

MADRAS RECORD OFFICE.

Government of Madras.

Financial DEPARTMENT.

G.O. No.	13	Press ~~Mis.~~
Dated	10. 1.	1860

B.m. 26-27

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Not to be folded or roughly handled

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*Proceedings of the Madras Government, Financial Department,
for the month of January 1860.*

Read the following Extract from the Proceedings of the Government of India, in the Financial Department, dated 22nd December 1859.

No. 26. Read letter from T. BOYCOTT, Esq., Assay Master, Calcutta Mint : to C. H. LUSHINGTON, Esq., Secretary to the Government of India, Financial Department, No. 82, dated 9th December 1859.

The system of taking musters for assay by granulating a small portion of the silver from each melting pot, both in the Government Melting room and in the Merchants' Bullion department, being satisfactorily established, I have the honor to present to you, for the information of Government, the following statement connected with the subject.

2. When I first came to the Assay Office under Mr. Dodd in 1853, all the silver bullion was melted and cast into ingots exactly like the standard silver for lamination, and the musters from both were taken in the same way *viz.*, by cutting a small wedge-shaped piece from one of the edges of the ingot, so that only the very outer part was assayed.

3. Mr. Dodd frequently found the standard meltings give a much lower assay report than they ought to do, and he was constantly afraid that he had over-estimated the merchant's bullion, or that something was wrong in the melting.

4. When I took charge of the Assay Office in 1854, I spoke of this to Colonel Forbes, and having assured myself that the assays and meltings were both properly conducted, I suggested that as the fact of alloys of silver and copper not being perfectly uniform had been long known, the disparity in question probably arose from the musters of the standard ingot not truly representing the mass.

5. Colonel Forbes with his usual readiness of resource, gave me a design for a pair of tongs to take a portion of the silver out of the centre of the pot when it was well melted and stirred, which would have answered no doubt, but there was a difficulty in getting it made to stand constant use. Soon after this I took charge of the Mint in consequence of the declining health of Colonel Forbes, and for some months I had no opportunity of attending to the Assay department.

6. In the summer of 1855, I received Colonel J. T. Smith's report on the Indian Mints from 1841-42 to 1853-54. At page 73, paragraph 9, he shows how the straps and coins vary in assay in different parts, and when he relieved me from the Acting Mint Mastership, I asked him if he had ever made any experiments on the standard ingot, with a view to get at a correct method of cutting or taking musters; and learning that he had not done so, I at once determined to set to work and make experiments on various alloys of silver and copper, with a view to determine their variations in different parts of the same ingot. The first series of experiments

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system of assaying, we can confidently report for alligation to two grains in the pound, and our standard meltings and coin reports afford a basis of calculation for the Mint Master very different to those of the Madras Mint report when additional alloy was added without any fractions of the half pennyweight being reported.

18. I have only alluded to my experiments on alloys of silver and copper in this statement with reference to their bearing on taking musters; the scientific considerations as to the laws regulating the separation of the copper from the silver under various circumstances, has required a great many experiments; these I hope to finish and present to you in a future statement; you are aware that I have not had much leisure in my Office, and I can only regret that I shall not have the opportunity much longer.

MEMORANDUM proposing the plan for taking musters in the Premelting room by granulating a small quantity of silver from each pot instead of cutting the musters.

In the Premelting room, at the present time, the numbering of the ingots and cutting the musters, is under the superintendence of the Melter in the presence of the importer's representative. I propose that taking the granules and numbering the ingots shall still be conducted by him.

The apparatus for taking and keeping the granulated musters are the following:—

- 1st. Copper vessels 9 inches deep and 4½ inches diameter for forming the granules.
- 2nd. Iron ladles for dipping out the silver.
- 2½ A strainer.
- 3rd. 36 Wooden cells two inches deep and 3 square in the inside measure, for keeping the granules, these will be numbered.
- 4th. A strong cabinet for keeping the 36 cells secure with lock and keys to be fixed against the wall in the weighing room.
- 5th. A small box for keeping the assay musters after they are put in the papers with lock and two keys.
- 6th. Small shelves to be fixed to the chimney of each of the furnaces for placing a cell on.

