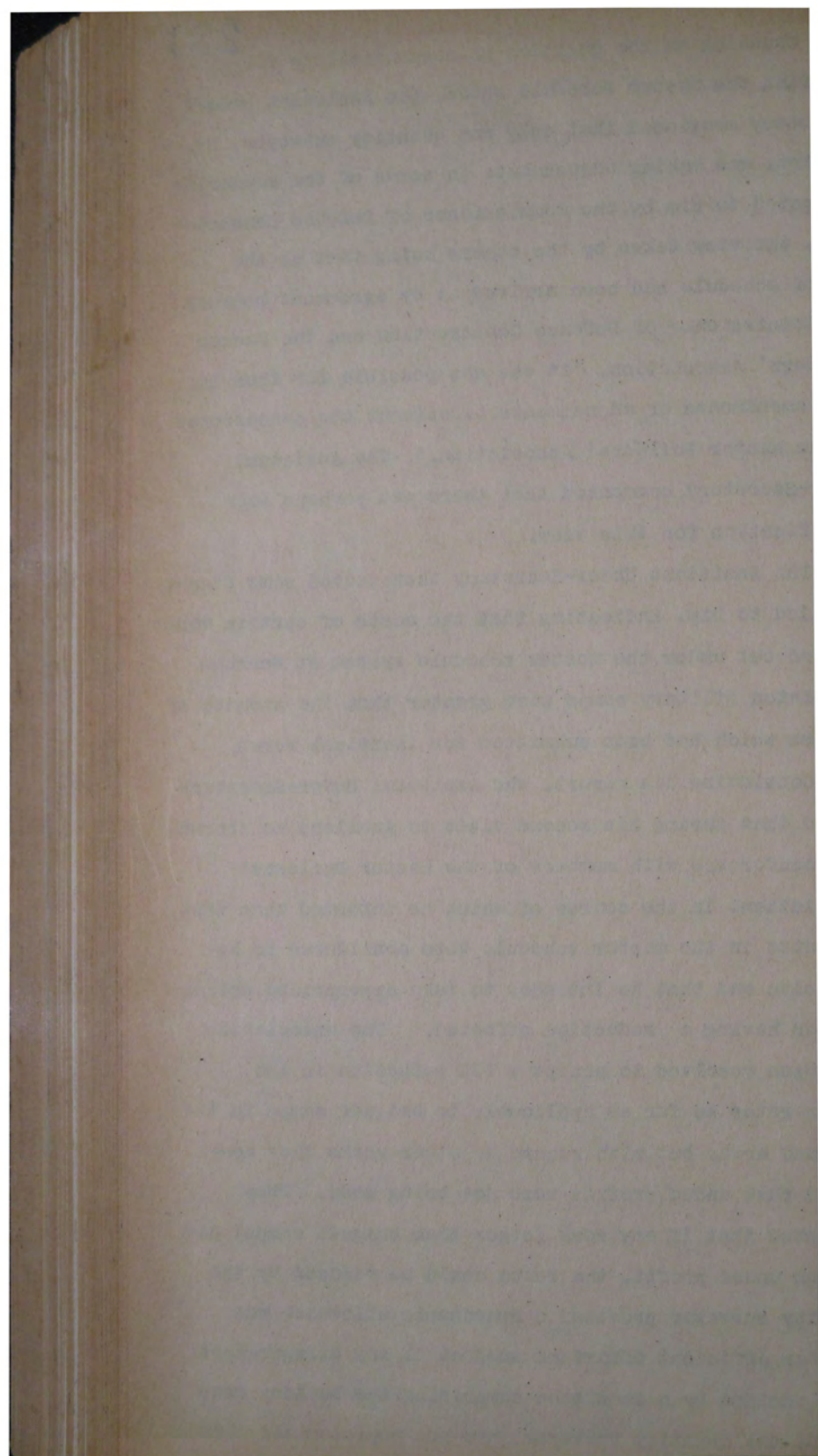
Assistant Under-Secretary's Report. This proposed investigation by a Parliamentary Committee did not eventuate but by direction of the Commissioner of Defence Construction and the Permanent Head the Assistant Under-Secretary had already made a visit to several districts and looked fully into the position with regard to defence contracts. His report of 18 September 1942,⁽¹⁾ after dealing with the delays taking place in making contract payments (see section 11), went on to say that in the course of long discussions with engineers, architects, draughtsmen, and quantity surveyors, he had been informed that in their general opinion the rates in the existing master schedule were far too high. 'Realising', he stated, 'that the master schedule is the very basis of the whole system and appreciating the fact that if it were only a small percentage too high, in such a large programme of work the over-cost would be very considerable indeed, I devoted considerable attention to this aspect of the matter. When certain senior and responsible officers of the Public Works Department referred to it as being 20% too high, and when Mr. Maltby, quantity surveyor in Auckland, said that on the smaller jobs the small builder could beat the schedule by, on the average, 15%, and when Mr. Stewart, quantity surveyor of Auckland, gave me his opinion that profits of up to 20% could be made, I became very concerned indeed. If the master schedule is even 10% too high, it means an over-cost of £800,000 on an £8,000,000 programme. The general opinion of public works officers who would express their opinion, and, as I have said, most of them who did so were responsible and senior officers, is that it is from 15 to 20 per cent too high.'



Touching on the question of responsibility for altering the master schedule rates, the Assistant Under-Secretary mentioned that only one quantity surveyor, Mr. Stewart, was making adjustments in terms of the authority delegated to him by the Commissioner of Defence Construction, the view taken by the others being that as the master schedule had been arrived at by agreement between the Commissioner of Defence Construction and the Master Builders' Association, 'it was not possible for them to make amendments or adjustments....without the concurrence of the Master Builders' Association.' The Assistant Under-Secretary commented that there was perhaps some justification for this view.

The Assistant Under-Secretary then quoted some figures supplied to him, indicating that the costs of certain works carried out under the master schedule system at Burnham and Linton military camps were greater than the amounts of tenders which had been submitted for identical works.

Continuing his report, the Assistant Under-Secretary stated that during his second visit to Auckland he attended a conference with members of the Master Builders' Association, in the course of which he informed them that the rates in the master schedule were considered to be excessive and that he intended to take appropriate action towards having a reduction effected. The association thereupon resolved to accept a 10% reduction in the labour rates so far as applicable to brigade camps in the Auckland area, but with regard to other works they contended that undue profits were not being made. They suggested that if any work (other than brigade camps) did show an undue profit, the rates could be reduced by the quantity surveyor provided a reasonable allowance was made for efficient effort and subject to any disagreement being decided by a committee comprising the builder concerned, the quantity surveyor, and one representative from



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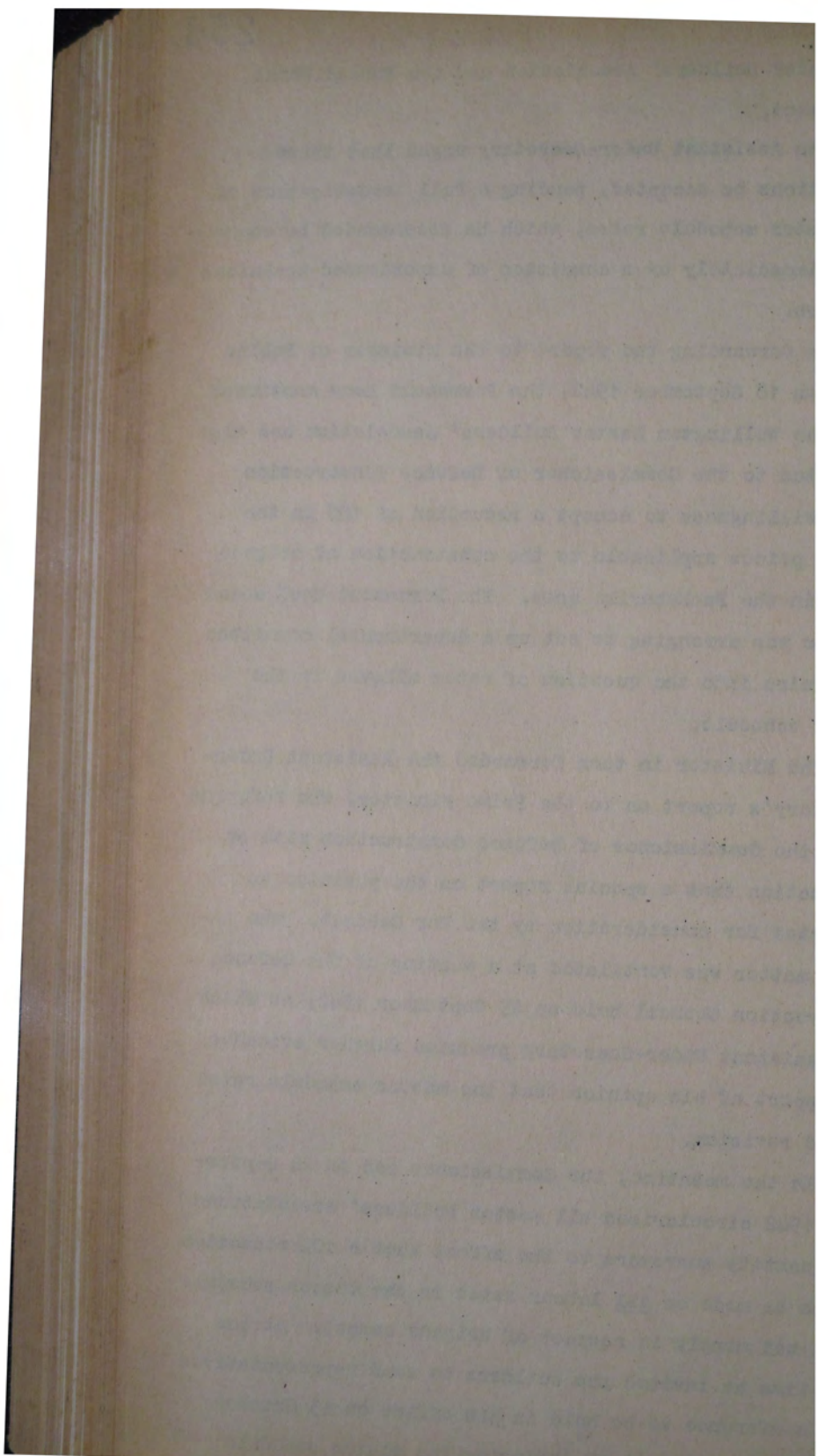
the Master Builders' Association and the Public Works Department.

The Assistant Under-Secretary urged that these resolutions be accepted, pending a full investigation of the master schedule rates, which he recommended be commenced immediately by a committee of experienced technical officers.

In forwarding the report to the Minister of Public Works on 18 September 1942, the Permanent Head mentioned that the Wellington Master Builders' Association had also intimated to the Commissioner of Defence Construction their willingness to accept a reduction of 10% in the labour prices applicable to the construction of brigade camps in the Paekakariki area. The Permanent Head added that he was arranging to set up a departmental committee to enquire into the question of rates allowed in the master schedule.

The Minister in turn forwarded the Assistant Under-Secretary's report on to the Prime Minister, who referred it to the Commissioner of Defence Construction with an instruction that a special report on the position be submitted for consideration by the War Cabinet. The whole matter was ventilated at a meeting of the Defence Construction Council held on 29 September 1942, at which the Assistant Under-Secretary produced further evidence in support of his opinion that the master schedule rates needed revision.

In the meantime, the Commissioner had on 24 September, 1942 circularised all master builders' associations and quantity surveyors to the effect that a 10% reduction was to be made on all labour rates in the master schedule (i.e. not merely in respect of brigade camps). At the same time he invited the builders to send representatives to a conference to be held in his office on 15 October 1942 with the object of 'bringing the master schedule



right up to date, both as regards rates and conditions.'

A copy of the circular was forwarded to District Engineers of the Department on 30 September 1942⁽¹⁾ for their information and action accordingly.

Departmental Committee's Report. In reporting to the Permanent Head on 5 October 1942,⁽²⁾ the chairman of the departmental committee (the Assistant Under-Secretary) stated that the committee agreed unanimously that 'no practical alternative to a basic schedule could be advanced', and that the problem was to suggest a practical and easy way of applying the schedule equitably to the diversity of works and conditions coming within the defence programme. 'Unless this is done', he said, 'it is highly probable that the cost to the State will be excessive on works of lower construction standard than that on which the schedule is based.'

The committee agreed with the Commissioner of Defence Construction that the schedule prices were on the whole fair and reasonable for what could be called standard, or ordinary good work, but that for grades of construction superior or inferior to this the labour content varied so much that adjustments were imperative 'in fairness to the contractor as well as to the Government.' It was obviously impossible to assign an adjustment factor to meet every standard of work, but all building work coming within the defence construction programme could be divided into five grades, in each of which the labour content per unit of materials was roughly constant. The committee therefore put forward for consideration the following 'table of labour adjustment factors,' which they stated was based on as much informed opinion and practical evidence as was then available, though they did not suggest that the test was exhaustive:

(1) 32/9025/3, p.2.

