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R.A. Brownish  
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President of the Executive Council 1917.



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FEDERAL CAPITAL ADMINISTRATION.

REPORT

OF THE

ROYAL COMMISSION.

(5.) BRICK-WORKS AT CANBERRA.

*1917, June 18th*  
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ROYAL COMMISSION ON FEDERAL CAPITAL  
ADMINISTRATION.

REPORT.

5. BRICK-WORKS AT CANBERRA.

*To His Excellency the Right Honorable Sir RONALD CRAUFORD MUNRO  
FERGUSON, a Member of His Majesty's Most Honorable Privy Council,  
Knight Grand Cross of the Most Distinguished Order of Saint Michael  
and Saint George, Governor-General and Commander-in-Chief of the  
Commonwealth of Australia.*

MAY IT PLEASE YOUR EXCELLENCY—

1. The point whether the brick-works were placed in their present position near Yarralumla at Canberra in order to defeat Mr. Griffin's plan has already been dealt with and answered in the negative in Part I of this Report. Other very important questions remain to be considered. First, whether the brick-works are in the most suitable position for economic manufacture; two, whether the Staffordshire kiln should have been erected; three, whether there was wasteful expenditure in the erection of that kiln; and four, whether work should be continued in the manufacture of bricks at this site or whether it is more desirable to remove the kiln and machinery to another site. These questions to some extent merge into one another, and I propose therefore to deal with the whole subject in the order of events.

2. The various deposits of shale or clay suitable for the purposes of brick-making were first of all reported upon by Mr. E. F. Pittman, Under-Secretary for Mines in New South Wales, and until recently Government Geologist for that State. Some considerable time before any step was taken in respect of the manufacture of bricks, the exact date is not stated, he visited Canberra and examined various deposits of shale in various places within or near the city. His conclusion was that the Yarralumla shales "were ideal material for the manufacture of machine pressed bricks," and in his opinion were better than any of the shales which he had examined elsewhere in the district. They were "very fine grained shales and homogeneous in character; that is to say, constant in character, or more constant than any of the other shale beds examined." He therefore reported that these shales were exceedingly suitable for brick-making. His estimate of the quantity available at Yarralumla was 500,000 cubic yards, equivalent to a product of 180,000,000 bricks. He was satisfied that the shale deposit would continue downwards and that it could be worked to considerable depth. His estimate of material already quoted allowed only for a 40-ft. face to the quarry to be opened, so that his anticipation was that the limit of capacity of the deposit was really in excess of the figures already given. His report and recommendation of the site seem to have been approved by the Minister and acted upon by the engineering officers, and brick-making at that site was accordingly begun in the year 1912. The manufacture was by semi-dry process and the bricks were burned in a Hoffman kiln. On 10th October 1913, Colonel Owen in a report to the Honorable W. H. Kelly reported that there were 250,000 good bricks ready to be used for the building of the power-house.

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but these could not have been of a quality equal to this description, for they were ultimately used for such purposes as filling and lining drains, and in the building of a new kiln. None of them were used for the power-house, nor except as to the kiln, for any other building purposes. These bricks were admittedly defective. The linc occurring in the shale rendered them too absorbent of moisture to be of any value for outside work, and the whole process was for this reason a failure. Colonel Owen in his report (Exhibit B.97) also stated that the shale at Yarralumla was quite suitable, and that the bricks burned to a good red colour, and estimated that removing the top of the ridge down to the 1920 contour, that is to say, cutting off 25 feet of the top of the hill, would provide sufficient material to make 90,000,000 bricks; further, that the results of the semi-dry process had been satisfactory, but that experiments made with the stiff-plastic process had produced bricks superior to the semi-dry process. He recommended that licence to erect a continuous kiln of the Staffordshire type should be obtained from the patentees; that two or three such kilns and machinery should be provided, and that the first kiln should be begun at once. The Honorable W. H. Kelly on 1st December approved of the recommendation as to the first stage of the work, estimated to cost £3,000, and a licence to erect was obtained from the patentees and an agreement made with the patentees' agent Mr. R. B. Odd, for supervision of erection of the kiln, but the actual work of erection of the kiln was not begun until November 1914.

