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MADRAS RECORD OFFICE.

Government of Madras,

Financial **DEPARTMENT.**

G.O. No. 264 Press
44-45 Mis.

Dated 18-6- 1867.

23/27

44-45

Not to be folded or roughly handled

Proceedings of the Madras Government, Financial Department, 18th June 1867.

No. 44. Read the following letter from the Mint Master, to the Chief Secretary to Government, Fort Saint George ; dated Madras, 23rd March 1867, No. 392.

In submitting letter,* as per margin, from the Acting Assay Master, proposing to assimilate the method of assaying and system of notation to those in use in the Calcutta and Bombay Mints, at an increased expenditure of Rupees 108 *per mensem*, I have the honor to state, that although, as observed by the Assay Master, the present time, when work is slack, is suitable for introducing a new system, it is very undesirable to incur any *extra* expense at a time when there is no income from seignorage to cover it.

* No. 226, 7th March 1867.

2. The chief reason for the change is to secure uniformity of practice with the other Mints, as suggested some time ago by the Assay Master at Calcutta, and approved of by the Government of India ; but as regards the accuracy of the coinage there is no necessity for a change, as the Madras Rupee coinage for any number of years will bear comparison, both in regard to accuracy of weight and of fineness, with that of the other Indian Mints, although all the operations of the coinage are regulated by the old method of assaying, called the cupellation process, and which, I may here observe, is still in use by the "Queen's Assayer" in the Royal Mint in London.

3. I have also to notice prominently, that while the present system of reporting on merchants' bullion is so favorable for the purchaser, that is, the Mint, that the settlement accounts show a positive gain to Government of Rupees 1-1-6 in each thousand tolas, with the introduction of the new system of assay a direct loss must be expected, and which the Commissioners of Inquiry into Indian Accounts state in their first Report to amount to a quarter *per cent.* in the Calcutta Mint.

4. In regard to the increase of expenditure, considering that, in the proper acceptation of the term accounts, there are really none kept in the Assay Office, and that the most important part of the office work is an arithmetical calculation of the value of each tender following on the assay, and which when made for the day has never again to be referred to or thought of, I consider that the Head Accountant of the Assay Office is very handsomely paid by his present salary of Rupees 200 a month, and that it is not only unnecessary, but very inexpedient, to raise his salary to that of the Head Accountant in the Mint Office, who is responsible for the correctness of an elaborate and extensive system of accounts, which are only closed once in six months. Moreover, the present Head Accountant of the Assay Office has not the same claim as his predecessor, lately deceased, had. Eleven months ago his salary was 70 Rupees a month, from which he was promoted in May last to 100 Rupees a month, as Superintendent of the Die Department in the Mint, and after the short period of five months was re-transferred to the Assay Office in his present situation on 200 Rupees a month.

5. With respect to the Assay Office generally, I have long thought that its establishment was needlessly large, but it is only now I have become acquainted with its actual extent, and I have no hesitation in asserting, that several of the hands maintained in the office for clerical work might be dispensed with.

6. The existing Office establishment in the Assay Department is—

1	Assay Master.
1	Deputy.
2	Accountants.
3	Writers.
7	Total.

7. In the Mint Office it is—

1	Mint Master.
6	Accountants and Book-keeper.
3	Writers.
10	Total.

and yet the clerical work of the Mint Office is certainly *twenty*, perhaps *thirty*, times as much as that of the Assay Office.

8. It is true that the work in the Assay Office is not constant, but I hesitate not to say that, assuming the Assay Master and his Deputy to do the delicate parts of the practical assay, and to make or verify the calculation of value of tenders, the clerical work of the Assay Office is not, at the busiest time of the year, more than one good Clerk or Accountant could conveniently perform, and that a Deputy Accountant is only absolutely requisite to be maintained in case of the absence, from sickness or other cause, of the Head Accountant, while the whole staff of Writers is altogether unnecessary.

9. It is with great reluctance that I make this report, as it has an invidious appearance ; but, while admitting that the Assay Office is an independent one, and very properly so, I cannot be blind to the fact that all its expenses are charged to the Mint, and now that the matter has come before me, I feel I should be neglecting my duty if I did not express my opinion. I cannot expect the Assay Master to concur in my opinion, especially as he is an Acting Officer, and would naturally conclude that the establishment he found in existence must be requisite, and I would, therefore, propose that an Officer, familiar with accounts and office work, should be deputed to inquire into the office work of the Assay Department, and to report what establishment he would consider requisite for the prompt despatch of the work at the busiest time of the year, viz., any month in which the importation of bullion is greatest, and the manufacture of coin largest.

From the Acting Assay Master, to the Mint Master ; dated Fort Saint George, 7th March 1867, No. 226.

I have the honor to request that you will submit the following circumstances for the consideration of Government.

2. In the month of September 1865, it was directed by the Government of India (at the suggestion of the Assay Master of the Calcutta Mint), that the decimal form of notation should be used in all Assay reports, recording the fineness of bullion, both gold and silver.

Vide G. O. G. G., dated Simla, 7th September 1865, No. 2253.

3. Dr. Shaw, the Assay Master of this Mint, shortly afterwards went to Europe on Medical Certificate, leaving, for the guidance of the Officiating Assay Master, a Memorandum,* explaining why he did not immediately give effect to this change.

* Appendix A.

4. Since Dr. Shaw's departure till very recently, I have been alone in this Assay Office, (which, moreover, sustained a loss by the death of Mr. VanDerwart, for many years its Manager and Head Accountant), and being thus short-handed, I did not think it judicious to take any steps towards the introduction of so radical an innovation as that recommended by my predecessor, involving as it would close and constant supervision in the Laboratory, while the subordinates were being trained to the manipulation of the new process ; but now that an (Acting) Assistant Assay Master has joined the office, I deem it my duty to no longer defer soliciting sanction for measures which appear necessary for carrying out the above order of Government.