(2) 32/9025/3, p.3.

| | | |
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| Grade 1 | Permanent building of departmental type. | Plus 5% |
| Grade 2 | Airport barracks Convalescent hospitals Special unit hospitals Combined mess buildings Buildings similar to S & I.R. laboratory, Gracefield, and Public Works Office, Wellington. | — |
| Grade 3 | Army dormitories Stores (quarter-master) Bulk of buildings - Trentham, Burnham, Papakura, Kairanga, Linton and Westerfield. USA and Army store dumps as at Petone, Waterloo, Plimmerton, and Paekakariki. | Less 10% |
| Grade 4 | Special unit camps buildings and pre-fabricated buildings of dressed timber. | Less 15% |
| Grade 5 | Phase 1 and 2 jobs, special unit camps, USA, and pre-fabricated buildings of rough sawn timber. | Less 20% |

The committee recommended that a system of grading such as this be adopted in lieu of the all-round cut of 10% imposed in the Commissioner's circular of 24 September 1942. The result, they felt, would not only prove more equitable to all concerned but would remove the danger of a decline in the standard of work coming within grade 2. As the proposed grading was governed by the standard of the building work, it would, of course, be necessary to make an appropriate adjustment in respect of earthworks (uniform in all contracts) should more than the comparatively small amount of excavation needed for footpaths, foundations, etc be involved. The committee considered that other factors affecting the cost of contracts were amply provided for in the full interpretation of the instructions accompanying the master schedule.

The committee's report was submitted to the Minister of Public Works and the Commissioner of Defence Construction on 7 October 1942.⁽¹⁾

(1) 32/9025/3, p.3.

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On 14 October 1942, officers of the Department attended a conference with the North Island quantity surveyors, at which a series of resolutions were passed dealing mainly with the suggested grading system. These were sent on to the Commissioner on 15 October 1942, and appeared on the agenda for the meeting with builders scheduled to take place on that date.

The whole question of the master schedule rates and conditions and defence contracts generally was fully discussed with the builders' representatives at the conference held in the Commissioner's office. This extended over two days, 15 and 16 October 1942. The principle of grading the work was not opposed by the builders, but the precise categories into which the various classes of buildings were to be placed was a contentious matter and occasioned a considerable amount of argument and debate before agreement was finally reached.

In reporting the result of the conference to the Minister of Public Works on 17 October 1942,⁽¹⁾ the Assistant Under-Secretary stated 'Summed up the situation is this: that we have realised that the schedule required variation along certain particular lines and that those variations have now been made, and at the present time at any rate the Department is quite satisfied that the work is being done at a reasonable cost having regard to the abnormal conditions, the winter period through which it was done, and the necessity for speed. By reason of the agreement arrived at with the builders this week, the Department now will be in a position to make final payments on a very large proportion of the works already completed.'

A statement was made in the House by the Minister on 22 October 1942, in which he answered the criticism previously levelled at the master schedule system of

(1) 32/9025/3, p.3.

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contracting, and went so far as venturing the opinion that the system had come to stay.

Grading Adopted. By circular No. 1942/35 dated 28 October 1942, ⁽¹⁾ the Permanent Head notified District Engineers and master builders' associations of the decisions reached following the conference. These, he said, were to apply to all contracts let under the master schedule system on which final payment had not yet been made. (In this connection it may here be mentioned that approximately £100,000 worth of defence works had already been finalised.)

The grading to be adopted was as under:

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| Grade 1 A: | High grade work: | Special assessment of rates in each case. |
| Grade 1. | PWD standard. | Master schedule rates with variations for superior finish where required. |
| Grade 2. | Slightly below PWD standard (e.g. plates not checked for studs). | Same as Grade 1 but with reduction of 7½% on labour rates on plates and other timbers not checked and other variations from PWD standard. |
| Grade 3. | Static defence works, ADU, etc. | Master schedule rates less 7½% on all labour rates. |
| Grade 4. | Phase 1 construction (e.g. brigade camps) | Master schedule rates less 15% on all labour rates. |

The Government Architect would indicate the grade applicable to each work at the time of its allocation to a contractor.

The adjustments were not to apply to the following trades: - brickwork, metal work, asbestos-cement work, fabric roofing, drain laying, plumbing, electrical work, fibrous plastering and such other trades as will later be included.' The existing schedules for painting and glazing were cancelled and new schedules were in course of preparation.

In a covering memorandum of 29 October 1942 to District Engineers, the Assistant Under-Secretary amplified

(1) 32/9025/3, p.3.

for their guidance in fixing grades the meaning of the various classifications adopted. Those were:

- Grade 1A: Ordinary permanent public works buildings of peace-time standard.
- Grade 1: Permanent wooden construction such as mental hospital villas, schools, etc.
- Grade 2: Structures of permanent or semi-permanent construction, such as large stores which must be structurally sound but in which finish is not so important.
- Grade 3: Temporary construction which is likely to be in use for, say, 25 years, and includes structures such as mess blocks, emergency hospitals, etc.
- Grade 4: Temporary construction of the minimum standard permissible.

The Permanent Head, in forwarding copies of the circular instructions to the secretary of the Master Builders' Federation on 28 October 1942⁽¹⁾ commented: 'It must be clearly understood that further information regarding costs may show that some types of buildings have not yet been properly grouped, in which event it will be necessary to revise the percentage of the variation from the master schedule rates.

'It must also be understood that if evidence and information re costs show that any individual rate in the master schedule requires adjustment, such adjustment will be made and the building industry will be advised accordingly.'

The letter stressed the importance of close co-operation between the building industry and the Public Works Department, and concluded by expressing the Department's appreciation of the very helpful spirit in which the builders' representatives had approached the recent conference.

The gradings established were adhered to until the master schedule system of contracting drew to a close, and few further alterations or amendments to the unit

(1) 32/9025/3p.3.

prices or terms and conditions of the master schedule were
authorised subsequently by the Commissioner of Defence
Construction. 260

Audit takes on Interest. In a memorandum dated 18 March 1943 to the Under-Secretary,⁽¹⁾ the Controller and Auditor-General commented that it was evident from the adoption of the grading system incorporating a reduction in the labour rates for certain classes of work that the original rates 'could not have been based on any exact costing data.' It would seem, he added, that if contracts were to continue to be let at master schedule rates the contractors' books should be examined to see whether or not excessive profits were being made and whether some restrictions on the amount of profits that might be earned were necessary.

Replying on 20 March 1943 the Assistant Under-Secretary recapitulated the circumstances which gave rise to the master schedule system of contracting, and stated that the Commissioner of Defence Construction also was most anxious that 'costs be so adjusted that anything in the nature of undue profits is controlled.' The Assistant Under-Secretary mentioned that following a previous request from Audit (on 24 September 1942)⁽²⁾ he had asked the District Engineers at Auckland, Wellington, Christchurch, and Dunedin to supply comparative figures in a representative number of cases showing the contractors' actual costs as compared with the contract prices arrived at under the master schedule. Difficulty had been experienced in obtaining these figures, however, and the contractors had since represented to the Commissioner of Defence Construction that the matter be deferred until after 31 March 1943, when their books would be up-to-date and the requisite information more readily available. The Assistant Under-Secretary assured the Controller and Auditor-General that

(1) A 26/101 on 32/9025/3, p.4.

(2) 32/9025/3, p.3.

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a complete investigation would be made at the earliest possible moment. He concluded by saying that it was the intention of the Commissioner to revert shortly - probably within the next three months - to a system of tendering based on a revised master schedule of prices as a check on tenders but retaining control over labour and materials.

Further correspondence ensued, and on 21 June 1943⁽¹⁾ Audit was advised by the Assistant Under-Secretary that departmental accountants were commencing an examination of contractors' books immediately.

The Controller and Auditor-General's report to Parliament for 1942-43 made the following reference to profits under the master schedule system of contracting:

'Investigation by the Public Works Department indicated that the original schedules gave contractors an unduly high rate of profits in certain types of buildings, and a reduction in rates was effected in September last. It is desirable that tests of the fairness of schedule prices should be made from time to time by reference to the actual profits made by contractors as shown by their own records, and the contracts provide for such reference if it is desired. Representatives were accordingly made to the Commissioner and the Public Works Department and these authorities have agreed that examination of the contractors' records will be made forthwith.'

By July 1943 19 contracts in the Wellington area had been examined, but further reports were awaited to enable a more accurate over-all picture of the incidence of contractor's profits generally to be presented. This was mentioned by the Permanent Head in a report furnished on 11 August 1943⁽²⁾ to the Minister of Public Works, for the information of the Prime Minister, who had asked for the Department's comments on the points raised by Audit. The Permanent Head added that the Wellington figures indicated excess profits in several cases, but he was inclined to think this might be due to over-measurement on the part of the quantity surveyor. The Assistant Under-Secretary was, he said, conferring with representatives of the builders in the main centres with a view to

(1) 32/9025/3, p.4.

(2) Ibid.

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securing their co-operation and assistance in connection with the examination of contractor's books, since no authority existed whereby the Department had the legal right to carry out such an examination. (This was remedied by Section 2 of the Finance Act, 1943, (No. 3) which empowered the inspection, examination, and audit of books, accounts, and documents and the obtaining of all information incidental to investigations in respect of Government contracts).

Report of Investigation Officers. Reports which reached the Department in September, 1943 from the six investigating officers engaged on the examination of contractors' books in the Auckland, Wellington and Christchurch districts clearly indicated that high profits had been made on defence works. In Auckland the accounts of 43 contracts, involving profit-bearing costs aggregating £337,775 had been examined, the combined profit and overhead ranging from 4.16% to 35.3% and averaging 10.4%, or £35,299.

In Wellington 34 contracts with profit-bearing costs of £263,624 disclosed an average profit and overhead of £40,360, or 15.3%, ranging from 3.1% to 36.7%. In Christchurch the examination of 24 contracts revealed a profit and overhead of £28,792, or 27.2%, on a total of £105,832 profit-bearing costs. The lowest figure was 15.75% and the highest 72.6%.

The profit and overhead envisaged in the master schedule, 5% profit plus $2\frac{1}{2}\%$ overhead, was equivalent to 7.625%.

By profit-bearing costs was meant the items in the master schedule on which profit and overhead at 5% plus $2\frac{1}{2}\%$ were allowed, i.e. excluding 'on costs' refunded to the contractor as a reimbursement. In all cases such profit-bearing costs included the value of timber.

It will be noted that the profit and overhead on

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Individual contracts examined fluctuated from 3% to as high as 72% and that the lowest figure in the Christchurch district was 15.75%.

In all, contracts to the value of about £1,000,000 were examined.

The investigating officers in their joint report dated 15 October 1943⁽¹⁾ stated that the accounts examined represented a fair cross-section of defence contracts let in the district concerned.

While conceding that some portion of the high profits earned was due to certain contractors reaping the benefit of allowances for sub-contractors' profits by carrying out their own sub-contracting, the investigating officers pointed out that the average contractor enjoying no particular advantage in this respect was enabled to earn considerably in excess of the standard profit and overhead rate of 7.625%. They expressed the opinion that 'the source of the high rate of profit to the least efficient contractor can only be the high rates in the master schedule', and they accordingly suggested that the master schedule be revised in the light of experience gained since it was first brought into operation - the difference to be regarded as excess profit and recovered from the contractors and sub-contractors.

Enquiry Recommended. The first move towards instituting an enquiry into the question of excess profits was made by the Commissioner of Defence Construction in a minute of 2 October 1943 to the Minister of Public Works.⁽²⁾ In this he sought Cabinet approval to the setting up of a committee comprising officers of Treasury, Public Works, Housing and Audit, together with representatives of the builders, to investigate and report on:

(1) What method was to be adopted for the recovery of monies paid through over-measurement.

(1) 32/483/2, p.1.

(2) Ibid.

(2) Whether the master schedule rates were based on the current costs of labour and materials, and, if so, whether they should be applied to work still required to be carried out; also 'to report on the soundness of the master schedule as a basis under which the work could have been carried on during the period under which defence works have been under construction.'

(3) The basis under which Government contracts were to be carried out during the next two years.

(4) The basis under which Government housing contracts were to be let.

The Commissioner stated that the preliminary investigation carried out by the Public Works and Audit Departments showed clearly that where the master schedule had been properly applied the rates of profit were reasonable, with the exception of a few cases which were being further examined. 'In Wellington and Christchurch, however, it is obvious that there has been over-payment due to over-measurement'. This was brought about, explained the Commissioner, through Auckland being the only centre enjoying the services of two large firms of quantity surveyors (Stewart & Maltby). In Wellington the lack of sufficient experienced quantity surveying staff meant that quantities had to be taken off by untrained personnel, while Christchurch contracts were dealt with by a Dunedin firm which had not the requisite local knowledge.

The Commissioner mentioned that the Assistant Under-Secretary of Public Works had had innumerable conferences with contractors and the latter had expressed their willingness for an investigation such as he now recommended to be undertaken, 'as they realise that an adjustment will be necessary.' A basis would have to be found, he stated, to ensure that the whole of the monies were recovered either by way of refund or through taxation, and in this connection he added that in Australia a committee had been set up for a similar object.

A copy of the Commissioner's minute was sent by him to the Prime Minister and the Minister of Finance, also to the Assistant Under-Secretary.

On receipt of his copy the Assistant Under-Secretary addressed a memorandum to the Minister of Works, dated 4 October 1943, indicating that he concurred fully in the Commissioner's proposal, as he was seriously concerned at the position disclosed by the investigation. At the same time he said he wished to make it clear that the information on which the Commissioner had based his recommendation had been produced by the Public Works Department. The Assistant Under-Secretary outlined the steps taken by the Department to check contractors' costs, and gave the percentages of profit disclosed by his investigating officers. He agreed that 'the key to the situation under the master schedule system is correct measurement of quantities,' and touched on the fact that re-measurement of the whole of the original brigade camp work in the Wellington area had revealed a difference of £37,000.