3. In April of that year Dr. Griffith Taylor had visited the Yarralumla site for the purpose of reporting on the shale for brick-making purposes. His report, dated on the 3rd of that month describes the shale being obtained as "a very satisfactory material," but says that some of the beds contained "abundant fossil shells, and these beds should be avoided." Further, he reported "The shale is particularly easy to work, being broken up by vertical and diagonal cleavages as well as to a less degree by the true bedding plane. On the whole the present quarry is therefore very satisfactory. . . . From the somewhat hurried inspection to-day I perhaps cannot give a decided opinion, but I may say that in my opinion there is not the slightest need for anxiety as to the future. . . . The land in the present quarry towards the shale trig. station (to the east) seems the soundest along which to work. I differ slightly from my colleague (Mr. Mahoney) in that I think the present face might be driven continuously in that direction without any fear of disappointment. He, I understand, favours opening new working cuts in the vicinity of shale trig. station, which would supply material and prospect also. I see no reason why the splendid face now being worked should be abandoned." Before the date of this report, the Honorable W. H. Kelly had determined in accordance with the recommendation of Mr. Griffin that the plan of cutting away the top of the hill should not be followed, the crest of the hill being reserved for tree-planting for shelter for the city, and that the quarrying should be kept wholly to the west of the hill. Dr. Griffith Taylor was not aware of this limitation at the time of his visit, but having been informed of the matter afterwards, he added a postscript dated 18th April to his report, citing this determination, and stating that "this restriction practically nullifies all the recommendations made upon previous inspections. It is now necessary to prospect further to the west in the hill immediately beyond the fence in this direction. I have therefore marked out a line across the 'strike' which will give us the greatest information and I believe that Mr. Siever is having a trench made in that position. Until this is done we are not able to gauge the amount of brick clay which may be available beyond the present brick-field reserve." The prospecting recommended in this postscript was carried out. The result is stated by Dr. Griffith Taylor in a further post-script to his report dated 26th June 1914 :-

"On the 22nd April I re-visited the brick-field. Mr. Siever had put down some blasts in the hill immediately west of the kilns and just outside the fence. When the surface soil was removed, the rock was found to be a rotten dolomite, which is useless for bricks. Hence the boundary of the brick shale is near the western fence, and I fear we can look for no further supplies hereabouts. Another blast put down to the north of the kilns to test the dip of the quartzite was unsatisfactory, and gave no useful information. I have no further recommendations to make in addition to those given previously. There are of course brick clays west of Red Hill and near Queanbeyan Crossing which have been briefly examined, which will give further supplies when required."

This report was received by Mr. Hill and forwarded to Colonel Owen, but the postscripts of April and June were never shown to the Minister, the Honorable W. H. Kelly, nor were they shown to Colonel Miller, the Administrator. From the notes upon the

documents Mr. Hill seems to have had these documents before him on various occasions up to 15th February 1915, when he intimated to be "put away." The importance of these postscripts must be apparent, and it is clear that if the Minister had seen them his opinion as to the suitability of the site for brick-works would have been altered. With this additional knowledge before him, including the nullification of Dr. Griffith Taylor's former recommendation of the site, it is inconceivable that the Minister would have allowed the work to proceed. Mr. Kelly in evidence states (6318) that he certainly would not have authorized further work at this site if he had seen either of these postscripts. After the date of the second postscript £39,800 was spent upon the Staffordshire kiln, and otherwise in connexion with the brick-works. Colonel Owen professes to regard the postscripts as documents of no importance. He admits that they were not shown to the Minister, but states (36066-9) that he "did not think it affected the matter because when we stopped at the top of the hill we went down deeper and still had the shale. I did not think it affected the project of making bricks at Canberra. I did not think so then, and I do not think so now." This evidence does not commend itself to me. The importance of the postscripts should have been apparent to Colonel Owen, and their probable if not certain consequence of preventing authorization by the Minister of any further work at that site should have been just as clear. Even though he believed, as no doubt he did, that the restriction of the surface area could be off-set by working the quarry to a greater depth, he was not justified in withholding these documents from the Minister. Mr. Kelly's approval had been given on the original estimate that shale sufficient for 180,000,000 bricks was available and that therefore no substantial amortisation charge would need to be considered in respect of shortage of material. The limitation imposed by his restriction of the area and the further limitation discovered in the fact that the material to the west was not shale but dolomite, immediately made this question of amortisation a very important one.