5. In this Mint the assay of silver is, as you are aware, effected by the method of cupellation, and the Assayer determines the fineness to the half pennyweight, viz., to the $\frac{1}{480}$th part, the

Assay report stating what is the variation of the bullion from the "standard" of the country, and not (directly) the amount of pure silver in it.

6. The lowest denomination of the report is, as above said, half pennyweight or 12 grains in the Pound Troy ; closer than this in the Madras Mint (and I believe such is the usage, wherever the dry method is in force) it has never been deemed expedient to report the assays for the valuation of merchants' bullion, chiefly because the cupellation process is well known to be far from perfect, and gives results (even in the hands of the most skilful and experienced manipulators) which can only be regarded as approximate and conjectural.

7. The results, therefore, "being uniformly accurate *only* to within certain limits of error" it is the custom to protect the buyer of bullion (viz., in this country, the Mint) by the above latitude in the Assay report, which in some degree indemnifies him, as it were, against two principal sources of error, viz., average unavoidable imperfection in the assay, and irregularity of mixture of alloy in the bullion.

8. Creditably as this system has worked on the whole (judging it at least from one point of view, viz., the annual Pyx Reports on the Madras Coins), still the decimal plan of notation, which has for some years superseded it on the Continent, and which prevails in the Calcutta and Bombay Mints, is no doubt a great improvement, as simplifying matters generally, dispensing with two different forms of notation, one for silver, another for gold, and doing away with all reference to this or that "standard," the Assay report simply stating the amount of precious metal in 1000 parts of any alloy.

9. To enable the Assayer to report as closely as this, with that degree of accuracy desirable, where selling and buying bullion are involved, it will be necessary to resort to a process of assay which will give results more reliable than those afforded by cupellation, and that known as the "Chloride process," which has for some years been admirably working in the Calcutta and Bombay Mints, is the one best adapted in this country for the end in view.

10. The superiority of this method, and the desirability of its introduction, have been already so fully brought to the notice of Government in an exhaustive report from Dr. Shaw in 1856, that I cannot do better than beg to refer Government to it, with the Order of Government thereon, dated 7th April 1857 ; extracts from it, pointing out the chief characteristic differences of the processes, and embodying his recommendations, are appended* to this letter for facility of reference.

Financial Department, No. 209.

* Vide Appendix B.

In Dr. Shaw's last Memorandum,† he again impresses the desirability of a change of system, and recommends that the change of notation and in the method of assay, should be made together, and in this recommendation I fully concur, believing as I do that the one cannot be efficiently made without the other

† Appendix A.

11. In anticipation, therefore, that Government will be pleased to sanction the introduction of this process, and so secure uniformity in the three Indian Assay Offices, I beg to submit an estimate of the probable increase of establishment which will he necessary.

In framing this estimate,‡ I have had before me the Calcutta Assay Office list,§ recently furnished, and the recommendations of Dr. Shaw in his report‖ in 1856, and his Memorandum¶ last year. I have endeavoured to be as economical as practicable, considering the peculiar elements of the present establish-

‡ Appendix C.
§ Appendix D.
‖ Appendix B.
¶ Appendix A.

ment, the difficulty of remodelling it, and the amount of extra work which will be thrown on it by the proposed arrangement.

12. There is not in this as in the Calcutta Assay Office an Accountant's establishment as distinct from a Laboratory one, the custom having grown up of the two senior Accountants (in addition to their more legitimate work) aiding in the preliminary weighings and manipulations of the assays; the Superintendents of Musters also taking part in a minor degree in the simpler operations. Though this system is not the best, (it being desirable, as a rule, that Laboratory work should be in the hands of assistants trained to it alone), still it is the best within reach, and an extension of it seems to me the most feasible and economical plan at present, circumstances and vested interests being considered.

I propose, therefore, to carefully train and practice all the subordinates under my immediate supervision in the Laboratory, so as to enable them to take part in the manipulations and be generally useful; and as the Laboratory work in the Chloride process is much greater, and more delicate and tedious than in cupellation, I have recommended extra pay for extra work.

13. As it would be desirable to have some one training up in the office to succeed by and bye to the senior posts, I beg further that sanction be allowed for an apprentice; an intelligent East Indian lad, who had passed the required Uncovenanted Civil Service Examination, might be entertained on a salary of (25) twenty-five Rupees monthly, and to make it worth his while to remain after being trained. I would recommend that his pay be yearly increased by 5 Rupees till it reached (45) forty-five Rupees; this is the only additional assistant that I have estimated for: a good portion of his pay will be met by a reduction in the furnace-room expenses, when the new process shall have been sufficiently established to enable us to dispense with the dry method; but of course at first the two systems must go on together, till the subordinates are thoroughly acquainted with the new.

14. In conclusion, I beg to say that now, while work is very slack, (owing to the present small importation of bullion), is the most favorable opportunity for commencing a process, the introduction of which must necessarily be gradual; also that it would greatly facilitate the introduction, if this office were empowered to send some one to Calcutta to see the Chloride process worked on a large scale. Though we frequently use it in this Assay Office, it is in a very limited way, chiefly as a confirmatory test for the satisfaction of the Assay Master, where more than ordinary precision is desired, and an intelligent, observant person, with some previous knowledge, could not but pick up some hints, and gain much valuable information as to detail, were he afforded an opportunity to see the system in extensive operation in a Mint, where they have had ten years' additional experience of it since Dr. Shaw wrote his report in 1856.