The Assistant Under-Secretary stated that his general conclusions at that stage were (1) that the master schedule rates themselves, particularly in certain types of work, were still too high, notwithstanding the adjustments already made, and (2) that a complete re-measure of all the work in the Wellington and Christchurch districts might be necessary. In a postscript he added that in Wellington it was believed that certain of the master schedule amendments had not been applied through what appeared to have been a misunderstanding on the part of one of the measuring officers, and that in Christchurch it was possible that large quantities of timber had been supplied by certain builders from their own stocks - having been purchased by them earlier at a cost less than that allowed in the master schedule. Both these aspects of the matter were being looked into.

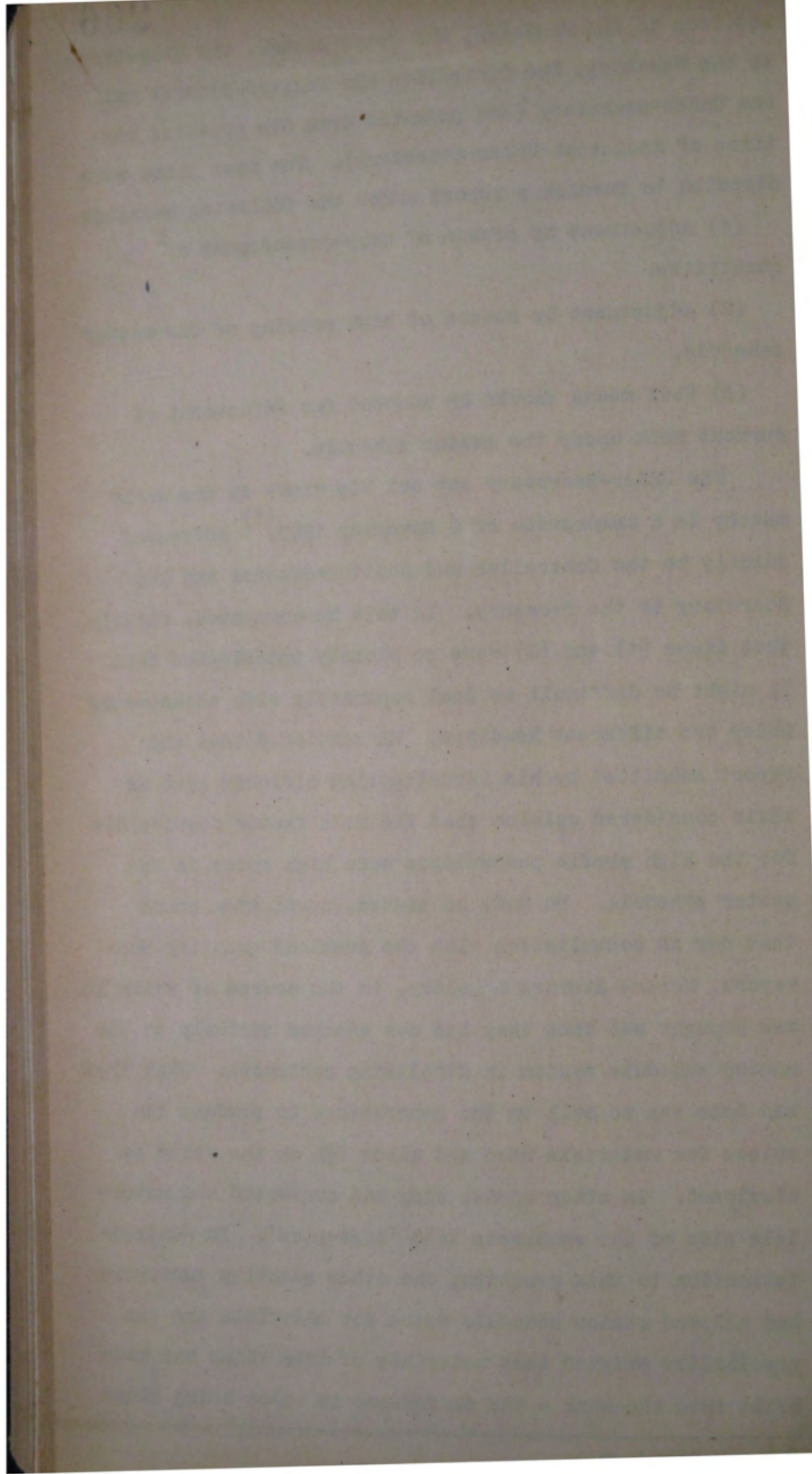
Conference with Builders. The next development was a conference held on 3 November 1943 in the office of the Minister of Finance, those attending including, in

addition to the Minister, the Commissioner, the Secretary to the Treasury, the Controller and Auditor-General and the Under-Secretary (now promoted from his previous position of Assistant Under-Secretary). The last three were directed to furnish a report under the following headings:

- (1) Adjustment by reason of over-measurement of quantities.
- (2) Adjustment by reason of high pricing of the master schedule.
- (3) What means should be adopted for adjustment of current work under the master schedule.

The Under-Secretary set out his views on the whole matter in a memorandum of 8 November 1943,⁽¹⁾ addressed jointly to the Controller and Auditor-General and the Secretary to the Treasury. In this he commented, firstly, that items (1) and (2) were so closely interlocked that it might be difficult to deal separately with adjustments under two different headings. He mentioned that the report submitted by his investigating officers gave as their considered opinion that the main factor responsible for the high profit percentages were high rates in the master schedule. He had, he stated, spent some hours that day in consultation with the Auckland quantity surveyors, Messrs Stewart & Maltby, in the course of which it was brought out that they had not adhered strictly to the master schedule system in finalising contracts. What they had done was to call on the contractors to produce invoices for materials used and allow 7½% on the value so disclosed. In other words, they had converted the materials side of the contracts into 'cost-plus'. In contradistinction to this practice, the other quantity surveyors had allowed master schedule rates for materials and the possibility existed that materials of less value had been built into the work - the difference in value being clear

(1) 32/483/2, p.1.



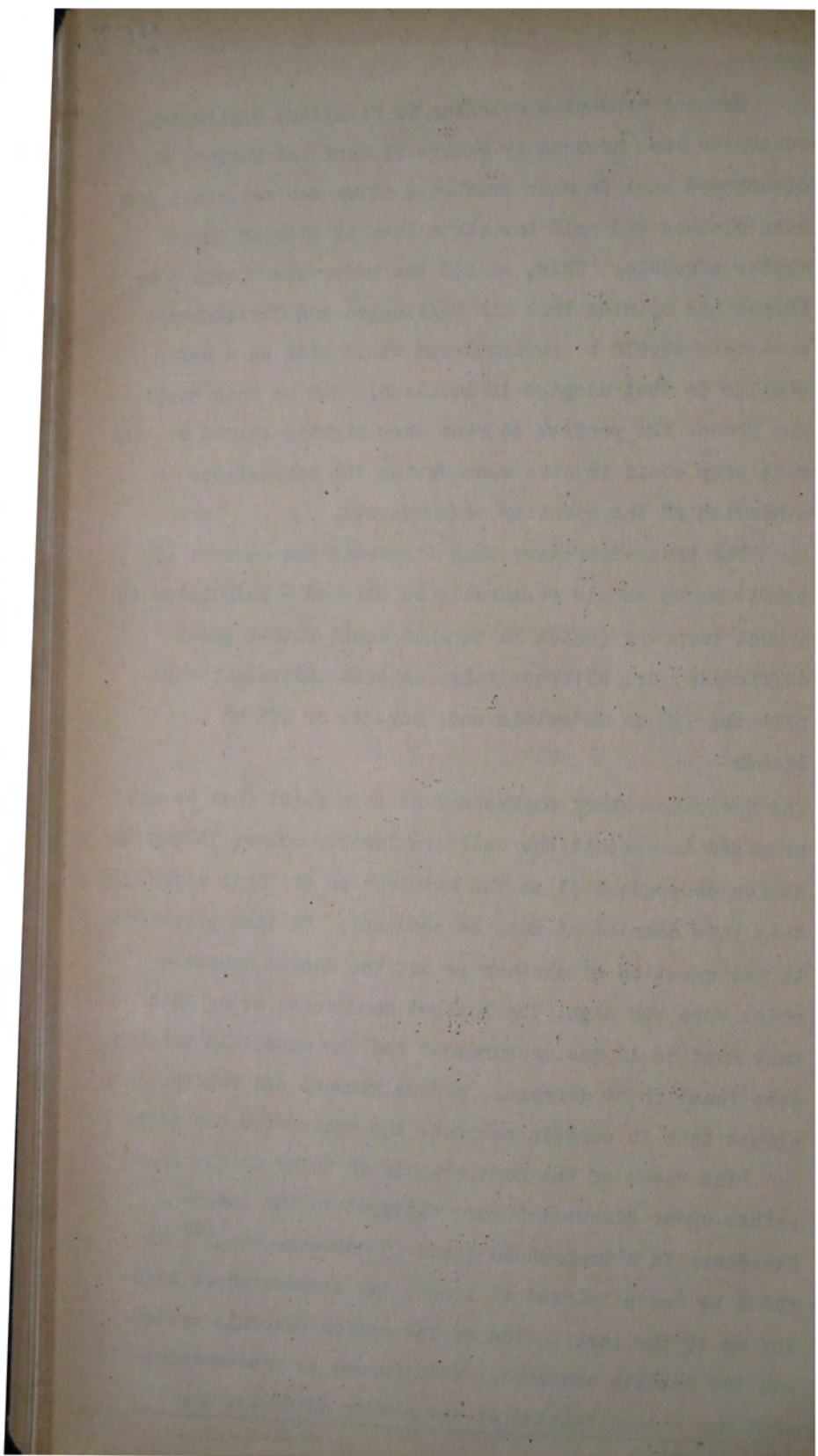
Several schedules relating to finalised Wellington contracts were perused by Messrs Stewart and Maltby, who discovered that in many instances rates for materials had been claimed and paid for other than as allowed in the master schedule. This, stated the Under-Secretary, confirmed his opinion that all Wellington and Christchurch contracts should be reviewed and dealt with on a basis similar to that adopted in Auckland. But as this might not reduce the profits to what they rightly should be, the next step would involve considering the correctness or otherwise of the quantity measurements.

The Under-Secretary then discussed the quantum of profit which should reasonably be allowed - calculated in annual turnover (which he thought would entail great difficulty) or, alternatively, on each individual work, allowing $7\frac{1}{2}\%$ on materials and, say, 15 or 20% on labour.

The Under-Secretary emphasised at this point that he had promised to consult the builders further before taking any action consequential to the examination of their books, and that this commitment must be honoured. He then proceeded to the question of whether or not the master schedule rates were too high, the logical conclusion being that they must be if the measurement and the materials pricing were found to be correct. Messrs Stewart and Maltby agreed that in certain respects the rates were too high.

The views of the Commissioner of Works on the four points under discussion were conveyed to the Under-Secretary in a memorandum dated 13 November 1943,⁽¹⁾ in which he recapitulated at length the circumstances leading up to the institution of the master schedule system and the results achieved. With regard to over-measurement and misapplication of the master schedule, the

(1) 32/483/2, p.1.



Commissioner recommended that an organisation be set up, including Messrs Stewart and Maltby, to check all the contracts concerned and recover the monies due to the Government. He anticipated no great difficulty would be experienced in securing refunds, since the majority of overpaid contractors would now have realised from their records that over-measurement had taken place. The only high rates in the master schedule admitted by the Commissioner were in respect of heating and engineering and electrical services, and these he attributed to Public Works Department staff handling that class of work rather than to the quantity surveyors who, he stated, 'simply accepted the rates agreed upon as between the public works officers and the firms concerned.' Investigations into the rates payable for heating and engineering services were being made by the Auckland quantity surveyors and when these were completed the Commissioner was satisfied a reasonable settlement of the contracts involved could be readily arrived at.

On 15 November 1943 the Controller and Auditor-General, the Secretary to the Treasury, and the Under-Secretary of Public Works again conferred with the Minister of Finance. It was decided that the first matters calling for attention were:

(1) An urgent review of Wellington and Canterbury district contracts with a view to ascertaining why the average profit results were so much higher than in Auckland.

(2) Adjustment downwards of master schedule rates for the southern districts where experience in Auckland had shown they were too high.

By this date it was already obvious to the Department that any attempt to make adjustments on individual contracts would be fraught with extreme difficulties by reason of disputed measurements, quantities, etc. This

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had become apparent from the builders' attitude over the Wellington brigade camps. In this case the Department's own measurement of the work in the camps disclosed an overpayment of £37,000 as compared with payments made in terms of the quantity surveyor's certificates, and when this disparity was brought to the notice of the builders they had agreed to adjustments being made on account of over-measurement of quantities and wrongful application of the master schedule rates. When, however, it came to the question of actually refunding the amount overpaid, the builders prevaricated and endless arguments ensued without any satisfactory settlement being reached, the firms concerned categorically disputing the Department's figures. Later, the question of overpayments on the brigade camps was merged in the general proposal to 're-negotiate' defence contracts with a view to recovering excess profits, but eventually, when the Contracts Adjustment Commission ceased to function, a refund of £4,288 was made, as against the Department's reduced claim of £13,095. Indeed, as will be seen, the dispute over the Wellington brigade camps was one of the main reasons which led to the setting up of the Contracts Adjustment Commission.