4. Now that the brick-works have been completed at a cost of £40,997 for one kiln and machinery, the question as to the amount of material available for work in the future has to be considered. Mr. Pittman, who gave evidence before the Commission on 18th September, was perfectly certain that 180,000,000 bricks could be obtained from the restricted area. No prospecting shaft or tunnel had been put in to test the shale at any part, but his confidence in his geological knowledge enabled him to state that (10263) "he had no doubt that the shale would be found to go down considerably below the 1905 contour line", that is to say, 15 feet below the present floor. He also said, "I cannot undertake to say how far no one can but if they do not go down a considerable distance, I should be greatly surprised." After this evidence had been given a shaft was put down 20 feet below the floor, and it was seen that the shale lasted for 13 feet only, and that limestone rock was then encountered. Mr. J. T. Noble Anderson having inspected the area in August 1916, for the purpose of ascertaining the available quantity, asserts that there is only available sufficient shale for 22,500,000 bricks. If that is so the £40,000 spent on the brick-works would entail an amortisation charge of nearly £2 per thousand, and upon those figures the scheme would prove a very costly one. Colonel Owen estimates the quantity available as 90,000,000, apparently basing this estimate on workings extending only to the 1920 contour. The estimates of Mr. Pittman and Mr. Noble Anderson show the extremes, and each has been proved erroneous by the later investigations. Assuming that the limestone found in the shaft is uniform at that depth throughout the quarry, there would be another 12 feet of shale available for brick manufacture to be obtained by working down, and with the fuller information resulting from the workings in the face and from this prospecting shaft, I think that the 90,000,000 of Colonel Owen's estimate will probably prove to be an under estimate. It is impossible to say more. Limestone shows in small bands in several places, and such stone would have to be discarded as well as stone containing an undue proportion of the lime fossils which occur throughout the shale. No prospecting has been made to determine whether the limestone occurs to any considerable extent beyond the present face, and therefore the whole question must rest upon estimate; but I should be disposed to think that an amortisation charge of 10s. per thousand would probably be greater than will be required. The total at debit of the brick-works up to the end of 1915-16 was £40,997, of this amount £12,181 had been expended before the Staffordshire kiln was begun, and this item represents the preliminary preparations and opening of the quarry and the loss on the semi-dry process, the latter debit being subject to reduction by whatever may be counted as the

value of the bricks that were manufactured. The cost of the Staffordshire kiln and plant therefore represents £28,810, but to this total should be added the value—whatever it was of bricks produced by the Hoffman kiln and used in the erection of the Staffordshire. Colonel Owen's estimate of cost of erection of one Staffordshire kiln, one brick-making machine, a machine-house, a fan-house, and all the necessary appliances, was £10,400: of this total the fan-house and kiln were to cost £6,000, and the machine-house and machine £4,400; for three Staffordshire kilns, with five brick-making machines and necessary buildings the estimate was £41,850. The one Staffordshire kiln and machine and buildings and plant now in position represent all that there is to show for the total expenditure of £40,997. As usual exact figures are not available to show what has been the total cost of the kiln, or machine-shop, the cost of working, or the revenue to be credited to the works on account of bricks produced and used in other works or buildings; but it does appear that there is a debit of £1,000 on manufacturing account, and £438 for maintenance up to August 1916. No good bricks had up to that date been burned.