2. When the silver is potted by the melter, a wooden cell corresponding in number to the pot number, must be placed on the shelf of the furnace. As soon as the silver is well melted and stirred, the melter will take the granules in the copper vessel, and transfer them as quick as possible by means of a strainer into the wooden cell, and as soon as the ingots are numbered, the melter having himself clearly seen that the number on the ingot and the cell corresponds, he will place the latter in the cabinet.

3. When the Bullion Clerk weighs the silver after melting, the Assay Office Muster Sircar will attend to take a tola weight of granules from each of the cells for an assay muster, to be placed in a paper of following form (No. 1*); the number of the pot and particulars of the silver weight, &c., to be filled in by the Bullion Clerk, who will have charge of the musters and will see that they duly correspond to the silver they represent, the Assay Office Sircar will attend as a check.

4. As the muster papers are made out and the granules put in them, they will be placed in a box, one key of which may be kept by the Bullion Clerk, and the other by the First Assistant of the Mint; and when the bullion is sent to be registered, the box will be sent with it, and it will be for the latter officer to see, when registering the bullion, that its weight corresponds with that written on the muster paper, as well as the number of ingots, &c., and that the muster paper is duly filled up with registered number, &c., and delivered to the Assay Office Muster Sircar.

CALCUTTA MINT,
ASSAY OFFICE.
2nd February 1859.

(Signed) T. BOYCOTT,
Assay Master.

* FORM No. 1.

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for the month of January 1860.*

* FORM No. 1.

MUSTER FORM.

MELTING ROOM.	BULLION ROOM.
Date	Date
Importer	
Description	
Pot No.	Register No.
Weight Tolas	Weight Tolas
Ingots No.	Ingots No.

FINANCIAL DEPARTMENT RESOLUTION.

The Honorable the President in Council observes that the results of the system of taking musters for assay by granulating a small portion of the silver from each melting pot, as reported in the above letter, are very satisfactory and far more correct than any obtained in former years; and that Dr. Boycott, to whom the introduction of the system into the Calcutta Mint appears to be entirely attributable, is entitled to great credit for what he has done.

2. His Honor in Council agrees with Dr. Boycott, in thinking that it will be advisable to introduce the same system in the Mints at Madras and Bombay; but before doing so, he is desirous that the report be sent through the local Governments for the consideration and remarks of the officers in charge of those Mints.

Ordered that a copy of the above be sent to the Mint Committee, Calcutta, for information and for communication to Dr. Boycott.

Ordered also that a copy be sent to the Governments of Madras and Bombay, with a request that the remarks of the officers in charge of the Mints at those Presidencies may be obtained and forwarded to the Financial Department for the information of the Government of India.

(A true Extract.)

(Signed) C. HUGH LUSHINGTON,
Secretary to the Government of India.

No. 27. ORDER THEREON, 10th January 1860, No. 13.

Ordered accordingly that the foregoing report and Proceedings thereon be forwarded to the Mint Master for his consideration and remarks.

(Signed) T. PYCROFT,
Chief Secretary.

Exd. F. Cartledge.

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for the month of January 1860.*

were made as represented in the diagram, and included the entire length, excepting half an inch at top and bottom, both from the edges and centre of the ingots; it is unnecessary to report these in detail, but they distinctly proved that in properly melted and well poured silver and copper alloys, if the musters are cut in the same line from top to bottom, no difference exists in the assay, so that if an ingot could be cut length-ways into 50 bars corresponding to the cross section represented in the next diagram, each would, from end to end, give the same assay.

7. The second series of experiments were made from cross sections of the ingot about a quarter of an inch thick, and cut accurately into small pieces so as to test every part as represented in the diagram.