Should Government be pleased to sanction this suggestion, which I regard as most essential, I beg to recommend Mr. Duarte, the present Manager of the Office, as the most suitable person, and to solicit for him leave of absence for three months, with full pay (to be drawn in Calcutta), and a free passage there and back. The experience which he would acquire, by a six or eight weeks' attendance in the Calcutta Assay Laboratory, would render him a valuable aid to me in drilling the subordinates in the necessary manipulation.

15. As much of the necessary apparatus for the new process was provided when this subject was last mooted, I do not anticipate that it will be necessary to incur much further expense under this head, but I should be in a better position to give an opinion on this point after the Manager's return from Calcutta.

APPENDIX A.

MEMORANDUM for the Officiating Assay Master, dated 12th March 1866.

On relinquishing my office, I think it right to place on record, for the information of my successor, a few points requiring his immediate attention.

2. It has been recently directed by the Government of India, that the decimal system should be used in preference to the old method by pennyweights, both in the valuations of the Assay Office and the Mint. I have not as yet given effect to this change in my office, as it seems to me very desirable that it should be done synchronously with the full introduction of the Chloride process of assay, which has hitherto been only partially in use; the current work being still carried on by cupellation. I was very anxious, some years ago, entirely to supersede cupellation by the new method, but there were difficulties in the way, owing to the different establishment we have in Madras from that of Calcutta, and the necessity of entirely remodelling it at some additional cost, and at the same time of providing for the old and valuable employés in the office. The question was referred to Government at that time (vide correspondence in the office), who declined to sanction any extra outlay, and the whole matter has remained since then in abeyance; the Annual Pyx Reports shewing no marked superiority in the assays of the other Indian Mints as compared with our own. I think, however, the time has now arrived when the change may be introduced with practical advantage in connection with the new system of reporting the out-turn of the Mint in decimals.

No. 111.
To Mint Committee, 5th March 1857.
From do. do. 21st April ,,
To do. do. 17th March ,,
Extract Minutes of Consultation, 7th April 1857.
To Mint Committee, 26th May 1857.

3. Mr. G. D. VanDerwart, the Head Accountant, has for some years taken an active part in the work of assaying, and is most pains-taking and trustworthy. I think he should be made Superintendent of the Laboratory, on a salary of at least Rupees 250 per mensem.

4. Mr. Duarte is also a most useful and deserving man, and has always given his aid cheerfully in carrying on the general work of the office, in addition to his own proper duties as the Deputy Accountant. I think he should receive a salary of Rupees 100 per mensem as 1st Assistant in the Laboratory and Deputy Accountant, if it should be still considered desirable to retain the Accountant's Office on its present footing.

5. It would also be advisable to have a young man trained in the Laboratory as an apprentice, to learn thoroughly the art of assaying and to succeed to the higher posts. I would recommend Mr. VanDerwart's son, an intelligent youth now employed as a writer in the office, who has passed the required examination, as a fit person for this situation on a salary of Rupees 30 per mensem.

6. When these changes are made the present establishment of furnace-men will not be required, and some saving may be effected in this Department, though it will still be necessary to have one or two furnaces and firemen for coarse silver and parting assays of gold. Some contingent servants, as the Mouthcoal maker, &c., may also be dispensed with, as they will but seldom be required.

7. The Superintendents of Musters are more highly paid than the same class of servants in Calcutta. Soobaroyaloo is the son of a very old servant, and has been employed for several years. He is very steady and attentive. His Assistant has passed the prescribed examination, and is a very intelligent well-behaved youth, who would no doubt be very useful also in the Laboratory, if taught the work.

8. Of the three Peons employed in the office, two, Permall and Rungiah, are becoming old and infirm, and it would be very desirable to obtain younger and more efficient men in their stead, if any provision in the way of pension can be assigned to them; they have been very honest and

faithful in the discharge of their important duties, having large sums of money constantly entrusted to their charge, and are deserving of every consideration.

(Signed) G. J. SHAW, M. D.,
Assay Master.

(True Copy).

(Signed) H. E. BUSTEED, M. D.,
Acting Assay Master.

B.

Extracts from a letter from Dr. G. J. SHAW, Assay Master, to the Mint Committee, dated 4th March 1856.

I have the honor, in compliance with the instructions of Government, conveyed in your letter dated 24th November 1855, with Extracts from Minutes of Consultation, to lay before you the result of my inquiries into the comparative merits of the processes of assay, as practised in the Mints of Calcutta and Madras.

2. In the brief period to which I was of necessity limited during my recent visit to Calcutta, it was impossible to conduct an extended experimental investigation into the comparative advantages of the Chloride process over the humid method known by the name of the eminent Chemist Guy Lussac, and adopted in the Mint at Paris ; but I believe it to be the decided opinion of my colleagues, as it is my own, that the former method, for the introduction of which we are indebted to the scientific knowledge and mechanical skill of Mr. Dodd, the late Assay Master of the Calcutta Mint, is the one best adapted to the Mints in India, while both processes are greatly superior in accuracy to the more ancient and ordinary method by cupellation practised in the Mints of Madras and Bombay.

3. I shall endeavour to lay before your Committee, as briefly as possible, the chief points in which these various processes differ from each other, and the grounds on which I consider the Chloride process entitled to preference, should it be deemed advisable to introduce an uniform system of assay into the Indian Mints.

4. In cupellation, or the dry method of assay, the chief difficulties arise from the variation of the absorption of the pure silver into the cupels, or what is termed the "Cupel allowance," which depends upon the quantity of oxidizable metal with which it may be combined, and the amount of heat employed in its reduction. These unavoidable sources of error can only be ascertained and provided against by the results of long experience, and even when all the practical difficulties are known and carefully met, an approximate result can only be obtained in place of a rigid chemical analysis. In Mr. James Prinsep's valuable experiments, on the subject of "Cupel allowance," a quarter of a dwt. or 6 grains is the minimum of variation that could be attained with the utmost exactness in manipulation. The humid process on the contrary being based on definite chemical laws, is in a great measure independent of the operator, and affords results at once uniform and strictly to be relied upon.