A further complication which arose at this time was the receipt from the secretary of the Master Builders' Federation of a letter dated 6 December 1943⁽¹⁾ to the effect that legal opinion obtained by the Federation indicated that Section 2 of the Finance Act (No. 3), 1943, did not give power to inspect all builders' records, but only those relating to Government contracts. This meant that a complete investigation into builders' annual accounts would be frustrated unless Government officers were given wider powers. Regulations were subsequently drafted which would have surmounted this difficulty but the necessity for their issue was superseded by other

Contract Adjustment Commission. Following the conference with the Minister of Finance, the Under-Secretary convened a meeting with the Master Builders' Federation on 24 November 1943. This was attended also by the Secretary to the Treasury (as chairman) and the Controller and Auditor-General. The whole position was fully discussed, and an endeavour made to reach an agreement on some procedure which would enable all defence contracts to be reviewed with a view to adjusting (1) overpayments resulting from wrong measurement and misapplication of the master schedule rates or conditions, and (2) high or excess profits earned on account of the tremendously increased turnover of all contractors - stated to be many times greater than anyone anticipated at the time the master schedule system was introduced. In the course of his address the Under-Secretary referred to the American Re-negotiation Act 1942, authorising Government bodies known as Price Adjustment Boards to re-negotiate the price of any defence contract and secure refunds of excessive profits. In brief, the Price Adjustment Board obtained by means of studying the balance sheets of a contracting firm, a picture of the size and scope of its organisation for what were termed five base years before the war, and compared with the firm's present position by reason of war contract activities. Then, by negotiation with the firm, the Board arrived at what was considered a fair and reasonable return having regard to all the circumstances and the firm's war production. Excess profits so determined became refundable to the Government. The Under-Secretary suggested that a somewhat similar line of approach might solve their mutual problems in New Zealand and avoid all the complexities and difficulties of re-measurement.

The question of setting up a committee to review contracts forthwith was raised, but the builders asked for

time to consider this proposal. The minutes of the meeting record that 'there appears to be no doubt whatever in the minds of the builders' representatives that the reported results for Wellington and Christchurch in particular were much too high and ought to be reduced to a considerably lower level.' It was finally arranged that the builders would consider the matter and put forward their views and suggested procedure.

Particulars of profits made on defence works were forwarded by the Under-Secretary on 29 November 1943⁽¹⁾ to the secretary of the Master Builders' Federation for the confidential information of the special committee which had represented the builders at the meeting. With his letter the Under-Secretary enclosed a copy of an address given by the vice-chairman of a Price Adjustment Board in the United States (appendix 5) and reiterated his suggestion that the principle of re-negotiation as followed in America might well be applied in New Zealand, for the purpose of adjusting excess profits in defence contracts. 'It seems to me' he said, 'that a solution of our problem lies in the adoption of an arrangement of this nature whereby a committee of, say, three (one to be a nominee of the building industry), could review with each firm its operations over the defence construction period and after discussion agree upon what would be a fair and reasonable return to the contracting firm having regard to all factors including speed and efficiency of output, manpower involved, etc and also having due regard to the position of that firm during four or five base years previous to the war.' The Under-Secretary recalled that all were in agreement that any attempt to review past work by checking up on quantities and the manner in which the master schedule had been applied would be a long, laborious process and, owing to the volume of work involved (approximately

(1) 32/483/2, p.1.

\$15,000,000 in value), would require the services of more quantity surveyors and departmental officers than could possibly be made available.

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'I am quite sure' concluded the letter 'that all the firms associated with the defence building programme of the past two years can feel that they achieved what seemed impossible in the way of speedy construction and volume of output. The production was remarkable. If the building industry, by reason of its ready co-operation and interest, could do what it has done on the production side, then I am quite satisfied that by consultation and reasonable negotiation the financial side also can be placed on a basis satisfactory to the industry, to the Government, and to the public, so that it can feel in the future that its efforts to help New Zealand in a critical period can withstand any criticism.'

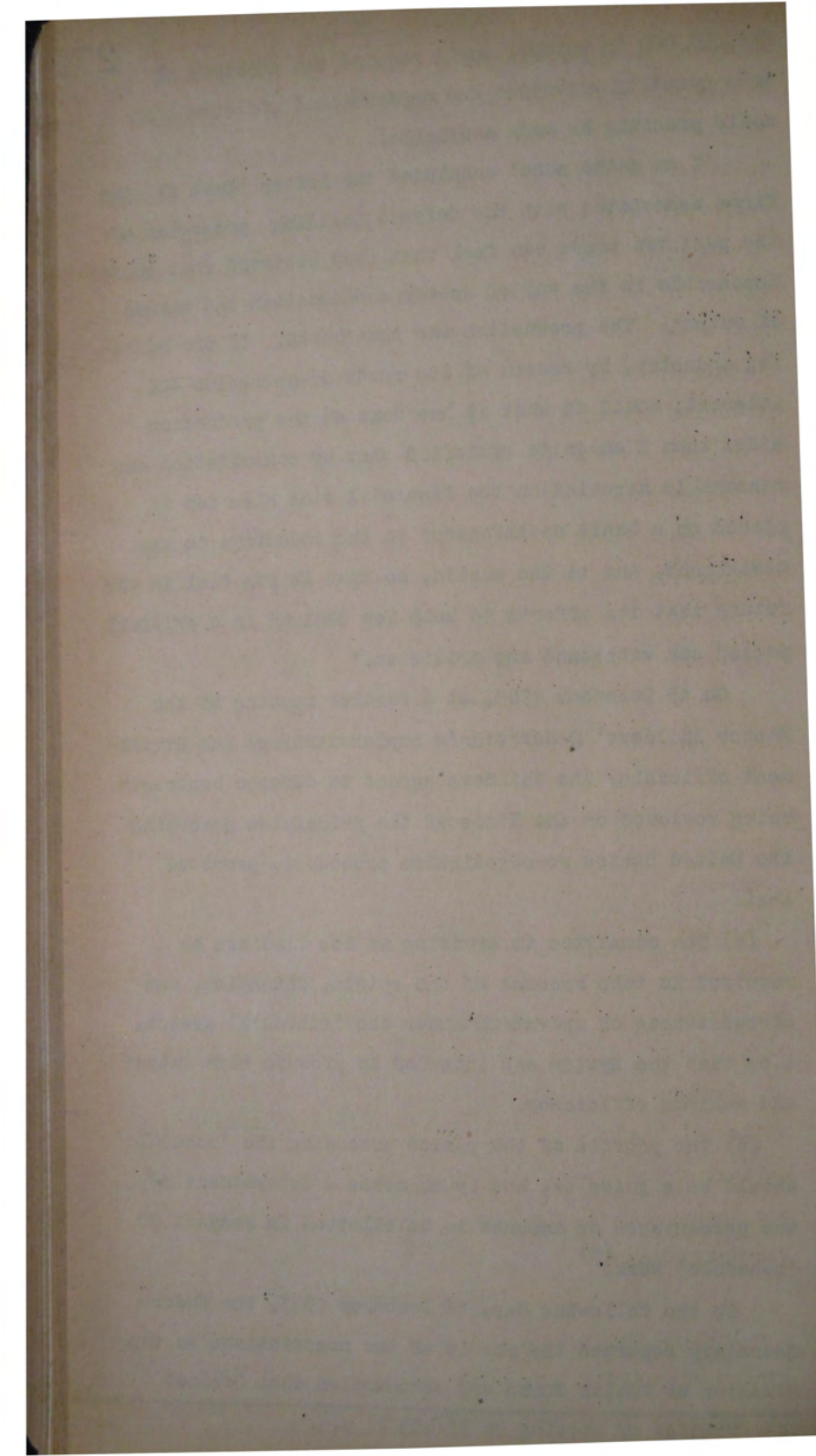
On 15 December 1943, at a further meeting of the Master Builders' Federation's representatives and Government officials, the builders agreed to defence contracts being reviewed on the lines of the principles governing the United States re-negotiation procedure, provided that:

(a) The committee in arriving at its findings be required to take account of the spirit, intention, and circumstances of operation under the 'schedule' system, i.e. that the system was intended to procure high output and maximum efficiency.

(b) The profits of the period preceding the 'schedule' should be a guide to, but by no means a determinant of, the percentages or amounts to be allotted in respect of 'schedule' work.⁽¹⁾

On the following day, 16 December 1943, the Under-Secretary reported the result of the negotiations to the Minister of Public Works and recommended that Cabinet

(1) Minutes of meeting on 32/483/2, p.1.



approval be sought to the setting up of a commission to review defence contracts. The Under-Secretary suggested that there was no need at that juncture for invoking legislation or statutory regulations, and that it would be preferable for the commission to proceed on an informal, voluntary basis, deferring the question of powers necessary to enforce its decisions until such time as difficulties arose in that connection. This would better suit the builders and would also avoid 'unnecessary and difficult publicity regarding the present position.'

Cabinet's approval was given on 17 December 1943, the relevant minute reading:

'Appointment of a commission consisting of three persons to inquire into the costs incurred in the construction of defence and other buildings under the emergency conditions existing during the possible Japanese invasion, with a view to reducing such charges to a reasonable economic basis and obtaining where necessary reimbursements of any sums overpaid.

That Mr. Justice Tyndall be appointed chairman of the commission, Mr. J.L. Griffin, Public accountant, to represent the Government, with one representative of the master builders.'

Later, owing to Mr. Griffin's inability to act, Mr. John T. Mair, ex Government Architect, was appointed as Government representative. The Master Builders' Federation nominated Mr. R.C. Love as their representative.

Order of Reference. An order of reference was drawn up by the Under-Secretary of Public Works in collaboration with Treasury and Audit, in form of a letter addressed to Mr. Justice Tyndall. After perusal by the Master Builders' Federation, the draft letter was submitted to Cabinet and approved therein on 28 January 1944.⁽¹⁾ It was despatched to Mr. Justice Tyndall under date of 22 February 1944.

The order of reference recapitulated the circumstances leading up to the adoption of the master schedule system of contracting, the difficulties experienced, and the reasons for requiring a review of all contracts with

the object of recovering excess profits. It was left to the commission itself to lay down its method of approach to the problem, based on a broad consideration of every aspect of the position. Paragraph 3 reads:

'The task of the commission is to investigate the contracts referred to, and if it is satisfied that exorbitant profits have been made by any contractor or sub-contractor, to negotiate on behalf of the Government with the contractor or sub-contractor, and, if possible, secure equitable voluntary adjustments or finalise agreement for the refund to the State of such portion of the profits as are deemed by the commission to be excessive, having regard to what may be considered in all the circumstances a fair and reasonable return to the contractor as well as proper economy in the expenditure of public monies during the war period. In the event of it not being possible to reach agreement the commission will determine and report to what extent in its opinion the contractor or sub-contractor involved has received an excessive reward for services rendered and what adjustments should be made to secure a fair and reasonable return to the contractor, as well as a reasonable economy in the expenditure of public monies.'

After mentioning that an investigation of the books of selected contractors had disclosed that the rates of profit earned were considerably in excess of the 5% provided for in the master schedule, and explaining that it was not the desire of the Government to give any specific direction upon the procedure to be followed by the commission to define what should be regarded as a fair and reasonable profit, the letter gave three suggested bases for decisions. These were:

'(a) That profits be related to average profits over an antecedent period. It is thought that the profits of the period preceding the period under review should be a guide to but by no means a determinant of the profits to be allowed.

(b) Profits made on work other than Government work during the period under review may be regarded as relevant in deciding what profit should be allowed in respect of the work under review, particularly as some contractors are able to maintain in varying degrees their other work.

(c) As regards any suggestion that the position is remedied by taxation, it is considered that this is fallacious. If adjustment of taxes is necessary as a result of the commission's operations this may be adjusted by the contractor submitting an amended return to the Commissioner of Taxes, who will make a refund where necessary.'

With regard to (a), it was suggested that a 'just standard' would be the builder's profit on his operations

during the period of three years prior to the introduction of the master schedule system.

Paragraph 8 of the order of reference stated that information required by the commission might be obtained by three methods, viz:

(a) Investigation of the contractor's books by departmental officers.

(b) Submission by contractors of certified statements of direct and indirect costs in a form to be settled by the commission.

(c) A combination of these methods whereby the departmental officers would investigate only accounts with which the commission was not satisfied.

The paragraph continued:

'The first method is favoured because the information should thereby be collected and presented in a more uniform manner and not be so dependent upon the exigencies of the contractors' current business. It has the disadvantage that the information available may be limited by the construction placed upon the contractors' books by the investigating officers. The second method has the merit of requiring the contractor himself to present the required information, which he may do more clearly from his more intimate knowledge, and to some extent places on him the onus of making full disclosure. It is anticipated that dispute will largely centre upon what is allowable by way of overhead. Departmental officers will quickly gain a much wider view than the contractor would have upon these contentions and should be able to represent to the contractor the commission's views and practice, thus saving the time of the commission.....'

An officer of the Department was appointed secretary to the commission.

The period to be covered by the review was not given in the order of reference, but by arrangement with the Commissioner of Works and the builders it was subsequently fixed as from 1 April 1942 to 31 March 1944.

