M.R.O. 1—82 400—23-11-60

MADRAS RECORD OFFICE.

Government of Madras.

Jubilee Book DEPARTMENT.

G.O. No. 727 Press Mis.

1167

Dated 19 — 4 — 18 58

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No. 116. Read the following letter from Colonel C. E. FABER, Chief Engineer; to H. FORBES, Esq., Acting Secretary to Government, dated 18th March 1858, No, 8221.

SIR,

1. On the 15th* December 1856, I had the honor to submit a proposition from the Civil Engineer of the Kistnah Division, for increasing the efficiency of the small workshops at Bezoarah, by the purchase for them of a few tools and pieces of Machinery, to the value of Rupees 8,000, and the erection of a small Cupola, at a probable outlay of Rupees 2,000, and I strongly recommended the grant of the latter sum, and authority to include the tools and Machinery either in the annual Indent then under preparation, or in a special one.

* Letter No. 8881.
1 Letter from District Engineer of the Kistnah Division No. 125 of 30th November 1857, with one enclosure from E. E. Merrall Esq., dated 7th November 1857.
1 Copy of Memo. by Mr. Merrall on Bezoarah workshops and improvements of Mechanical works of this country.

2. The Government, under date the 13th February* 1857, rejected the application, on the ground that it had agreed to a proposal for greatly enlarging the workshops at Dowlaishweram; but as that decision seems to have been given under a misapprehension of the extent and character of the proposed improvements at Bezoarah, and of the facilities that the workshops at Dowlaishweram afford, I venture, in forwarding a letter lately received from the Officer now in charge at the Kistnah, together with its enclosure, a second letter from Mr. Covenanted Civil Engineer Merrall, renewing his predecessors application with some additions, strongly to urge a more favorable re-consideration of the subject.

* No. 305.

3. On whatever footing the large Workshops at Dowlaishweram may be placed, it is, in my opinion, highly necessary, if not indispensable, that the small Establishment at Bezoarah should be made capable of performing the repairs of all the Tools, Machinery, and apparatus employed in the Division, of which it is the Head quarters. The articles already in use consist of a large stock of Tools of all ordinary kind of numerous Cranes, Winches, Railway wagons, Iron and wooden pumps, boats, and three Steam Engines &c. and there will soon be added, three large iron Steam Dredges and an iron Steam Tug of 80 Horse Power, and ere long it will, undoubtedly, be found both expedient and economical to build iron cargo boats for the channels. These, as well as the iron Dredges and Tug boat, must necessarily be put together, and the Engines and Machinery fitted into the latter on the spot, which will be difficult in the present ineffective condition of the workshops, but easily and cheaply performed if the additional apparatus asked for by the local Officers be granted.

4. The Cupola is intended to be a small one, to permit of light castings in iron being made. Its want is now much felt, as on the breaking of a cog wheel, plumber box, or other part of any apparatus, the whole article is useless till a model of the broken part is made and despatched to Dowlaishweram and a new casting received from thence, probably in about the same time that it might have been obtained from England, without the means of fusing iron the only alternative is to re-place breakages with castings in brass, and this is generally done at a considerable waste of money, as a valuable material has to be purchased, while quantities of broken wheels and other old iron, are lying about, and might be profitably used up, were a cupola erected.

5. The enlargement of the workshop at Bezoarah, or rather the fitting it with additional Machinery to the extent proposed, since no new buildings are required, is, in my opinion, not only absolutely necessary for the efficient Maintenance of plant and Machinery in that important Division of Public Works, but is a measure of sound practical economy, and I have therefore no hesitation in giving the present application my utmost support, in recommending 1st the grant of Rupees 2,000 for the immediate erection of a cupola, and 2ndly that I may be authorized to prepare a special indent for the Tools and Machinery specified, which together, it is expected, will not exceed in cost Rupees 10,000; a sum bearing a very low ratio on the system of Public Works, to the efficient working of which at all times, in its various details, the grant now solicited and strongly recommended will so largely contribute.