* * *

6. The Chloride process, introduced by Mr. Dodd into the Calcutta Mint, is at once the most scientific and the most elegant method of ascertaining the true value of silver alloys with which I am acquainted, and is altogether free from the sources of error to which I have adverted It is based upon the same chemical principle as the humid process of Guy Lussac, viz, the definite proportion in which Chlorine unites with silver, but differs from it in the calculation being made from the precipitate itself, when carefully collected, freed from moisture and weighed. By this method reports can be made to a single grain, or, to speak more accurately, to $1\frac{1}{2}$ grains Troy, which has been the practise in the Assay Office at Calcutta for some years past, where the system has been confidently adopted, and gradually perfected.

* * *

10. Having thus as succinctly as possible laid before your Committee the chief points of superiority which the Chloride process possesses over the other recognized method of assay, it only remains for me, in the event of its being adopted in the Madras Mint, to suggest that one or more steady intelligent lads should be sent to make themselves thoroughly acquainted with the practical details of the process in the Laboratory of the Assay Office in Calcutta, as its successful introduction must altogether depend upon careful manipulation, which could only be acquired in working for three or four months diligently on the large scale, and with the complete apparatus employed there.

* * *

(True Extracts).

(Signed) H. E. BUSTEED, M. D.,
Acting Assay Master.

PUBLIC

Number.	Date.	Office to which the proposition refers.	Nature of Charge.						Permanent Increase per mensem.		
			Present Scale.	RS.	A.	P.	Proposed Scale.	RS.	A.	P.	RS.	A.	P.
		Assay Office.	* 1 Head Accountant and Manager.....	200	0	0	1 Head Accountant and Superintendent of Laboratory.....	250	0	0	†		
			1 Deputy do.	70	0	0							
			1 Writer.....	30	0	0	1 Second Accountant and Assistant do. ...	100	0	0			
			1 Do.	25	0	0							
			1 Do.	14	0	0	1 Head Writer and do.	40	0	0			
			1 Moochee.....	12	0	0	1 Second do. and do.	30	0	0			
			3 Peons, at 7 Rs. each.	21	0	0	1 Third do. and do.	17	0	0			
			1 Superintendent of Musters...	30	0	0	1 Superintendent of Musters.....	35	0	0			
			1 Assistant do.	15	0	0	1 Assistant do.	18	0	0			
			1 Head Fireman.....	28	0	0	1 Laboratory Apprentice.....	25	0	0			
			1 First Assistant... ...	10	0	0	1 Mooche...	12	0	0			
			1 Second do.	8	0	0	1 Flattening man... ...	10	0	0			
			1 Third do.	7	0	0	1 First Fireman..... ...	15	0	0			
			1 Flattening man... ...	10	0	0	1 Second do.	8	0	0			
			1 Sweeper...	3	8	0	1 Laboratory man... ..	7	0	0			
			1 Scavenger.....	1	0	0	3 Peons, at 7 Rs. each.	21	0	0			
							1 Sweeper.....	3	8	0			
							1 Scavenger...	1	0	0			
			Total...	484	8	0	Total...	592	8	0	108	0	0

* On this establishment there devolves also the duty of correcting and adjusting all weights and measures, a duty for which, I believe, in the Calcutta Mint a separate establishment is maintained.

† Vide Dr. Shaw's Memorandum, paragraphs 3 and 4.

FORT SAINT GEORGE,
H. M.'s ASSAY OFFICE,
7th March 1867.

(Signed) H. E. BUSTEED, M. D.,
Acting Assay Master.

C.
DEPARTMENT.

Extract from Home Department of Government of India.	Proposition.												Orders of the Government of India.		
	Permanent.			Temporary.						Casual or Extraordinary.	Grounds of Proposition.	Local Government's recommendation.	Home Department.	Financial Department.	
	Decrease per mensem.			Increase per mensem.			Period.	Decrease per mensem.					Remarks.	Remarks.	Orders.
	RS.	A.	P.	RS.	A.	P.		RS.	A.	P.					
For the introduction of the new system of Assay by the Chloride process.															

D.

STATEMENT of the fixed Establishment of the Calcutta Assay Office in 1856 and in 1867, showing the increase in eleven years.

Establishment in January 1856.				Establishment in February 1867.				Remarks.
Designation of Office.	Salary.			Designation of Office.	Salary.			
	RS.	A.	P.		RS.	A.	P.	
Foreman or Head Uncovenanted Assistant	200	0	0	Head Assistant..... 250} Personal allowance.... 100}	350	0	0	
European Apprentice	50	0	0	2nd Assistant, rising to Rupees 150	120	0	0	
				3rd do.	50	0	0	
Head Accountant and Writer	45	0	0	Head Writer	55	0	0	
2nd do. do.	28	0	0	2nd do.	28	0	0	
3rd do. do.	16	0	0	3rd do.	20	0	0	
				4th do.	16	0	0	
Head Muster Sircar	40	0	0	Head Muster Sircar	40	0	0	
2nd do. do.	14	0	0	2nd do.	15	0	0	
Duftry or Stationer	8	5	9	Duftry	8	0	0	
1st Weighman	15	0	0	Head Weighman	30	0	0	
2nd do.	10	0	0	2nd do.	15	0	0	
				3rd do.	10	0	0	
				4th do.	10	0	0	
First Laboratory Assistant	8	0	0	1st Laboratory Man	9	0	0	
2nd do.	6	0	0	2nd do.	9	0	0	
3rd do.	6	0	0	3rd do.	9	0	0	
				4th do.	8	0	0	
				5th do.	6	0	0	
				6th do.	6	0	0	
Head Muster Melter	5	0	0	Muster Melter	9	0	0	
2nd do.	4	0	0	1st Hammer Man	6	0	0	
3rd do.	4	0	0	2nd do.	6	0	0	
				3rd do.	6	0	0	
Armourer	10	7	2	Armourer	10	0	0	
Head Bearer	6	0	0	Head Peon	7	0	0	
Peon	5	0	0	2nd do.	6	0	0	
				Furrash	6	0	0	
2nd Bearer	4	0	0	Bearer	4	0	0	
Bheasty	4	0	0	1st Bheasty	4	0	0	
				2nd do.	4	0	0	
				3rd do.	4	0	0	
Sweeper	4	0	0	Sweeper	890	0	0	
Total	492	12	11	Total				