The first meeting of the commission was held on 25 February 1944, during which the secretary was instructed to obtain from District Engineers particulars of all defence building contracts let in their districts.

(Departmental accountants were already investigating contractors' books and collecting information therefrom for

the information of the commission). Another meeting took place on 19 June 1944, and the next - and final, on 1 July 1944.

Builders Withdraw. On 14 August 1944⁽¹⁾ the secretary of the Master Builders' Federation notified the Under-Secretary that their representative on the commission, Mr. R.C. Love, had resigned, and requested that before appointing another member in his stead 'the conditions of investigation be clearly defined and understood by all parties.'

The Under-Secretary pointed out in reply that it had been left to the commission to define its own policy and method of procedure, and he suggested that the federation might regard it as desirable 'to nominate its representative so that he may take part in whatever further discussions may be necessary to enable the matter to proceed.'

The Master Builders' Federation wrote again on 23 August 1944 stating that they were not prepared to continue to support the Contracts Adjustment Commission and suggesting that the commission be disbanded. 'This action' said the secretary 'is taken because of information obtained in reports presented to the association (federation) by its representative on the committee (commission). The New Zealand Builders' Federation has been forced to this conclusion because the Department's difficulties are such that they can never be solved in this way.' The letter went on to say that the federation was prepared to render 'whatever assistance is within its power to facilitate the adjustments of any payments that may have been made in error, or as a result of the misapplication of the master schedule, 'but that the federation was of the opinion that taxation would take care of the extra profits earned as a result of increased turnover, 'taxation having been specifically designed for

(1) 32/483/2.

The attitude of the builders was made clearer at a meeting held on the day the letter was written. The Under-Secretary was present by invitation, and in the course of a memorandum he addressed to the Commissioner of Works on the following day, 24 August 1944, he stated that the crux of the dissatisfaction expressed at the meeting was that whereas the builders had agreed to the results of the master schedule system being investigated, the commission was apparently concentrating on the system itself and its operation. This was not considered by the builders to be the intention of the arrangement nor in accordance with the charter on which the commission was authorised to proceed.

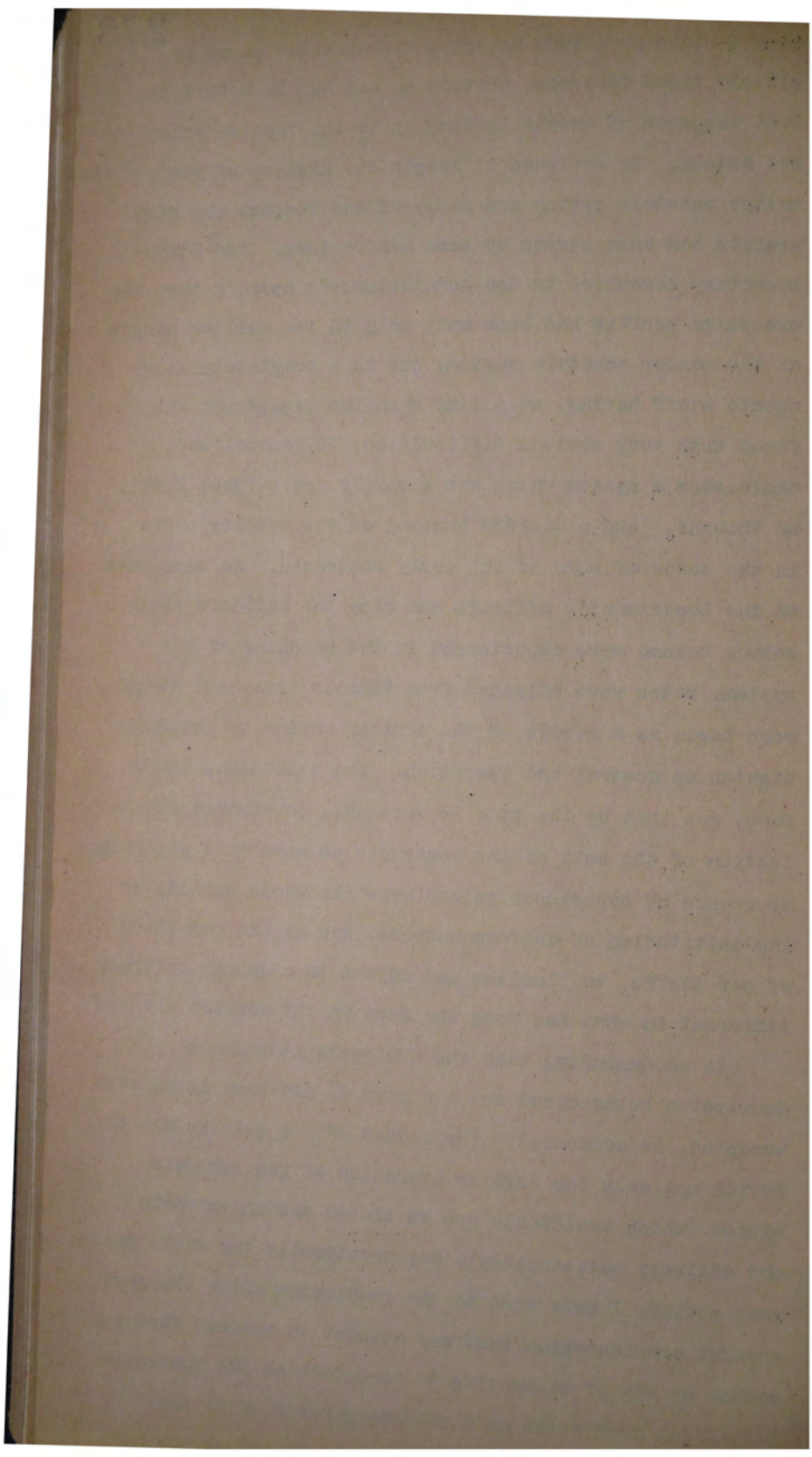
Immediately on receipt of the Master Builders' Federation's earlier letter of 14 August 1944, the Under-Secretary reported the whole position to the Minister of Works, giving a resume' of developments up to date. This minute was referred by the Minister of Works to the Minister of Finance, to whom the Commissioner of Works submitted two reports on the same subject, on 24 August 1944 and again on 5 September 1944.⁽¹⁾ The Commissioner also made a report on the matter to the Prime Minister.

The Commissioner of Works took the view that while unduly high profits had been made by contractors during the first 12 months of the master schedule system, the general tightening up in procedure which then took place, coupled with reductions in rates where evidence had proved they were too high, had had an effect which convinced him that 'the result of the whole programme is by no means unsatisfactory.' He strongly recommended against any legislative action being taken to enforce what the commission had been unable to achieve by negotiation.

On 30 November 1944⁽²⁾ the Under-Secretary submitted

(1) 32/483/2.

(2) Ibid.



considered earlier, should not be made.'

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Touching on the high rates of profit earned in the Canterbury district, the Under-Secretary advised that within recent weeks he had had all South Island contracts specially reviewed, both in Wellington and during a visit to Christchurch, and had satisfied himself that there had been no general misapplication of the master schedule nor any likelihood of over-measurement. It was the considered opinion of his Christchurch officers that the high profits were due practically entirely to the efficiency of the South Island building firms, who were well organised and did not have to contend with the same manpower shortages as in the North Island.

The report also dealt with (1) the overpayment on brigade camps in the Wellington area- one of the main reasons for setting up the Contracts Adjustment Commission, and sought a direction as to whether the firms' offer to refund £4,288 in settlement of the Department's reduced claim of £13,095 was to be accepted, and (2) the question of timber shortages: whether the difference between the value of timber supplied and the value built into the work had or would exceed the tolerance of 5% previously agreed to.

Commission Abandoned. A final report on the whole matter was submitted by the Under-Secretary to the Minister of Public Works on 29 June 1945⁽¹⁾ in which he repeated his earlier recommendation that the Contracts Adjustment Commission be abandoned. 'The Contracts Adjustment Commission' he stated, 'whether as a voluntary organisation or as a statutory tribunal would bear certain aspects of unfairness. There must be many sections of the public who have profited unduly out of conditions brought about by the war and no doubt in a good many instances the extra profit has come out of the War Expenses account. To take this particular section (building

construction), either voluntarily or compulsorily, for investigation and, in appropriate cases, mulcting, would be unwarranted unless all other sections were to be dealt with in turn in the same way. At this stage it would be impracticable for the contractor to attempt to spread any refund in proportion throughout the associated parties to the contract, yet unless he could do so it would seem unfair to deal with the contract. A certain ignominy must inevitably attach to all whose operations are reviewed as possibly falling within the category of "war profiteering" and although the withdrawal of the builders' representatives from the tribunal may to some suggest apprehension of discovery, it is equally consistent with the realisation that voluntary submission would appear in many minds as an admission that all was not right.'

The Under-Secretary added that the further lapse of time since the commission broke down strengthened the view that 'there was no ground upon which the tribunal could proceed to operate with reasonable prospect of either justice between parties or success as regards return to the Crown.'

War Cabinet finally disposed of the matter on 3 August 1945⁽¹⁾ by approving 'acceptance of the master schedule position as reported and that no further action be taken regarding the Contracts Adjustment Commission.' The minute also approved acceptance of the refunds offered in finalisation of the costs of the brigade camps in Wellington.

13. CONCLUSION.

On 8 July 1943⁽²⁾ the Commissioner of Defence Construction notified the Engineer-in-Chief that contracts for all work up to a value of £3,000 were to be arranged by tender and not by allotment. He stated that it would

(1) 32/483/2.

(2) 32/9025/3, p.4.

not be possible to secure a fixed price for large contracts, due to the fact that plans and specifications could not be completed in sufficient detail. In advising the Master Builders' Federation of this decision the Commissioner mentioned that three tenders were to be obtained for all contracts up to £3,000, and that in respect of such works the timber was to be ordered by the contractor through the ordinary merchant's channels and paid for by him.

This instruction was communicated to District Engineers by the Permanent Head on 19 July 1943.⁽¹⁾

During the ensuing 12 months the question of the procedure to be adopted in the future for building construction contracts was given careful consideration. The general consensus of opinion favoured 'fixed price' contracts, but it was realised that until conditions in the building industry became more stabilised there would be serious objections to reverting to the pre-war system of competitive tendering.

At the conference held in the office of the Minister of Finance on 3 November 1943 to discuss primarily the extent of profits made on master schedule contracts (see last section) a fourth item on which the Secretary to the Treasury, the Controller and Auditor-General and the Under-Secretary were directed to report was 'What the policy in regard to future work should be.'

The Under-Secretary expressed his views as follows in the memorandum of 8 November 1943⁽²⁾ addressed by him to the Controller and Auditor-General and the Secretary to the Treasury.

I wish to say by way of general reference that while I am firmly of opinion that the master schedule system met the particular conditions that existed at the time of the extreme pressure when an invasion of New Zealand looked to be something more than a possibility, it is a fact that there were insufficient qualified quantity surveyors available to handle it in the manner which

(1) 32/9025/3, p.4.

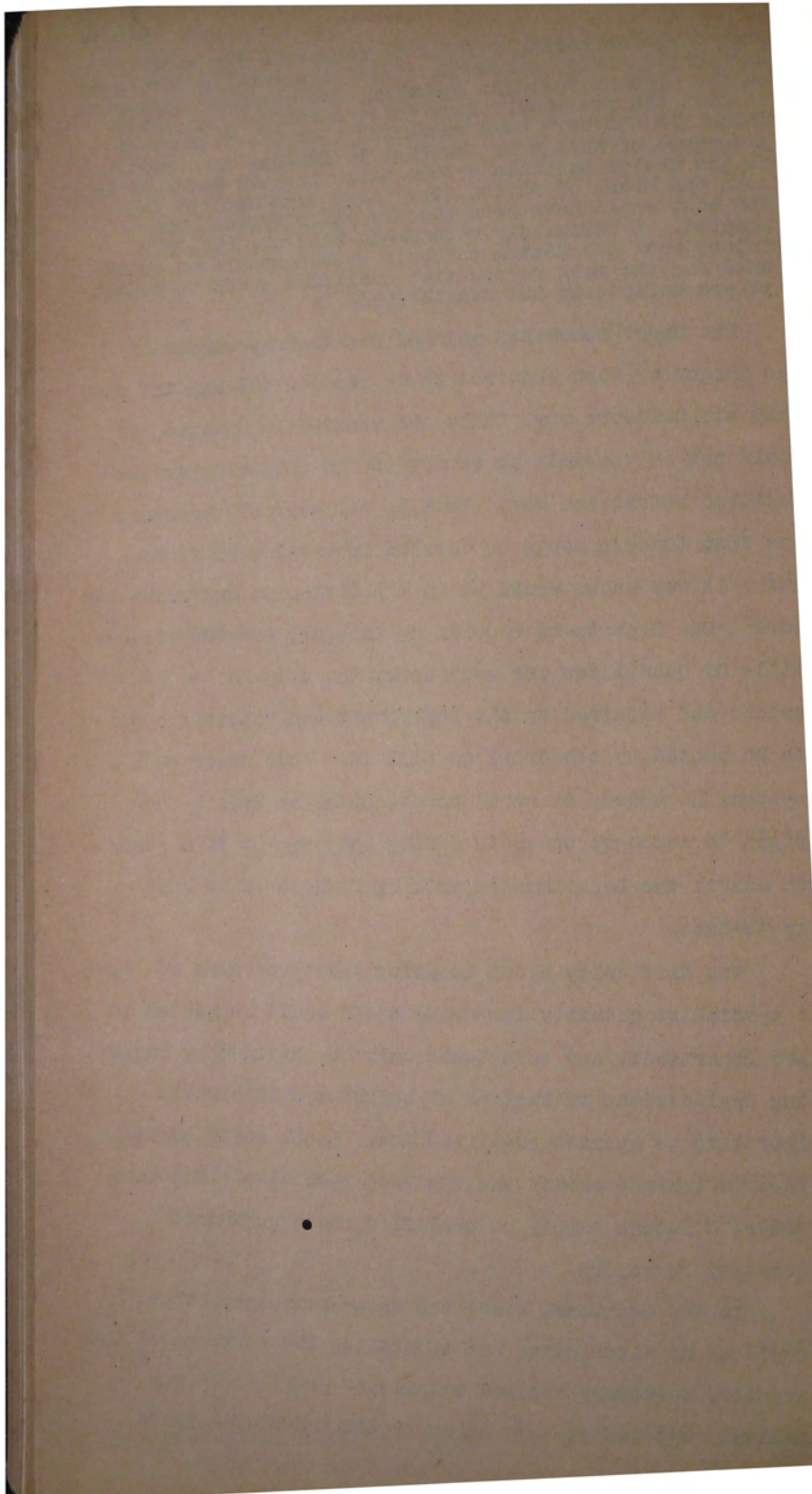
(2) 32/483/2, p.1.

such a system necessitated and, moreover, the staff of the Public Works Department itself was totally inadequate on the side of building overseers and quantity surveyors to meet the position. I am quite satisfied, as are I think all who have been connected with the tremendous programme of work over the last 18 months, that costly as the master schedule system seems to have been, it has been the means of saving very large sums against what the cost would have been had any other system been adopted. I definitely recommend, however, that for future work the master schedule system should be abandoned for the main reason that qualified staff to handle it are definitely not available.'