5. Besides excessive cost, other serious charges of defect are alleged by Mr. Noble Anderson. Admittedly since the brick-works started in July 1916, there has been considerable detriment by reason of the dampness in the flues, and Mr. Anderson's contention is that it will be impossible to overcome this defect without pulling down the Staffordshire kiln, thoroughly draining the foundations, and then re-erecting the kiln. Other evidence was given in support of this charge, but it was shown on the other hand that this detriment was diminishing, and that the more recent burnings at the kiln had shown a very good percentage of properly burned bricks. Shafts had been put down near the kiln to test the state of the strata as to dampness, and only in one of these holes was there a perceptible quantity of water or signs of dampness at my inspection, and this shaft had been sunk not in the shale which underlies the kiln, but in the strata adjacent. Part of the detriment caused by dampness results from an omission to provide for a central flue, designed by the inventors to be used when the kiln is first being dried out after erection, in order to dry out the moisture to be anticipated in any foundation. Recently a tunnel has been put beneath the kiln by Mr. Griffin's direction to dissipate the dampness, and the opinions of various witnesses differ as to the wisdom and advisability of this expedient. Whether the tunnel did or did not assist in drying the subjacent strata I am satisfied now, upon the evidence of Mr. R. E. Odd (32508-10) and the evidence of Mr. Christie (12120-30) Mr. Card of the Waterloo Fire Brick Company, and Mr. James Edwards, that there is no reason to assume that the brick-works will in future suffer any serious or permanent loss of efficiency by reason of this dampness. Work at the kiln has been suspended since December last, and when it is again started there may probably be some dampness to contend with until after the first round of the kiln has been burned, and the want of the central flue may be a matter of some detriment. Mr. Noble Anderson also attacked the works upon the ground that the wire-cut bricks would be very much cheaper to manufacture, and that the necessary machinery would be much less costly than the machinery required for making bricks by the stiff-plastic process. This charge was met, and I think wholly refuted, by the evidence of Mr. Ernest J. Card, who has had 40 years' experience in brick-making, and who is now with the Waterloo Fire Brick Company, near Sydney, and Mr. James Edwards, Manager of that Company, who has had very many years' experience in the brick-making trade.

6. A considerable body of evidence was given to show that in the erection of the kiln serious mistakes have been made and an excessive amount of money spent. Some of the facts proved certainly tended strongly to these conclusions. Mr. R. E. Odd, who as agent for the patentees, was interested in the success of the kiln, had undertaken to supervise its erection for a nominal fee of 20 guineas, visiting Canberra every fortnight, or as often as required during the construction of the kiln. For some reason which was not disclosed, Mr. Odd's services in this behalf were not invoked to any considerable extent by the officers. He supplied the patentees' plans as provided in the contract, and occasionally interviewed Mr. Christie, who was in charge of the work subject to the supervision of Mr. Rolland, but on three occasions only did he visit the kiln. No definite facts are stated to account for this, but Mr. Odd asserts that he had no opportunity of supervising, that he was only sent for on two occasions when difficulties in the work had been encountered, and that on one occasion when he was sent up the men were not at work, and that he had no opportunity of properly performing