(Signed) H. E. BUSTEED, M. D.,
Acting Assay Master.

No. 45. ORDER THEREON, 18th June 1867, No. 264.

Under the opinion expressed by the Mint Master, in which the Government concur, the Governor in Council must decline to sanction any change in the method of assaying at the Madras Mint.

2. The Government resolve to depute V. Ramiengar, Superintendent of Stamps, to inquire into the Office work of the Assay Department, and report what establishment he considers necessary for the prompt performance of the work at the busiest time of the year.

(True Extract).

Chief Secretary.

To the Mint Master.
,, V. Ramiengar, Superintendent of Stamps.
Exd. J. Tulloch.

10

Appendix A.

Memorandum for the Officiating Assay Master dated 12th March 1866.

Para 1. *On relinquishing my Office, I think it right to place on record for the information of my successor a few points requiring his immediate attention.*

2. *It has been recently directed by the Government of India that the decimal system should be used in preference to the old method by pennyweights both in the valuations of the Assay Office and the Mint. I have not as yet given effect to this change, in my Office, as it seems to me very desirable, that it should be done synchronously with the full introduction of the Chloride Process of Assay, which has hitherto been only partially in use the current work being still carried on by Cupellation. I was very anxious some years ago, entirely to supersede Cupellation by the new method, but there were difficulties in the way, owing to the different establishment we have in Madras from that of Calcutta and the necessity of entirely remodelling it at*

at some additional cost and at the same time of providing for the old and valuable employés in the Office. The question was referred to Government at that time (vide correspondence in the Office) who declined to sanction any extra outlay and the whole matter has remained since then in abeyance. The annual Pyx Reports shewing no marked superiority in the Assays of the other Indian Mints as compared with our own. I think however the time has now arrived when the change may be introduced with practical advantage in connection with the new system of reporting the outturn of the Mint in decimals.

3. Mr. G. D. Van Derwart, the Head Accountant has for some years taken an active part in the work of Assaying and is most painstaking and trustworthy. I think he should be made Superintendent of the Laboratory on a salary of at least Rs: 250 per mensem.

4. Mr. Duarte is also a most useful and deserving man and has always given his aid chearfully in carrying

carrying on the general work of the Office in addition to his own proper duties as the Deputy Accountant, I think he should receive a salary of Rs. 100 per mensem as First Assistant in the Laboratory and Deputy Accountant - if it should be still considered desirable to retain the Accountant's Office on its present footing.

5. It would also be advisable to have a young man trained in the Laboratory as an Apprentice, to learn thoroughly the art of Assaying and to succeed to the higher posts. I would recommend Mr Van Derwart's son an intelligent youth now employed as a writer in the Office, who has passed the required examination as a fit person for this situation on a salary of Rs 30 per mensem.

6. When these changes are made the present establishment of furnacemen will not be required and some saving may be effected in this department though it will still be necessary to have one or two furnaces and firemen for coarse Silver and Parting Assays of Gold. Some Contingent Servants as the Mouthcoal maker &c. may also be dispensed with as they will but seldom be required.

The

7. The Superintendents of Masters are more highly paid than the same class of Servants in Calcutta. Sorbaroyalor is the son of a very old Servant and has been employed for several years. He is very steady and attentive. His Assistant has passed the prescribed examination and is a very intelligent well behaved youth, who would no doubt be very useful also in the Laboratory if taught the work.

8. Of the three Peons employed in the Office, two Permall and Ranjiah are becoming old and infirm and it would be very desirable to obtain younger and more efficient men in their stead, if any provision in the way of pension can be assigned to them; they have been very honest and faithful in the discharge of their important duties having large sums of money constantly entrusted to their charge and are deserving of every consideration.

(Signed) G. J. Shaw M.D.
Assay Master.

True Copy,

H. E. Woollcott Ind.
Acting Assay Master.

No. 6 Letter from Assay Master dated 21st January 1858 Rec'd

Appendix B.

Extracts from a Letter from Dr. G. J. Shaw Assay Master to the Mint Committee dated 4th March 1856.

Para 1. I have the honor in compliance with the instructions of Government, conveyed in your letter dated 24th November 1855, with Extracts from Minutes of Consultation, to lay before you the result of my enquiries into the comparative merits of the processes of Assay, as practised in the Mints of Calcutta and Madras.

2. In the brief period to which I was of necessity limited during my recent visit to Calcutta it was impossible to conduct an extended experimental investigation into the comparative advantages of the Chloride Process over the humid method known by the name of the eminent Chemist Guy Lussac and adopted in the Mint at Paris, but I believe it to be the decided opinion of my Colleagues, as it is my own, that the former method, for the introduction of which we are indebted to the scientific knowledge and mechanical skill of Mr. Dodd the late Assay Master

of

of the Calcutta Mint is the one best adapted to the Mints in India, while both processes are greatly superior in accuracy to the more ancient and ordinary method by Cupellation practised in the Mints of Madras and Bombay.