The Under-Secretary pointed out that by reason of the amount of work required to be carried out and the fact that all builders were fully and constantly engaged, it would not be possible to revert to the tendering system followed before the war. What he did suggest, however, was that tenders could be invited from selected firms which it was known would be in a position to undertake the work. The Department should, he thought, provide its own bills of quantities for such work, the original to be priced and retained by the Department and unpriced copies to be handed to tenderers to fill in. But under such a system, he added, it would be essential to retain the right to check up on costs during the progress of a work, to enable the Department's pricing figures to be kept up-to-date.

The difficulty about adopting this procedure was that a specialist quantity surveying staff would be needed in the Department, and this could only be obtained by inviting applications in England at salaries sufficiently lucrative to attract qualified men. Local staff could then be trained around the imported specialists and thus assure a future supply of qualified and experienced quantity surveyors.

In the meantime, added the Under-Secretary, there would be no alternative but to utilise the services of the quantity surveyors engaged in private practice in New Zealand, who had already demonstrated their ability in connection with the master schedule system.



A report on the same subject was received by the Under-Secretary from the Commissioner of Works under date of 13 November 1943.⁽¹⁾ The Commissioner dealt with future work under three headings, viz:

- (a) Buildings directly connected with the Services and with the war.
- (b) Public buildings, and
- (c) Housing.

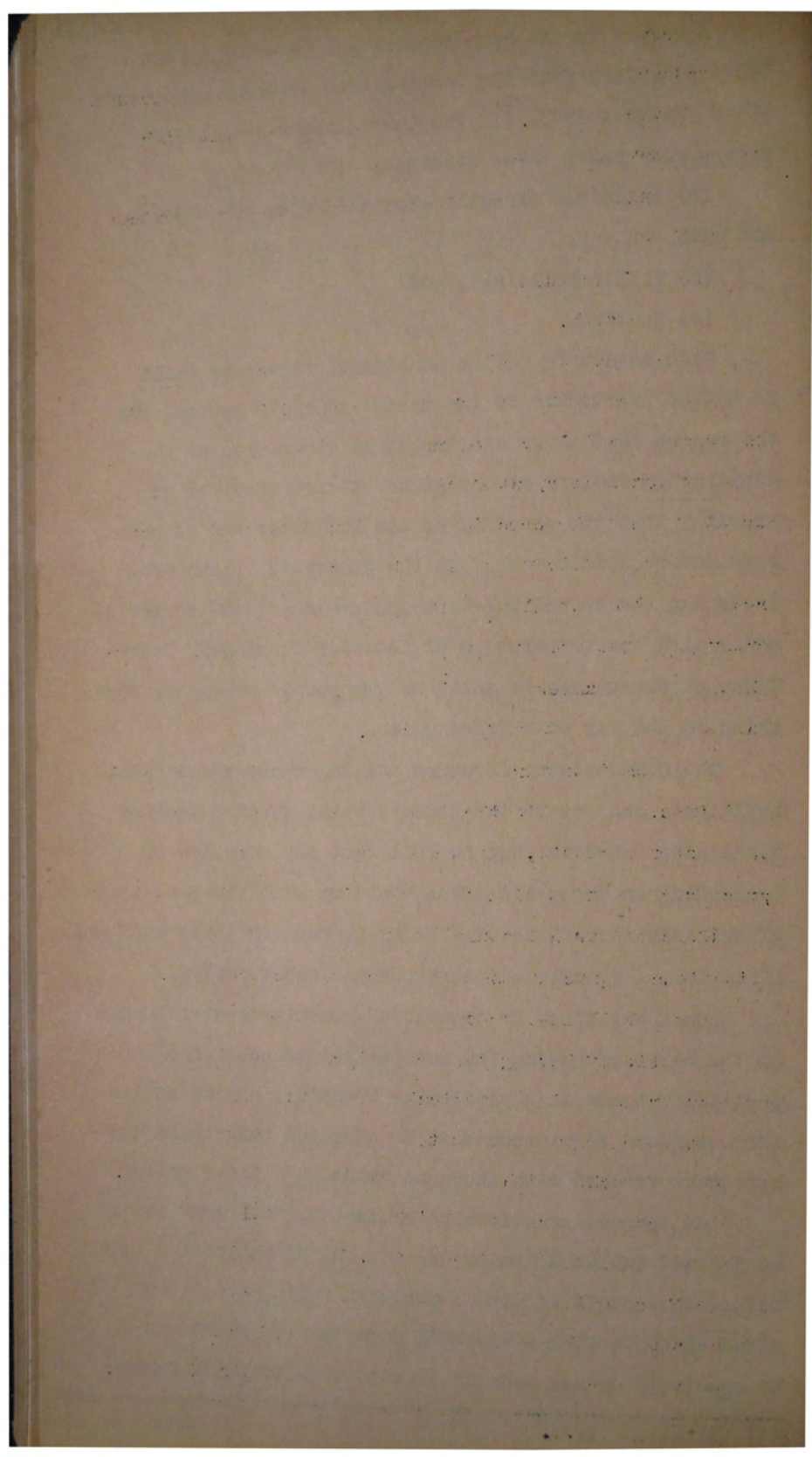
With regard to (a) he considered there was still no method preferable to the master schedule system, for the reason that large and important works such as a dehydration factory at Christchurch were required so urgently that the erection of the buildings had to commence before little more than the foundation plans were ready and the actual construction would proceed co-incidentally with the preparation of detailed drawings. Under these circumstances it would be impossible to expect anything in the way of a fixed price.

The Commissioner favoured calling tenders for public buildings, subject to the tenders being checked against the master schedule, but he felt that any question of proceeding on these lines was bound up with the provision of sufficient architectural staff to prepare plans and specifications quickly and to supervise construction.

House building, he considered, should be carried out on the basis of having the pre-determined cost of a particular house in a particular locality, any variation from standard requirements to be adjusted beforehand and agreement reached with the contractor on a fixed price.

'As soon as practicable' he stated, 'all work should be carried out on a tender basis', but he reiterated that before this could be done a decision would have to be given as to whether additional departmental staff was to be appointed or use made of private architectural firms.

(1) 32/483/2, p.1.



In conclusion, the Commissioner vigorously condemned any suggestion that the balance of the Dominion's defence construction programme be undertaken on the 'cost-plus' principle.

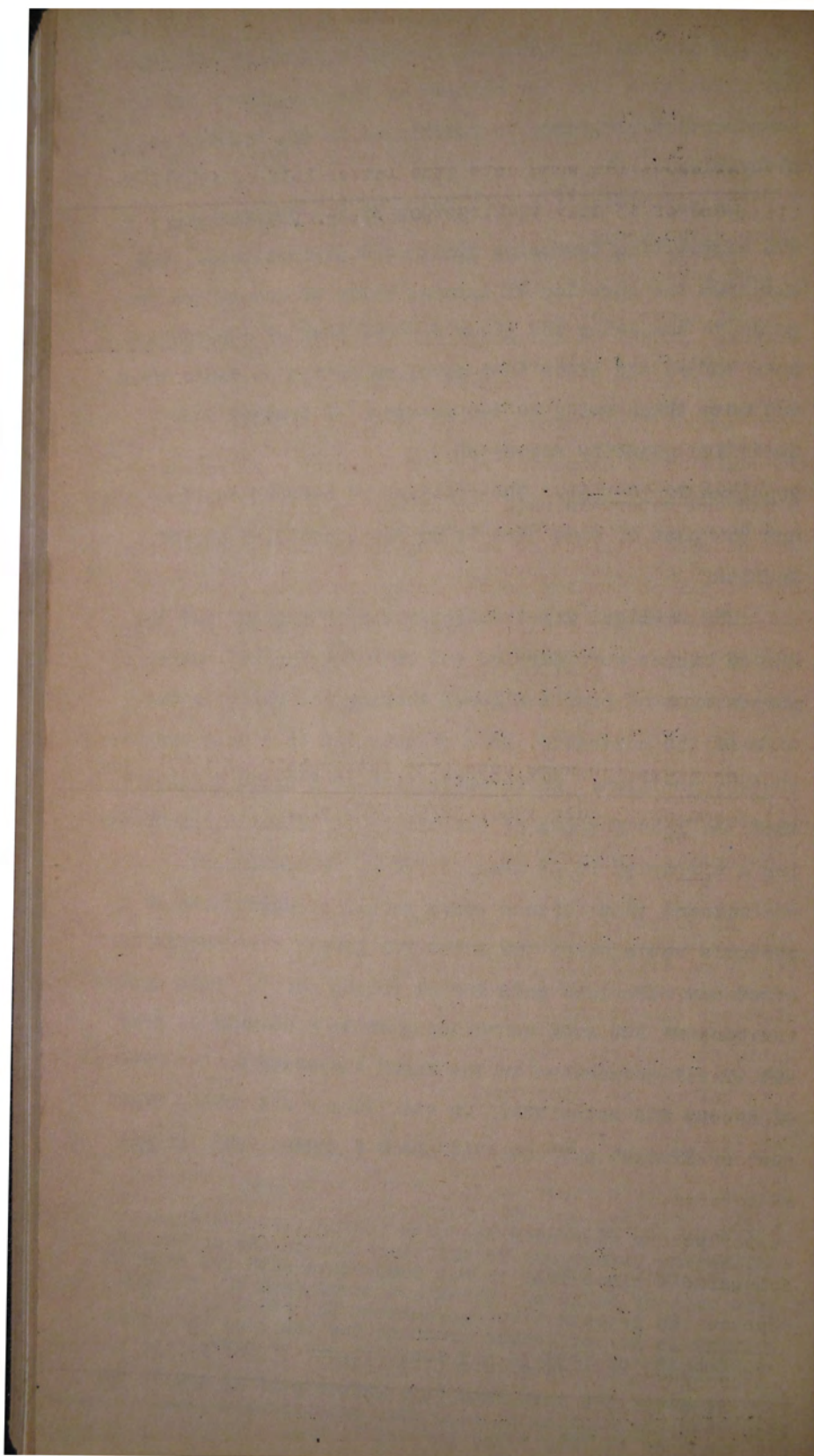
In July 1944,⁽¹⁾ by direction of the Commissioner, the competitive tendering system was re-instituted, and although the question of issuing bills of quantities as a guide to tendering was given a great deal of consideration both before and after that date, no action on those lines had been taken owing to the shortage of trained and qualified quantity surveyors.

Problems World-Wide. The problems of defence construction and the cost of same were by no means peculiar to New Zealand.

The earliest war-time contracts in England and the United States were carried out on a 'cost-plus' basis, the percentages of profit allowed varying according to the size of the contract. This quickly led to a most unsatisfactory position. An investigation in England disclosed that the labour costs of similar types of buildings showing a disparity of as much as 100%. A commission recommended that defence works should be undertaken on a schedule basis where the rates for labour were pre-determined and materials paid for at ruling costs. This system was adopted but even so building costs continued to soar out of all proportion to the known increases in the prices of labour and materials. In the 'Survey and County Engineer' (a British publication) dated 6 August 1943, it was stated:

'Mystery surrounds the question of building costs. Excepting timber and bricks, increase in the prices of materials since 1939 is not comparable with the rise in the cost of building, which has moved from 100 to 120% above the pre-war levels... Neither the added cost of materials nor of labour accounts for the fact that the £500 house of 1938-39 now costs £1,000 or more.'