AVERAGE report of experiments made on different alloys of silver and copper most commonly found in the Calcutta Mint. The numbers on the diagram refer to corresponding portions in all the experiments, and the figures after the signs *plus* and *minus* refer to grains in the assay pound above or below proper touch of the silver alloy operated on.

6		7		8								Ingot of silver alloy 23 worse.	Ingot of silver alloy 4 worse.	Ingot of silver standard alloy 7 better.	Ingot of silver alloy 18 better.		
1	2	3	4	5								1 — 9 grs. 2 + 0 3 + 2 4 + 18 5 + 47	1 — 16 grs. 2 + 24 3 + 24 4 + 37 5 + 35 6 — 19 7 — 16 8 — 3 9 — 12 10 — 6 11 — 2	1 — 13 2 — 1 3 + 4 4 + 13 5 + 26 6 — 16 7 — 13 8 — 10 9 — 22 10 — 10 11 — 10	1 — 9 2 — 4 3 + 5 4 + 6 5 + 6		
9		10		11													
Diagram of the $\frac{1}{4}$ inch thick section; one side, is shaded, the lines of which shew the direction the copper takes in cooling.																	
												Difference from No. 1 to 5=56 grs.	Difference from No. 1 to 5=52 grs	Difference from No. 1 to 5=39 grs	Difference from No. 1 to 5=15 grs	Difference from 1 to 5 none.	

8. The great fact which these experiments show is that the silver alloy operated on.

Diagram of the $\frac{1}{4}$ inch thick section; one side, is shaded, the lines of which shew the direction the copper takes in cooling.

8. The great fact which these experiments firmly establish with regard to ingots cast in upright moulds, is that all the outside is much below the average of the mass in assay, and the centre very much above it, and in looking at the line represented in the diagram from No. 1 to 5, and referring to the report, it will be seen that the difference in the assay increases with the proportion of alloy in the silver as shown in the lower line below each set of reports. In referring to the reports of the portions, numbers 6 and 9, on the Indian standard silver, and seeing by the diagram that these are the very points from which all the old musters were cut, it will be easily understood, when bar silver, 19 br, and copper were mixed to form standard ingots, how they would give an assay report 12 or 20 grains below standard. And it bears equally on the musters cut from merchants' bullion, as former reports show, that Five Franc and Dollar silver were generally reported $4\frac{1}{2}$ or 5 worse; whereas in the 52 lacs lately imported by Government, I have reported nearly all only 4 worse; (this gain of $\frac{1}{2}$ dwt. on the whole is Rupees 11,815 profit over the old system of reports); a further larger gain of Rupees 27,197 was brought to the credit of Government by this improved method of taking musters in the Calcutta Mint, on the extra additional alloy added to the Bullion.

* Coinage of the last four years
21,72,03,267-4.

LONDON REPORTS.

1850	Standard	+	4 $\frac{1}{2}$
1851	Standard	+	8 $\frac{1}{2}$
1852	Standard	+	11
1853	Standard	+	5 $\frac{3}{4}$
1854	Standard	+	6 $\frac{1}{2}$

alloy added to the Bombay silver received in 1856-57, 1857-58, and a still larger saving may be estimated on the coinage of the last four years* by referring to the London reports of our coins as given in the margin ; it will then be seen how much they were formerly above standard, and how nearly approaching it were, since I have had charge of the Assay Office.

9. After this discovery of the exact way, the copper separated from the silver in the ignots during their cooling in the moulds, it was evident the system of cutting musters required altering. I proposed then taking granules from

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1855 Standard	+	$\frac{1}{2}$	the pot, but Colonel J. T. Smith considered that it would
1856 Standard	—	$\frac{5}{4}$	not be safe to throw any new or additional responsibility
1857 Standard	+	$\frac{1}{2}$	on the melting department, which was at that time labouring
Last year not yet received.			under a great pressure of work.