3. I shall endeavour to lay before your Committee as briefly as possible, the chief points in which these various processes differ from each other, and the grounds on which I consider the Chloride Process entitled to preference should it be deemed advisable to introduce an uniform system of Assay into the Indian Mints.

4. In Cupellation, or the dry method of Assay the chief difficulties arise from the variation of the absorption of the pure Silver into the Cupels, or what is termed the "Cupel Allowance" which depends upon the quantity of oxidizable metal with which it may be combined and the amount of heat employed in its reduction. These unavoidable sources of error can only be ascertained and provided against by the results of long experience, and even when all the practical difficulties are known and carefully met, an approximate result can only be obtained in place of a rigid Chemical Analysis. In Mr. James Prinsep's valuable experiments on the subject of "Cupel Allowance", a quarter of a dwt. or 6 grains is the minimum

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of variation that could be attained, with the utmost exactness in manipulation. The humid process on the contrary being based on definite Chemical laws is in a great measure independent of the Operator, and affords results at once uniform and strictly to be relied upon.

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6. The Chloride Process introduced by Mr. Dodd into the Calcutta Mint is at once the most scientific and the most elegant method of ascertaining the true value of Silver Alloys with which I am acquainted, and is altogether free from the sources of error to which I have adverted. It is based upon the same Chemical principle as the humid Process of Guy Lussac, viz: the definite proportion in which Chlorine unites with Silver, but differs from it in the calculation being made from the precipitate itself, when carefully collected, freed from moisture and weighed. By this method reports can be made to a single grain, or to speak more accurately to 1/8 Grains Troy, which has been the practise in the Assay Office at Calcutta for some years past where the system has been confidently adopted and gradually perfected.

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10. Having thus as succinctly as possible laid before your Committee the chief points of superiority which the Chloride Process possesses over the other recognized method of Assay, it only

Tub. Ltr. to Govt. Etc.
Numbers 1868 Etc.

only remains for me, in the event of its being adopted in the Madras Mint, to suggest that one or more steady intelligent lads should be sent to make themselves thoroughly acquainted with the practical details of the process in the Laboratory of the Assay Office in Calcutta as its successful introduction must altogether depend upon careful manipulation which could only be acquired in working for three or four months diligently, on the large scale, and with the complete apparatus employed there.

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True Extracts.

H. E. Hunter Esq.
Acting Assay Master.

L.P.

Appendix F.

Appendix C.

Public Department

For Estimated Expenditure	Years	Revenue: Ordinary	Revenue: Extra Ordinary	Charges: Ordinary	Charges: Extra Ordinary	Total: Revenue	Total: Charges	Net: Surplus	Net: Deficit

Extract from Home Depart. Govt of India: No.	Date	Office to what the Proposition refers	Nature of Charges: Present scale	Proposed scale	Proposition: Permanent: Increase per Month	Permanent: Decrease per Month	Temporary: Increase per Month	Temporary: Decrease per Month	Grounds of Proposition	Local Government Recommendation	Orders of the Govt of India: Home Department: Remarks	Financial Department: Remarks	Financial Department: Orders
		Assay Office	⊗ 1 Head Accountant and Manager	200 . .	1 Head Accountant and Superintendent of Labour	250 . . } x							
			1 Deputy do	70 . .	1 Second Accountant & Assist do	100 . .							
			1 Writer	30 . .	1 Head Writer and do	40 . .							
			1 do	25 . .	1 Second do and do	30 . .							
			1 do	14 . .	1 Third do and do	17 . .							
			1 Moochie	12 . .	1 Superintendent of Musters	35 . .							
			3 Peons at 7/ each	21 . .	1 Assistant do	18 . .							
			1 Supt of Musters	30 . .	1 Laboratory Apprentice	25 . .							
			1 Asst do	15 . .	1 Moochie	12 . .							
			1 Head Fireman	28 . .	1 Flattening Man	10 . .							
			1 First Assist	10 . .	1 First Fireman	15 . .							
			1 Second do	8 . .	1 Second do	8 . .							
			1 Third do	7 . .	1 Laboratory Man	7 . .							
			1 Flattening man	10 . .	3 Peons at 7/ Rupee each	21 . .							
			1 Sweeper	3 8 "	1 Sweeper	3 8 "							
			1 Scavenger	1 . .	1 Scavenger	1 . .							
				484 8 "		592 8 .	108 " .						

Circular or Extraordinary

For the introduction of the New System of Assay by the Chloride Process

H. E. Burkett Asst

Acting Assay Master

⊗ On this establishment there devolves also the duty of correcting and adjusting all weights and measures – a duty for which I believe in the Calcutta Mint a separate establishment is maintained.

x Vide Dr Shaw's Memorandum Paras 3 and 4.

Fort St George
H. M's Assay Office
7 March 1867.
Ex I. T.

Smithsonian Institution
1868 12-7

Appendix D.

Statement of the Fixed Establishment of the Calcutta Assay Office in 1856 and in 1867. Shewing the increase in eleven years.