At about the same date (the latter half of 1943), the

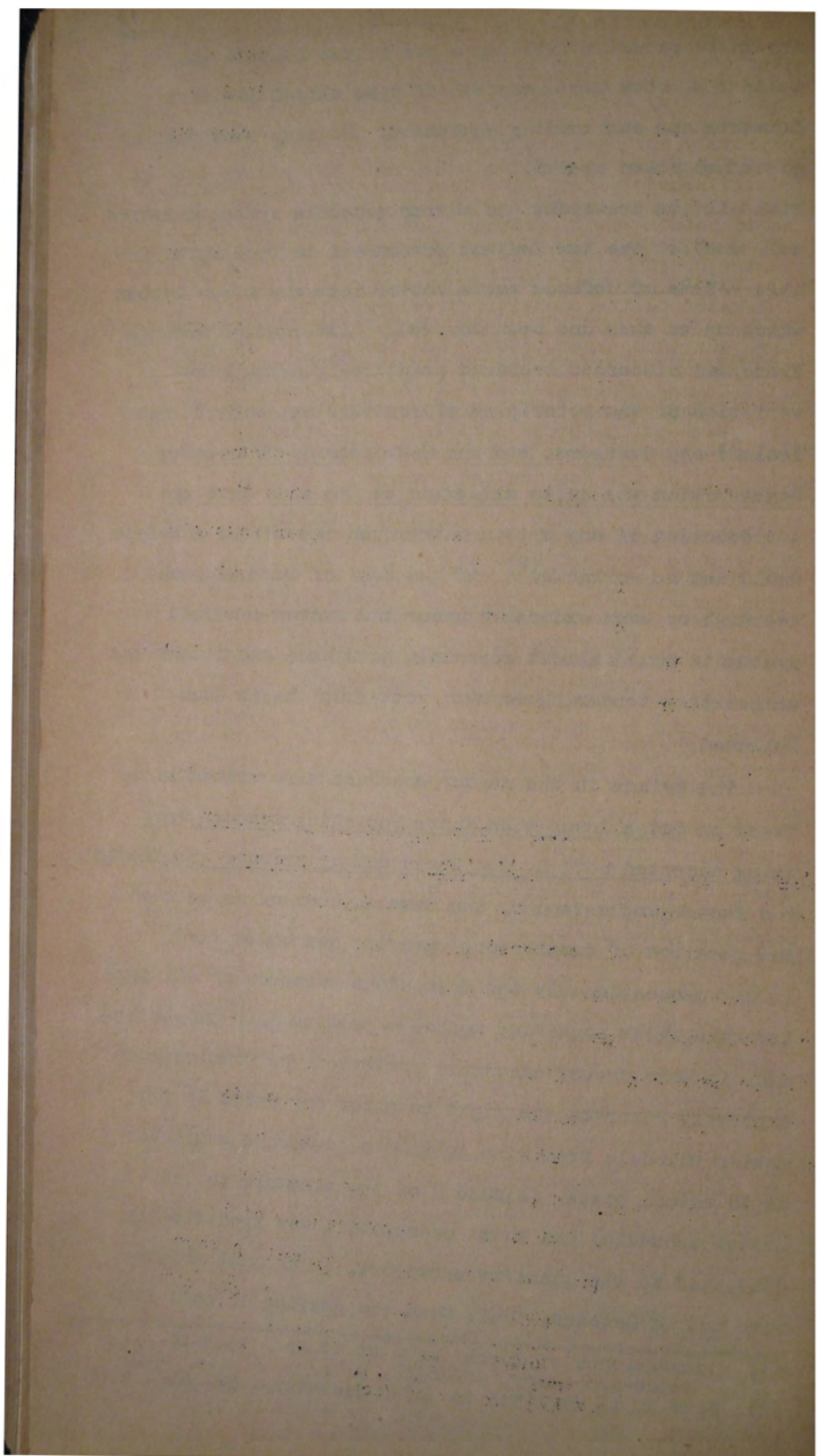


all-in increase in building costs in New Zealand was under 25%, with the exception of specialised hospital fittings and engineering equipment. Housing construction costs had risen by 22%.⁽¹⁾

With all its drawbacks the master schedule system undoubtedly enabled the New Zealand Government to face up to the huge volume of defence works better than any other system which up to then had been devised. Alternative methods tried and discarded embraced practically every known variation of the principles of contracting, both in New Zealand and overseas, and the Commissioner of Defence Construction was quite satisfied at the time that the introduction of any system other than the master schedule would not be workable.⁽²⁾ If the cost of defence works was high or even excessive under the master schedule system it would almost certainly have been exorbitant had competitive tendering or the 'cost-plus' basis been followed.

The prices in the master schedule were stated to be based on rates lower than those for which tenders were being accepted both by the State and by private architects - a factor emphasised by the Commissioner of Works when the question of contractors' profits was under fire.⁽³⁾ It was unquestionably the tremendous turnover of all contractors which magnified moderate profits into substantial and, in some cases, excessive profits. The Commissioner expressly reserved the right to alter any price in the master schedule from time to time on evidence available as to actual costs. (clause 9 of the preamble to the master schedule) and this prerogative was specifically delegated to the quantity surveyors. The unit prices were cut in October, 1942, when the grading of work into

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- (1) Commissioner of Works' memo of 13 Nov. 1943 to Under-Secretary, 32/483/2, p.1.
 (2) Memo of 13 Nov 1943 to Under Secretary, 32/483/2, p.1.
 (3) Ibid.

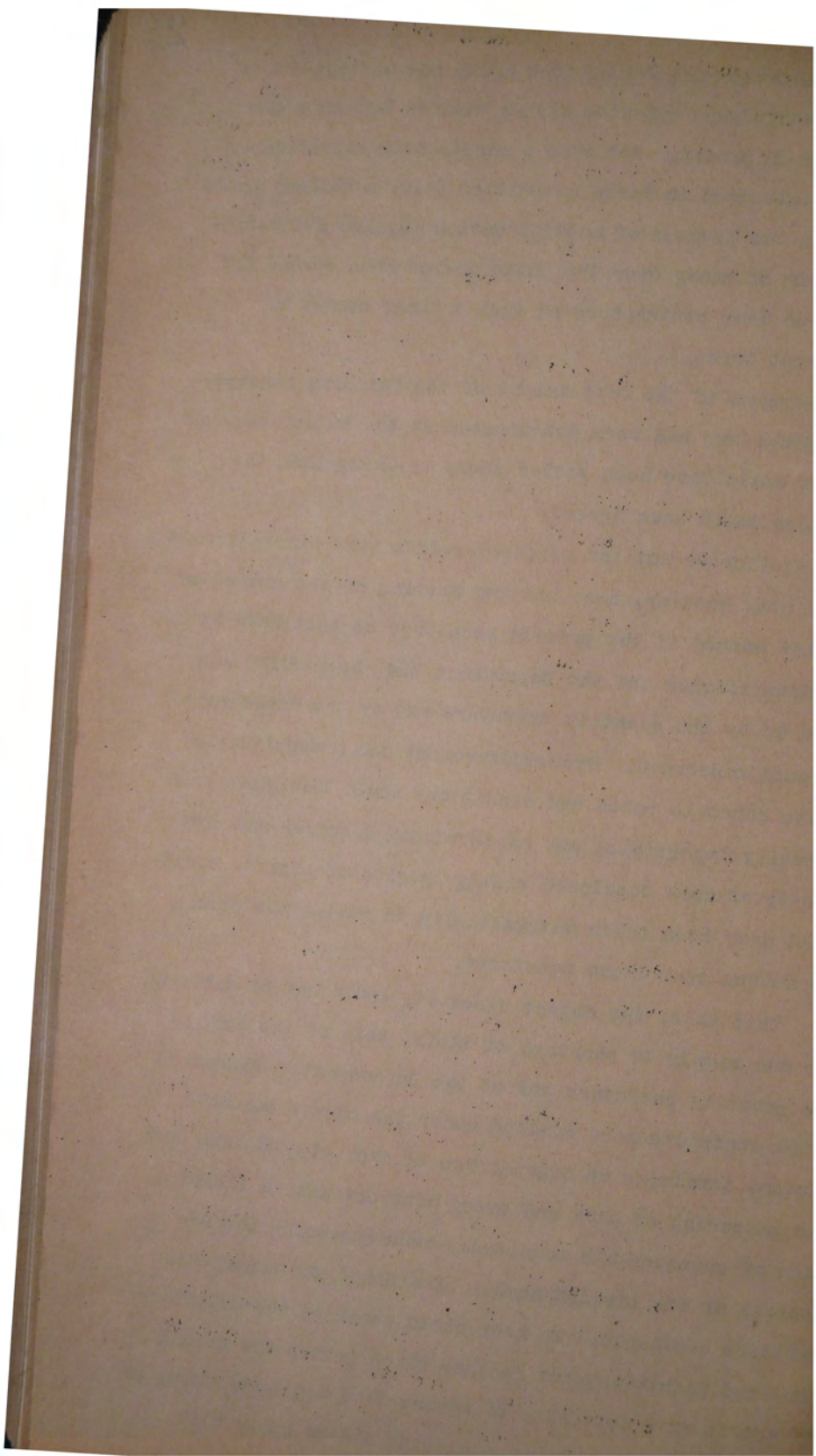


certain categories was decided upon, and various other adjustments were effected with a view to reducing the quantum of profit. But even a minute over-valuation of an article used in large quantities (c.g. a window) could through the process of multiplication involve a substantial sum of money over the whole period when spread out among so many contractors on such a large number of different works.

Perhaps if the full extent of the building construction programme had been anticipated at the outset the unit prices could have been scaled down, assuming that the builders would have agreed.

Whether or not the original prices were over-generous would not, however, have had any bearing on the amount of profits earned if the precise procedure as laid down by the Commissioner and the Department had been fully adhered to by the quantity surveyors and by the departmental officers concerned. Over-measurement and misapplication of the schedule rates and conditions would then have been virtually impossible, and as increased turnover and continuity of work disclosed rising margins of profit, steps would have been taken automatically to review the prices and reduce them where necessary.

That this, the object aimed at, could not be achieved was due simply to shortage of staff, both on the part of the quantity surveyors and of the Department. Upwards of 3,500 contracts were handled under the master schedule system, involving an expenditure of over £15,000,000, and the measuring of each and every contract was in itself a task of considerable magnitude, over-straining the resources of the limited number of trained and experienced officers available. To keep close check on the multifarious and highly complex factors which govern the extent of profit on a contract, to ensure that the measurement of quantities was correct to a nicety, and to apply with



exactitude the many terms and conditions of the master schedule system, was quite beyond the capacity of the staff available.

The Commissioner's claim that 'an examination will prove that if the master schedule had been properly applied and the rates checked with actual costs kept on the works, the results must have proved to be more satisfactory than under any other system with which it could be compared' would be hard to refute. He did say there was a lack of appreciation by certain of the District Engineers and their staffs of their responsibilities under the system, but he recognised the difficulties with which departmental officers had to contend.

A district office viewpoint on the matter was given in a memorandum of 3 September 1943⁽¹⁾ from the District Engineer at Auckland, which read, *inter alia*:

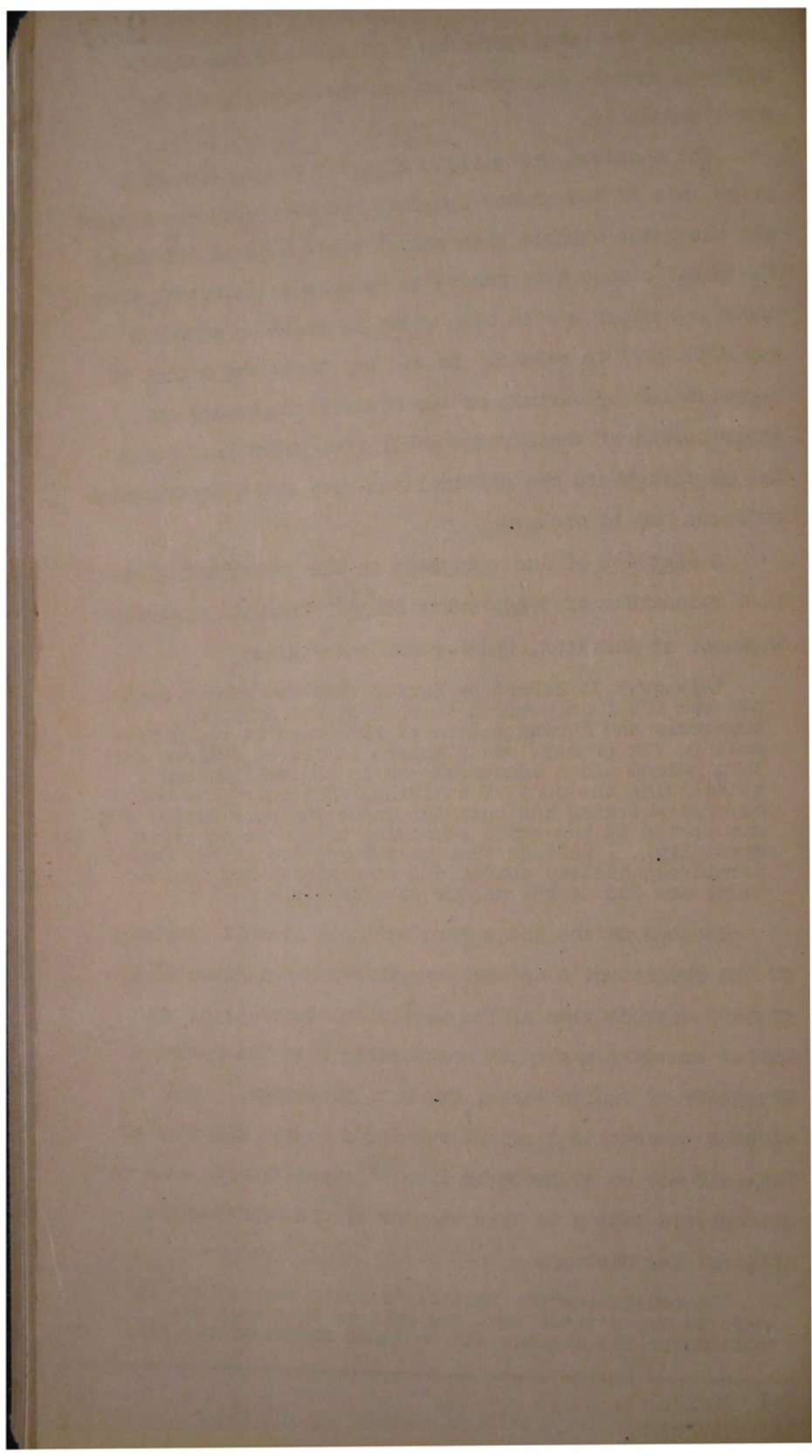
'Although it cannot be denied that the master schedule was far from perfect in that it was compiled hurriedly and during a time of flux when it was difficult to fix prices, nevertheless it can be claimed that this method did a wonderful job in controlling and stabilising the cost of building. Not only that but because building has been the major industry during the war period it has had a steadying influence on prices generally. I believe that to a large extent the comparatively healthy conditions existing in New Zealand today are due to the master schedule....'