10. I therefore ordered musters to be cut, so that the portion taken for assay should correspond to the point marked No. 2 in the diagram of the cross section; these I tested with granules taken from the same pot, and finding them agree very nearly in report, all the musters were for a time taken in this way, and as long as the Assistants attended to exact cutting, most satisfactory results followed.

11. In September 1856, Major Bell having kindly entered into the question of taking musters with me, I made with his permission a series of experiments in the Government Melting room on granulating silver for musters.

12. These experiments had especial reference as to the state of the alloy of silver and copper before pouring and whilst pouring from the pot. It is unnecessary to report these experiments in detail; they have been repeated over and over again with different kinds of silver *viz.*, Standard, Five Francs and Dollars in the following way:—

Granules before pouring.

Ditto	after the 1st ingot.	} A full pot makes 18 ingots.
Ditto	after the 8th or 9th ditto.	
Ditto	after the 16th or 17th ditto.	

13. In all the experiments, the assay report showed a remarkable uniformity, so as to allow me confidently to state that as long as alloys of silver and copper are in a fuses state, and fit to pour ingots for lamination, it continues uniform, and that it is only whilst cooling in the mould, that a partial separation, explained by my former experiments, takes place. After these experiments, Major Bell agreed with me that the musters from the standards meltings should be taken by granulation; and if these succeeded we might recommend to the Mint Committee that the musters should also be taken in the same way from the merchants' bullion. The attention of the Melter and his Assistants to this work has been most remarkable; for nearly three years it has been carried on so successfully that scarcely a mistake has occurred.

14. In consequence of Mr. Davis' leaving the Bullion department, the introduction of taking musters by granulations was delayed till Mr. Peterson took charge. Dr. Shekleton feeling confidence in that officer's knowledge of the subject, recommended (during my absence on leave) that it should be established; and the Mint Committee gave their consent in a letter which I received on my return to Calcutta.

15. As there was some peculiar arrangements between the Mint and Assay Office regarding taking musters which required to be well understood, the following memorandum* was drawn out, which the Mint Master approved of; and that is now the basis of our present system.

16. The taking of granules has now been working some months under Mr. Peterson's careful superintendence, and the assays resulting from them are more uniform than any we have ever had before. I feel perfect confidence in the system, and its truthfulness in representing the mass of silver to be valued, is so far beyond what any cut muster can give, that I strongly recommend its adoption in all the Indian Mints.

17. In large operations on bullion, it is most important for all parties that the nearest approximation to truth should be obtained. As a very small fraction in the assay report makes a great difference in large sums, I believe with granulated musters and the Calcutta

Financial 1800 Depart

No of Govt 10 January

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of Excheq 1806

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Forward copy of a
petition from the Govt.
of India, to be given to the
Govt. of the system of the
Masters for assay by granulating
a small portion of the silver, from
each melting, to be used for
the purpose, I think it will be
able to introduce the same
system in the Mint, it has been
done, but before doing
so, I must that the result of the
of the officers in charge of the
Mint in those cases may be
obtained and forwarded
for the information of the Govt.
of India, with an Order

Order thereon 10 January, 1860. No 12.

Ordered accordingly that the fore-
going report and Proceedings thereon be for-
warded to the Mint Master for his conside-
ration and remarks.

To the Mint Master (Sd/-)

J.P.

26527

FINANCIAL DEPARTMENT, RESOLUTION.

The Hon'ble the President in Council observes that the results of taking musters for assay by granulating a small portion of the each melting pot, as reported in the above letter, are very satisfactory, far more correct than any obtained in former years; and that, to whom the introduction of the system into the Calcutta Mint be entirely attributable, is entitled to great credit for what he is Honor in Council agrees with Dr. Boycott in thinking that it will be to introduce the same system in the Mints at Madras and Bombay; doing so, he is desirous that the report be sent through the local officers for the consideration and remarks of the officers in charge of

Pot No.	Weight Tolas	Ingot No.
Register No.	Weight Tolas	Ingot No.