Establishment in January 1856.		Establishment in February 1867.		Remarks
Designation of Office	Salary Rs.	Designation of Office	Salary Rs.	
Foreman or Hd Uncovenanted Asst.	200	Head Assistant 250 Personal allowance 100	350	
European Apprentice	50	Second Assistant rising to Rs 150	120	
		Third do	50	
Head Accountant & Writer	145	Head Writer	55	
2nd do do	28	2nd do	28	
3rd do do	16	3rd do	20	
		4th do	16	
Head Master Sircar	40	Head Master Sircar	40	
2nd do do	14	2nd do	15	
Duftry or Stationer	9/6/4	Duftry	8	
First Weighman	15	Head Weighman	30	
2nd do	10	2nd do	15	
		3rd do	10	
		4th do	10	
First Laboratory Assistant	8	1st Laboratory Mate	9	
2nd do	6	2nd do	9	
3rd do	6	3rd do	9	
		4th do	8	
		5th do	6	
		6th do	6	
Head Master Melter	5	Master Melter	9	
2nd do	4	1st Hammer Mate	6	
3rd do	4	2nd do	6	
		3rd do	6	
Armourers	12/12	Armourers	10	
Head Bearer	6	Head Peon	7	
Peon	5	2nd do	6	
		Durrash	6	
2nd Bearer	4	Bearer	4	
Bhisty	4	1st Bhisty	4	
		2nd do	4	
		3 do	4	
Sweeper	4	Sweeper	4	
	492/12		890	

No 1301/67

Mint. Bd's Corpd. 21st. March 1868 No 7

HER MAJESTY'S ASSAY OFFICE MADRAS

257 5

No 226.

Fort St. George.
H. M's Assay Office.
7th March 1867.

From, H. E. Busteed Esq. M.D.
Acting Assay Master.

To, Colonel S. Carpendale R.E.
Mint Master.

Sir,

Para 1. I have the honor to request that you will submit the following circumstances for the consideration of Government.

2. In the month of September 1865, it was directed by the Government of India (at the suggestion of the Assay Master of the Calcutta Mint,) that the Decimal form of Notation should be used in all assay reports recording the fineness of Bullion both Gold and Silver.

Vide G.O.G.G. Dated Simla 7th Sept. 1865. No 2253.

3. Dr Shaw the Assay Master of this Mint shortly afterwards went to Europe on Medical Certificate, leaving for the guidance of the Officiating Assay Master

Master, a Memorandum explaining why he did not immediately give effect to this change.

4. Since Dr. Shaw's departure till very recently, I have been alone in this Assay Office, (which moreover sustained a loss by the death of Mr. Van Derwart for many years its Manager and Head Account-ant) and being thus shorthanded, I did not think it judicious to take any steps towards the introduction of so radical an innovation as that recommended by my Predecessor; involving as it would, close and constant supervision in the Laboratory, while the sub-ordinates were being trained to the manipulation of the new process. But now that an (Acting) Assistant Assay Master has joined the Office, I deem it my duty to no longer defer soliciting sanction for measures which appear necessary for carrying out the above order of Government.

5. In this Mint the Assay of Silver is as you are aware, effected by the method of Cupellation, and the

Assayer

* Appendix 1

Assayer determines the fineness to the ½ pennyweight viz: to the 1/480th part, the Assay Report stating what is the variation of the Bullion from the "Standard" of the Country and not (directly) the amount of pure Silver in it.

6. The lowest denomination of the report is as above said, half pennyweight or 12 grains in the Pound Troy; closer than this in the Madras Mint (and I believe such is the usage, wherever the dry method is in force) it has never been deemed expedient to report the assays for the valuation of Merchants' Bullion, chiefly because the cupellation process is well known to be far from perfect, and gives results (even in the hands of the most skilful and experienced manipulators) which can only be regarded as approximate and conjectural.

7. The results therefore "being uniformly accurate only to within certain limits of error" it is the custom to protect the buyer of bullion (viz: in this Country the Mint) by the above latitude in the assay report which in some degree indemnifies him

him as it were, against two principal sources of error, viz average unavoidable imperfection in the assay and irregularity of mixture of alloy in the Bullion.

8. Creditably as this system has worked on the whole (judging it at least from one point of view: viz the annual Mys reports on the Madras Coins) still the decimal plan of Notation, which has for some years superseded it on the Continent and which prevails in the Calcutta and Bombay Mints, is no doubt a great improvement as simplifying matters generally, dispensing with two different forms of Notation, one for Silver, another for Gold - and doing away with all reference to this or that "Standard", the assay report simply stating the Amount of precious metal in 1000 parts of any alloy.

9. To enable the assayer to report as closely as this, with that degree of accuracy desirable, where selling and buying bullion are involved, it will be necessary to resort to a process of assay, which will give results more reliable than those afforded

HER MAJESTY'S ASSAY OFFICE MADRAS

by Cupellation, and that known as the "Chloride process" which has for some years been admirably working in the Calcutta and Bombay Mints, is the one best adapted in this Country for the end in view.

10. The superiority of this method and the desirability of its introduction, have been already so fully brought to the notice of Government in an exhaustive report from Dr Shaw in 1856 that I can not do better than beg to refer Government to it with the order of Government thereon dated 7th April 1857 (extracts from it pointing out the chief characteristic differences of the processes & embodying his recommendations are appended to this letter for facility of reference.

Fin. Dept. No 209. dated 7th April 1857. Appendix B.

In Dr Shaw's last Memorandum, Appendix A. he again impresses the desirability of a change of system and recommends that the change of notation and in the method of Assay, should be made together, and in this recommendation I fully concur, believing as I do, that the one cannot be efficiently made without the other.

11. In

11. In anticipation therefore, that Government will be pleased to sanction the introduction of this process and so secure uniformity in the three Indian Assay Offices, I beg to submit an estimate of the probable increase of establishment which will be necessary.

In framing this Estimate I have had before me the Calcutta Assay Office list, recently furnished, and the recommendation of Dr. Shaw in his report in 1856 and his Memorandum last year. I have endeavored to be as economical as practicable, considering the peculiar elements of the present establishment, the difficulty of remodelling it, and the amount of extra work which will be thrown on it by the proposed arrangement. Appendix C. Appendix D. Appendix B Appendix A.