Perhaps no one had a more intimate overall knowledge of the Department's defence construction programme or a greater appreciation of the merits and demerits of the master schedule system of contracting than the Under-Secretary of Public Works, Mr. N.E. Hutchings. His closing remarks in a report submitted to the Minister of Public Works on 30 November 1944⁽²⁾ serve therefore as an appropriate ending to this chapter of the Department's Official War History.

'In conclusion' he stated, 'I would stress that it must be appreciated that the bulk of this work was done under the serious and imminent threat of invasion

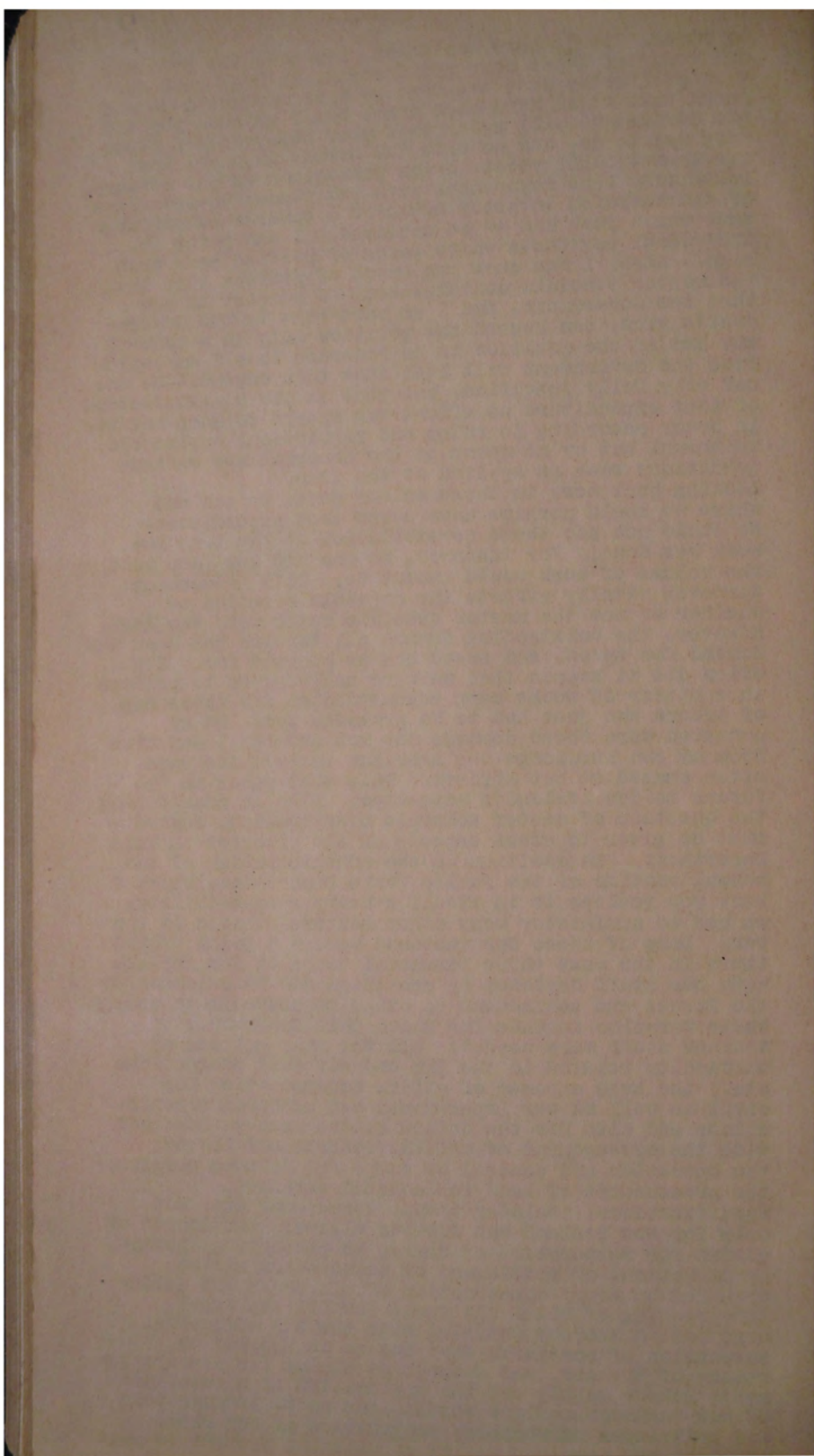
(1) 32/9025/7.

(2) 32/483/2.



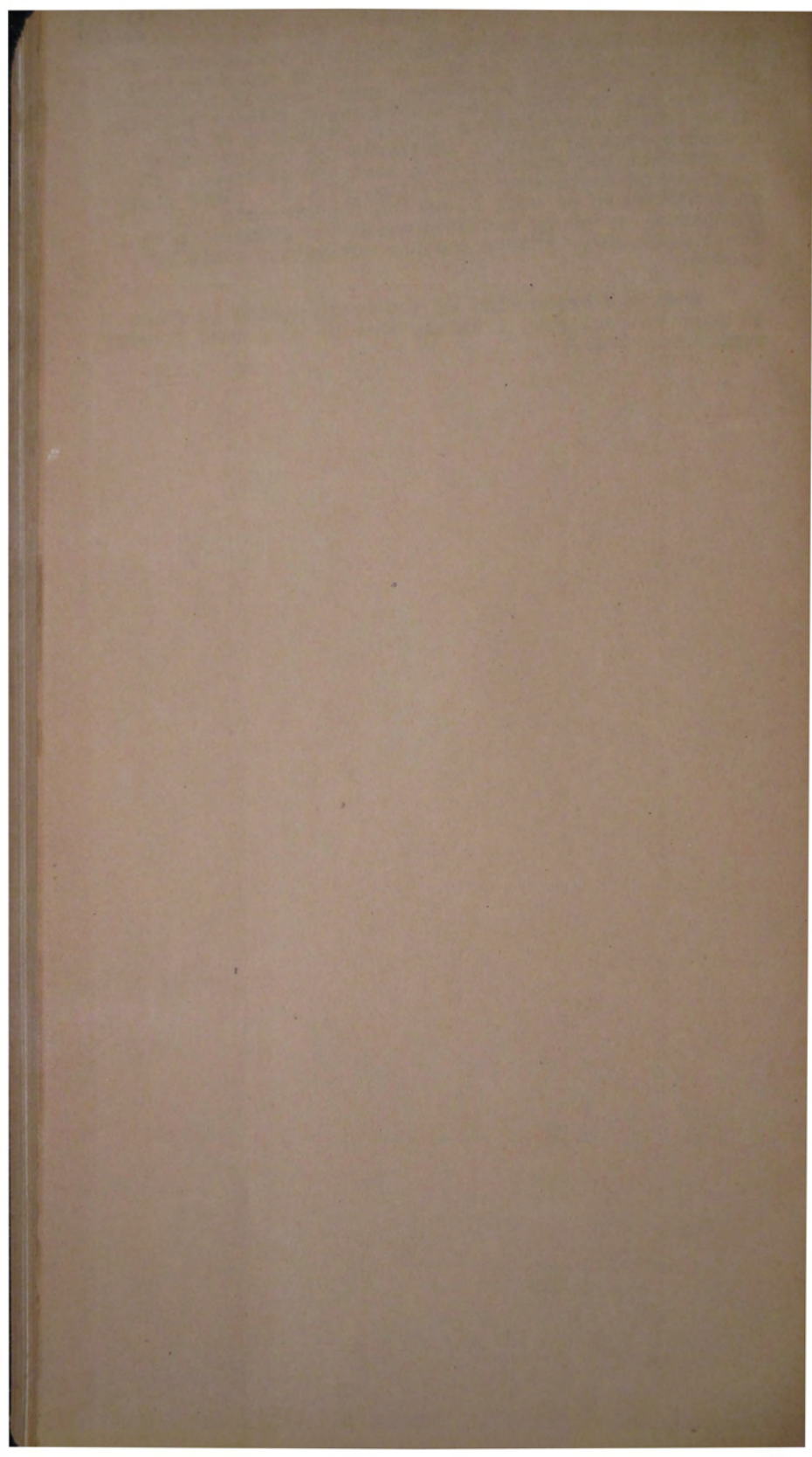
by Japan. It is easy, no doubt, now that the pressure and worry of those days has receded, to look back and view critically what was done or what was not done and think what might have been done, but I am sure you and the Government will agree that your Department's first duty was to do, and do with the utmost urgency, what was then thought vital in the protection of our country. Definitely this Department with the utmost co-operation of the building industry achieved a remarkable performance which just had to be achieved. I can point to individual contracts where rates of profits have been high. Also, I can show you cases of profits less than the master schedule contemplated. I suggest to you that the Government, and I am sure this is the Government's view, can regard the position only in a general way and if the position is so regarded then I am satisfied the Government will feel that this expenditure was not only fully justified, but that in the administration of that expenditure no effort was spared to keep matters in order according to rules and regulations applicable to normal but by no means to the abnormal and serious conditions such as applied at the time.

Looking back now, in these calmer days, we can see where we could perhaps have saved some expenditure. We could not see those possibilities at the time the work was done. For instance, no one had any idea what the volume of work would amount to. This tremendous turnover vitally affects the arguable question of whether or not the master schedule rates were too high. However, the outstanding demand all through has been the demand for speed, and speed has to be paid for. How often did it happen that we were called upon to produce in a matter of weeks camp accommodation for thousands of troops who just had to be provided for. On no occasion were these demands not met and may I say that from my own knowledge the American authorities were often amazed at our efforts. This must react in the future to New Zealand's advantage. Also in considering the question of master schedule construction, regard must be given to other aspects of the pressure on this Department. In addition to the administration of the normal routine of the Public Works Department, which I know you realise is in itself a heavy responsibility, we had to administer many other matters related to the war. Some of these for instance were - a total expenditure in the past three financial years of £68,355,424 with our staff depleted by one-third due to releases to the Forces and secondment to other Departments to assist their war-time demands for which this Department's trained staff were needed; all the many matters of difficulty related to the EPS and air raid precautions etc.; the huge expanse of office accommodation for civil as well as war Departments and mushroom organisations and also for the United States Forces, together with the arrangement of all the rentals and leases; the operation and control of camps for defence workers; the procurement of land for coastal defences, fortifications, training camps, aerodromes etc. not only for New Zealand but for our allies; settlement of claims for restoration of damage to properties; review, by direction, of settlement of restoration claims arranged by Army; construction of oil tanks and splinter-proofing of vital oil tanks and all the legal negotiation thereby entailed with the oil companies; suspension of contracts that had to be stopped by reason of the war, and subsequent claims for re-arrangement; labour supply and the application of a multitude of new instructions and regulations as to remuneration and privileges of workers; preparation of new forms of contract and complete review of existing systems to meet



the application of the master schedule system with the difficulties of running side by side at the same time the master schedule contracts, some 'cost-plus' contracts, and ordinary Treasury contracts; large numbers of important compensation claims; extension of our stores system to make it available for use by other Departments and Services both here and overseas; the carrying of employers' liability, fire and other risks on contractors as well as on the Department's own employees, which we estimate saved the Government at least £200,000. Numerous other activities could be quoted.

When the broad view of the whole period is taken it must be realised, I think, that we have come through remarkably well.*



APPENDICES

- (1) Set of the printed documents used in competitive tendering contracts.
- (2) Form PW 71X : Special conditions of contract for master schedule contracts.
- (3) A typical master schedule.
- (4) Set of printed documents for master schedule contracts.
- (5) Copy of an address by the vice-chairman of a Price Adjustment Board in U.S.A., on 'Re-negotiation of Contracts.'