his duty under his contract. He says, (3568) "I took it in effect that the whole thing as far as I was concerned had been annulled." But for all that he was able to render some efficient service to the Commonwealth in preventing excessive expenditure. Mr. Rolland ordered the bricks and other material required, the quantities being calculated for him by Mr. Franklin (36271). The latter officer estimated that 243 tons of fire-clay would be required in the erection of the kiln, and Mr. Rolland accordingly wrote an order for that amount, and this order was endorsed by Mr. Hill. Fortunately it was then seen by Mr. Odd. Mr. Odd's evidence is that no more than 30 tons should have been required in the kiln, and he induced the officers mentioned to alter the order accordingly. Upon the documents it is clear that this alteration was in fact made after the order had been first written out, and the order actually sent, although it states 30 tons of fire-clay only, also states the cost as for 243 tons. Mr. Hill in his evidence asserts that 243 tons was really required, but that he economized by cutting down the order from 243 tons to 30 tons, and in the construction of the kiln used crushed shale to make up the difference. As between Mr. Odd and Mr. Hill, I accept Mr. Odd's statement of the transaction and think that if the kiln had been properly constructed, and with dipped joints to the brick-works, no more than this amount of fire-clay should have been required. Successive orders for 30 and 36 tons of fire-clay were given after the first order, and this quantity of fire-clay seems somehow to have been used, or at least to have disappeared during construction. Mr. Franklin (36261-75) asserts in evidence that a dipped joint would take as much fire-clay as a three-sixteenths joint, because the wet fire-clay would drop off in the process of lifting the brick from the bucket in which it is dipped, and that therefore as much fire-clay would be required in the one case as in the other. I cannot accept this evidence. I think that only 30 tons of fire-clay should have been used, and that 96 tons were used because three-sixteenths joints were made in lieu of dipped joints, and I do not think that 150 tons of crushed shale were used in construction. The position of affairs was very remarkable. Mr. Odd was bound by his interest, for it was of the highest importance that this, the first Staffordshire kiln built in Australia, should be a success, and also by his contract, to do his utmost to enable the Commonwealth to have the work cheaply and satisfactorily done, and he was the first expert in Australia in regard to this particular matter. Mr. Hill, Mr. Rolland, Mr. Franklin, and Mr. Christie had not had any experience whatever in building a kiln, and yet they did not correct their want of knowledge and want of experience by obtaining the expert assistance that Mr. Odd was able and willing to give; and so, in more than one particular, loss accrued to the Commonwealth. A strong contest arises in the evidence as to whether Mr. Odd or the officers were to blame for ordering an excessive quantity of a particular kind of brick required for the arches of the kiln. On behalf of the officers an effort is made to prove that Mr. Odd drew out the specifications stating the number of bricks of each particular shape and kind required. Mr. Odd, on the contrary, states that this calculation was made by a Mr. Ohlsen, a draftsman acting under Mr. Christie's supervision. The position put forward by the officers is that Mr. Odd had the plans and tracings showing the shape and dimensions of the various bricks required, and that he, with the assistance of Mr. Ohlsen calculated the quantities from the plans. The plans produced before the Commission show various descriptions and sizes of bricks, and one plan (Exhibit C-25A) shows the quantities required of each class of brick. This Exhibit is not signed by any one. On behalf of Mr. Christie the suggestion is that particulars of bricks required were marked on the plan by Mr. Odd, and that the list was then handed to him. Mr. Odd's evidence is that he had never been asked to calculate, and had not in fact calculated, the number of bricks, and that although he handed to Mr. Christie a specification (C-25B) showing the dimensions of bricks to be used, the plan was blank, as indeed it now appears, when handed to Mr. Christie, and that the calculation as to quantities was made by Mr. Ohlsen under Mr. Christie's supervision upon the basis of a 12-chamber Manchester kiln, plan and specifications of which had been given by Mr. Odd to Mr. Christie. The importance of this controversy is to be found in the fact that 120,000 "m" bricks were ordered and only 75,000 were required, and therefore it would appear that 45,000 of that particular class of bricks have been, as the phrase is, "smothered" in the kiln, and that altogether 107,000 more bricks were ordered than were required. Upon the whole of the evidence I have no doubt whatever that Mr. Odd's evidence is correct and that the estimates were prepared by Mr. Ohlsen, working under Mr. Christie, and that his estimates were made with as little skill as the estimates of fire-clay by Mr. Franklin

and Mr. Rolland. In one matter Mr. Odd certainly did blunder. He drew a design for a template for certain bricks, and this design was inaccurate, and bricks made in accordance with it were unsuitable and useless, and over 600 had been made and delivered before the error was discovered; but he was able to atone for this mistake by his accidental discovery at the Waterloo Brick Works of an order given on behalf of the Commonwealth for 120,000 fire-bricks for the kiln that were unsuitable in dimension and incapable of being used if they had been delivered. He apprised Mr. Christie of the error and the order was cancelled before any of the bricks had been made, and a very considerable loss was thus avoided. One other matter of error in connexion with the erection of the kiln was in respect of a central flue intended to assist the drying of the kiln after its erection and also upon its being re-started after any stoppage. Upon the evidence properly before me, I cannot say that it was clearly indicated on the plans that a central flue should have been provided. Only the main flues were shown on the plan, and in the specifications there is no particular reference to this central flue. The flue was to be reached by a manhole, and Mr. Christie provided this manhole, but not the flue. I think that the fact that the manhole was provided, is evidence against Mr. Christie as to the necessity of providing also for the central flue. To put the matter at the lowest, he was put upon inquiry to ascertain what purpose the manhole was to serve, and Mr. Odd states that Mr. Christie when the omission to provide the flue was noticed, asked Mr. Odd to "be good enough to say nothing about" it, "if the omission did not matter much."