12. There is not in this as in the Calcutta assay Office, an accountant's Establishment as distinct from a laboratory one, the custom having grown up, of the two Senior Accountants (in addition to their more legitimate work)

aiding

aiding in the preliminary weighings and manipulations of the assays: the Superintendents of musters also taking part in a minor degree in the simpler operations. Though this system is not the best, (it being desirable as a rule that laboratory work should be in the hands of assistants trained to it alone) still it is the best within reach and an extension of it seems to me the most feasible and economical plan at present, circumstances and vested interests being considered.

I propose therefore, to carefully train and practise all the subordinates under my immediate supervision in the Laboratory, so as to enable them to take part in the manipulations and be generally useful - and as the Laboratory work in the Chloride process is much greater and more delicate and tedious than in cupellation, I have recommended extra pay for extra work.

13. As it would be desirable to have some one training up in the Office to succeed by and bye to the Senior posts,

I

I beg further that sanction be allowed for an apprentice, an intelligent East Indian lad who had passed the required M.E.S. Examination, might be entertained at a Salary of (25) Twenty five Rupees monthly and to make it worth his while to remain after being trained, I would recommend that his pay be yearly increased by five Rupees till it reached forty five (45) Rupees, this is the only additional assistant that I have estimated for:- a good portion of his pay will be met by a reduction in the furnace room expenses, when the new process shall have been sufficiently established to enable us to dispense with the dry method, but of course at first, the two systems must go on together, till the subordinates are thoroughly acquainted with the new.

14. In conclusion I beg to say, that now while work is very slack, (owing to the present small importation of Bullion) is the most favorable opportunity for commencing a process the introduction of

which

HER MAJESTY'S ASSAY OFFICE MADRAS

which, must necessarily be gradual, also that it would greatly facilitate the introduction, if this Office were empowered to send some one to Calcutta to see the Chloride process worked on a large scale: Though we frequently use it in this Assay Office, it is in a very limited way, chiefly as a confirmatory test, for the satisfaction of the Assay Master, where more than ordinary precision is desired, and an intelligent observant person with some previous knowledge, could not but pick up some hints and gain much valuable information as to detail, were he afforded an opportunity to see the system in extensive operation in a Mint, where they have had ten years additional experience of it since Dr. Shaw wrote his report in 1856.

Should Government be pleased to sanction this suggestion, which I regard as most essential, I beg to recommend Mr. Duarte the present Manager

of

of the Office, as the most suitable person and to solicit for him leave of absence for three months, with full pay (to be drawn in Calcutta) and a free passage there and back. The experience which he would acquire, by a six or eight weeks attendance in the Calcutta Assay laboratory, would render him a valuable aid to me in drilling the subordinates in the necessary manipulation.

15. As much of the necessary apparatus for the new process was provided when this subject was last mooted, I do not anticipate that it will be necessary to incur much further expense under this head, but I should be in a better position to give an opinion on this point after the Manager's return from Calcutta.

I have the honor to be
Sir,
Your most obed.t Servant

H. E. Hustler Jnr

Acting Assay Master.

Financial Department.

PROCEEDINGS of the MADRAS GOVERNMENT.

Read the following letter from the Mint Master, Madras.

ORDER THEREON 18th June 1867. No. 264.

Under the opinion expressed by the Mint Master, in which the Govt. concur, the Governor in Council must decline to sanction any change in the method of assaying at the Madras Mint

2. The Govt. resolve to depute V. Ramiengar, Superintendent of Stamps, to enquire into the Office work

Fin. Dept. G.O. No. 264 Dated 18th June 1867 Rec'd

1867. Dept.

From

The Master of the Mint Madras

To The Chief Secretary to Govt. Fort St. George.

Dated 1st March 1867.

Rec'd 5th June 1867.

No. 220.

Requesting the consideration of Govt. of the proposition to introduce into the Madras Mint Office the decimal system of notation in the Assay Reports on Gold & Silver containing Platinum with the Chlorides necessary with the Chlorides necessary to make for the adoption of Govt. a Madras Grain Standard to the present Assay Standard for the Mint Master General Mint Office Madras and to call for the opinion of Govt. thereon.

Ans. 18/3/67

Informing that it may be available to effect a simplification of the work.

of the Assay Department and report what establishment he considers necessary for the prompt performance of the work at the busiest time of the year.

Mint Master.

C. Ramiengar. Supdt of Stamps. Revenue Department.

Coll. Campbell does not support Dr. Rustead's proposal to assimilate the method of charging for assay in Calcutta & Bombay.

He considers it very unde: sirable to incur any extra expense at a time when there is no income to cover it.

Nor is, he thinks, any necessity for a change as the hundies for Rupee Coinage for many years with near comparison with that of the Bombay mint.

He points out prominently the evils the present system is favourable to fore; the new system will entail a direct loss.

Coll. Campbell agrees that assaying the cost of the establishment of the assay Department should be dispensed with.

Lastly he proposes that an Office

Officers familiar with Accounts
and Official Work be deputed
to enquire into the Official
Work of the Agency Departts, &
to report upon the Establish=
=ment required for the prompt
despatch of Work at the
busiest time=

Revenue &c

Increase to the
Assay Office Staff

Keep with F 130/67

H. W. [illegible]

Recd 20/6

Ansd 21/6

Tin & Lr to Engr 21st
March 1868 No 7.

Financial 186⅞. Department.

No. 264

PROCEEDINGS OF GOVERNMENT.

Dated 18 June 1867

Fin A 419 1852 - 489 -

Replied 6-7 May
No 51 of 1868

Assay Dept & Mint Buildings

44.45.