6. The great importance of advancing the Mechanical arts in this country, by Government setting the example in the establishments attached to extensive works like those at the Kistnah, is I believe, or at all events, very soon must be admitted, and a better opportunity than that

offered at Bezoarah for the introduction of Machinery and improved apparatus, cannot well be found, as labour is there both scarce and indifferent, and that place is more centrically situated than any other, being in the immediate vicinity of an extensive system of navigable Canals, and on the intersection of two great main roads. Finally the present time, one of comparative inaction, is singularly opportune for the supply of existing deficiencies, so that on the career of improvement, now so unhappily suspended, being resumed, all those lets and hindrances, which have hitherto proved, from time to time, so prejudicial (and not unfrequently from the most trivial causes) may in future be under complete professional control, instead of compromising, as at present, the progress and success of one of the largest schemes of artificial irrigation undertaken by this, or by any other Government.

7. In further support of the view I have above expressed, I take this opportunity of laying before Government a transcript of a paper addressed to me by Covenanted Civil Engineer E. E. Merrall Esquire, describing the present organization and uses of the workshop at Bezoarah, and, after detailing, at some length, his experiences therein, recommending its enlargement, with a view, in the first place, of facilitating and cheapening the manufacture and maintenance of such plant and simple articles of Machinery as can be prepared there for use in economizing labour on the great works in progress in the Delta, and in the second place, of bringing up a class of workmen trained to the employment of appliances by which alone improvement of the mechanical arts in this country can be effected.

Letter from Lieutenant OSB. CHAMBERS, Acting District Engineer Kistna Division; to Colonel C. E. FABER, Chief Engineer, dated Bezoarah, 30th November 1857, No. 125.

SIR,

With respect to your Official Memorandum of the 28th October 1857, without Number, calling upon me in pursuance with your circular, date and number as per margin, to report upon the quantity of timber and tools to be purchased for the works in this District together with a list of Machinery required here, I do myself the honor to inform you that, to the best of my judgment, we are at present well enough supplied with timber to meet all current requirements, are equally well furnished with tools, but that with regard to Machinery our workshops would be far more efficient than they now are, were the Articles below specified procured from England.

16th October 1856, No. 7287.

2. The Articles, as will appear from the subjoined letter addressed to the Executive Officer lately in charge of the Division by the Covenanted Civil Engineer directing the workshops, are

1 Large Planing Machine.
1 Small do. do.
1 Small Lathe.
1 Slothing or grooving Machine.
1 Bolt Tapping Machine.
1 Nut Shaping do.

3. On reference to a letter addressed to you by the late District Engineer number and date as per margin, giving enclosure to Mr. Merrall's original communication to him respecting the Machinery granted in the workshops, it will be evident that I am but repeating my Predecessor's application with the addition of the Bolt tapping and Nut shaping Machines.

No. 107, dated 30th October 1856.

4. I do not dwell upon the advantage to be obtained by purchasing this Machinery, as I cannot hope to put before you in a clearer light than the District Engineer and the Covenanted Engineer in charge of workshops have done, the great gain that will accrue thereby to the Kistnah works when compared with the smallness of the outlay.

5. Mr. Merrall states the cost of the six pieces of Machinery mentioned above at Rupees 7,000 to which the sum of Rupees 3,000 for tools and charges and Rupees 2,000 for the erection of a little cupola must be added, making Rupees 12,000 the price at which the Bezoarah workshops can be put in excellent working order

From E. E. MERRAL, Esq., Civil Engineer; to Lieutenant FAREWELL, Executive Engineer, &c., &c., dated 7th November 1857.

DEAR SIR,

As I am now getting up the shafting in the workshop here, I think it would not do amiss if you would kindly enquire of the Company as to whether there was any likelihood of our obtaining any part of the Machinery, I wrote to Captain Orr about some time since, we have now in the shop the large lathe, the Drilling Machine, small Circular Sau, and Vertical Sau Mill, and I hope shortly, with a little assistance, to get the large circular Saws fixed likewise, what we most require to complete our Machine establishment is the following viz.,

1 Large Planing Machine slow motion.
1 Small do. quick motion with reversing gear.
1 Small lathe.
1 Slothing Machine.
1 Bolt tapping Machine.
1 Nut shaping Machine.