7. The summary of the whole matter with regard to the construction of the brickworks is that errors more or less costly have been made by the officers who relied upon their own insufficient skill in carrying out the work, and refused to avail themselves of the competent skill and complete knowledge of Mr. Odd. These mistakes have been somewhat costly, the surplus of fire-clay used amounts to £75, the excess of fire-bricks accounts for another £600, and the extra cost involved by reason of the omission of the central flue may very probably amount to £300 or £400. How the remainder of excess of cost can be accounted for I am not able to ascertain except by assuming that this work, like every other work in the Commonwealth, cost about 40 per cent. more than it should have done, by reason of the causes that are more specifically stated in Part 3 of this Report. The brickworks never should have been erected there and never would have been if Colonel Owen had observed his duty in informing the Minister of the postscripts of Mr. Griffith Taylor's report. Therefore it is that the Commonwealth possesses brick-works which should not have been begun, and cost a great deal more than should have been paid for their erection. But in spite of all these things, I am inclined to think that the brick-works will prove worthy of all the money that has been spent upon them. Mr. Odd says the kiln is the "best kiln in England or Australia" (33154), that "on the whole it has been erected to his satisfaction," and (33489-503) that "it is efficient and economical." It is quite true that Mr. Odd is an interested witness, but in spite of his interest I am able to accept his evidence unreservedly. The quantity of shale to be quarried will, upon the information now available be sufficient to last the life of the kiln, and there is no question as to the high quality of the bricks." As to their value Mr. E. J. Card says that the "bricks turned out are the best he has ever seen and they are worth, or would be worth in Sydney £7 per thousand." He also says that "the plant is the completest and best he has ever seen," and his evidence to this effect, supported entirely by that of his manager, Mr. James Edwards, is affirmed by the fact that upon sight of the Canberra kiln, and the bricks produced, a replica of that kiln was at once put in hand by the Waterloo Brick Company, and is now in course of construction. Mr. Odd (33495) does not put the value quite so high. He describes them as "O.K. facing bricks," and that they would be worth in Sydney 90s. per thousand at the kiln, as against £2 5s. to £2 8s. per thousand for ordinary bricks, and that all the bricks produced by this kiln could be sold by reason of their quality at £1 10s.

8. Figures have been supplied as to the cost of production during the time from July to December 1916, that operations were being carried on. Operations ceased in December on account of the coal strike, and up to the time of the sitting in Canberra at the end of January, had not been resumed. These figures are unsatisfactory because it is doubtful upon their statement what the cost of production was at the time when manufacture ceased. The first return for the month of July gave the total cost per thousand as £1 11s. 6d. That total does not include any allowance for amortisation

or depreciation. For the next month the cost went up to £1 19s. 1d., and the September cost was £2 16s. 8d. October showed a reduction to £2 10s. 8d., and a further reduction in October to £2 5s. 9d. The same rate was maintained in November. For the last fortnight in December, the cost of production is stated at £1 18s. 10d., and that total would show a gratifying decrease of cost were it not for the doubt raised by the statement of items whether the December total include any charge for burning. In the September and October returns there is an item "wheeling bricks and coal to kiln, setting, burning, drawing from kiln, and stacking on site, and re setting and re burning soft bricks, 26s. 2d." in September, and 24s. 6d. in October. For the December return the item is stated as "wheeling to kiln site, drawing from kiln, and stacking on site, 13s. 3d." Burning is not mentioned specifically, or by any inclusive term in any other item of the December cost, and I am therefore inclined to think that the cost of 38s. 10d. ought to be increased by 11s. to cover the omitted cost of burning. The cost of burning by reason of the increased price of coal must necessarily be greater upon the resumption of operations, and I do not think that the cost of manufacture can be assumed to be anything less than £2 15s. per thousand, to which 10s. per thousand for amortisation and depreciation should be added. But even upon these figures the bricks will be produced 25s. per thousand less than their value.

9. Some shafts sunk in the industrial area to the north of the city site show a very deep and extensive body of shale suitable for brick-making. It contains fossils in large quantity, but these are fresh water fossils, and are free from lime. Samples of bricks, and also of tiles, made from shale in that area, have been produced, and the evidence is conflicting as to whether they are equal to the Yarralumla bricks. On the balance of evidence and upon inspection it appears to me that the Yarralumla bricks are superior, and that it would be financially imprudent to abandon the work at Yarralumla in order to establish a new plant on the other site. To pull down and rebuild the Staffordshire kiln would be as costly as to build a new one.

I have the honour to be,

Your Excellency's obedient servant,

WILFRED BLACKETT,

Commissioner.

Melbourne, 3rd April, 1917.