I think the whole of these could be obtained for about Rupees 7,000.

It must be borne in mind that we have now upon the premises 1-6-H. P. stationary engine fixed in the workshop, 1-4. H. P. portable engine for District use, 1-8 H. P. pumping engine just arrived, and to these are likely to be shortly added, 2 dredgers and 1 pug boat.

Should any of these at any time get out of order, we could, without such additional Machines only get them repaired by sending them to Dowlaishweram, and, to say nothing of the delay, the expense alone would amount to almost the value of the Machinery I want here, and which, if we had it upon the spot, would enable us to do a large amount of work, the value of which would very soon re-pay the outlay in the first instance, as well as keep all our Mechanical Stock in good repair.

If you are writing to the Company perhaps you would endeavour to get from them some definite reply upon the subject.

Letter from E. E. MERRALL, Esq., Civil Engineer; to Colonel C. E. FABER, Chief Engineer in the Department Public Works, Madras dated Bezoarah, 26th August 1857.

SIR,

Having for the last eighteen months been connected with the Workshop Establishment at this place I thought it might not be deemed uninteresting to commit to writing a few observations upon the present state of the Mechanical Arts in this District more especially with reference to those branches which are most intimately connected with Engineering and building operations.

2. For several years past I have been accustomed to the Superintendence of large bodies of workmen in great Britain and Ireland, and I have been thereby enabled to form a tolerable correct estimate of the relative efficiency of the working Departments of these two countries, and to enquire how near the Mechanical Arts of European India approach to this standard will be the principal object of the present paper. Before however I proceed further a short description of the workshops may not be deemed unsuitable. When I first arrived at Bezoarah in April 1855, the workshops here consisted of merely two tolerable sized sheds situated in an open space of ground of about one acre in extent on the north side of the Bezoarah lock at the head of the Kistnah Channels, this plat of ground was but partially closed in and a small office at its western extremity for the Chief Engineers Establishment and the two sheds before mentioned formed the whole of the buildings, in one of these sheds the operations of forging brass foundring, and filing were carried on, and in the other shed, which was of somewhat better character all the carpentry and joinery works were executed all the Machinery consisted of only one excellent Lathe purchased (I believe) from Forester of Liverpool, together with a good stock of tools for iron turning a few vices and European forge bellows and anvils and a small stock of Carpenters tools completed the catalogue of useful implements, and the stores of various kinds required for the different works

were deposited in a building at a somewhat inconvenient distance in the stone quarries ; towards the close of the year 1855, the District Engineer commenced the erection of the present workshops which were originally laid out and partly constructed under the Superintendence of Lieutenant Farewell 1st Assistant Civil Engineer, in January 1856, upon the latter gentlemen proceeding into the District I was appointed by the District Engineer to the charge of the workshop Establishment in addition to my other position as Engineer to the Kistnah bridge, and in this capacity I contemplated the unfinished workshops and under the suggestions offered from time to time by Captain Orr made several additions until the entire mass of buildings reached its present state.

3. These buildings now consist of the following, viz., on the north side of the plot of ground before mentioned a small store for tools &c. a filers shed intended ultimately for an iron foundry a small brass foundry with 3 furnaces, a boiler house with high pressure circular flue boiler and chimney about 45 feet high, a large Machine shop with 6 H. P. high pressure horizontal Steam Engine by Rennies with fly wheel water tank &c. gateway entrance Carpenters shop with 5 double benches, Smiths shop with 6 European forges, at the eastern extremity is a continuation of the Smiths shop running at right angles to the preceding until it reaches the back wall and sufficiently capacious to contain 10 or 12 Native forges ; the south side is bounded by the lock wall near the middle of which is a large traversing crane capable of lifting several tons and reaching over to the middle of the lock, at the western end of the enclosure is a new office divided into two unequal parts the larger of which is appropriated to the staff of the District Engineer and consists of one very large room for writers and draughtsmen and a smaller room behind for Printing and Lithographic operations, the smaller portion of this building is occupied as an office and Bath Room for the Engineer Superintending the workshops near the centre of the enclosed area is a large shed under which is the vertical and circular saw mills with gough's portable 3 horse Steam Engine, a grind stone and double screw jack for tapping bolts &c., at the rear of the offices before mentioned is situated the former office which is now principally used as a depository for Records &c., around and behind this is a large triangular Space of ground chiefly occupied as a Timber yard and Charcoal store and at the extremity of this are two large Lime Kilns.

4. Returning to the gateway entrance on the north side is the Road from Bezoarah to Condapilly and Hyderabad on the opposite side of this Road a new Store has been erected consisting of a large Rectangular Building having an entrance gateway and doors corresponding with the Workshop entrance interiorly it consists on the right of the entrance of a Treasury and guard Room on the left a Storekeepers Office behind which is an open shed in the middle a narrow open Court and at the back one large central Room for the deposit of stores of various kinds among which is a tar tank with upwards of 20 Barrels of tar on each side is a smaller store for large tools iron work &c. &c. and directly behind this is a small cook-house for the Sepoy guard to prepare their food this last is not however yet finishd.

5. From this brief description it will be seen that the entire workshop is enclosed in and protected from promiscous intrusion and that the stores are close at hand instead of being as heretofore at a considerable distance.

6. The whole of the Buildings here enumerated are durably constructed of Brick and Stone in Chunam the roofs of Palmyra wood covered with tiles, all parts of the structure are uniform with Verandahs supported upon Square brick piers running all along the interior and all the walls are plastered with Chunam and whitewashed ; the Machine shop Offices and Store have doors and windows of teak wood glazed, and the whole presents a neat and by no means unpleasing appearance, drains have also been laid down at suitable points for carrying off the water and Ventilators in the Roof for the escape of the smoke from the forges &c.

7. Previous to the erection of the new Buildings the only Machine on the Premises was the large lathe before mentioned, since then we have received from the Government 1 Small portable 3 Horse Steam Engine (Goughs patent) with double pump attached ; 1 Small circular Saw Table and 2 double action Hand Pumps (Nasmyths) 1 Drilling Machine (Whitworths) and 1-6 Horse Power stationary Engine (Rennies) with Boiler and fly wheel complete 6 large 36 inches circular saws (Turtous) and a stock of Carpenters Smiths and other tools from Fennis we

have constructed on the premises 1 foot lathe for turning wood, 1 Tilt Hammer, 1 Large crane, 1 Vertical Saw Mill together with several pumps, Benches trucks Ladders Wheelbarrows and numerous other minor articles we have obtained from Dowlaishwaram. 8 Cast iron Europe Forge leacks and several Riggers for Shafting an American weighing Machine and various articles of ironmongery from England ; notwithstanding these additions to our stock the Establishment is nevertheless still very incomplete and indeed until we obtain a further supply of Machinery it will be quite impossible to avail ourselves of the steam power at present at our command or to complete the efficiency of the concern.

8. In order however that some idea may be formed of the value of the Workshops in connection with the Public Works Department the following is a list of some of the principal articles constructed therein since my arrival at Bezoarah.

1 Pair of double action Pumps 10″ diameter 3 feet stroke.
1 Pair of double action Pumps 1-6″ diameter 3 feet stroke.
1 Pair of do. do. 1′ 8″ diameter 3 feet stroke.
4 Water Wheels and framers diameter from 9 to 16 feet.
1 Vertical saw Machine capable of holding.
6 Saws and cutting Timber 30 feet long and 1-6 square.
1 Tilt Hammer 150lbs wright to make 20 strokes per minute.
1 Wood turning lathe 4 Tool Boxes.
6 Carpenters Benches 3 Vice Benches.
2 Pairs of Lock gates for Doogeralla with iron work complete.
2 Pairs of do. for Kunkapaud with iron work complete.
1 Small pair of do for small channel at Peddaravoor.
24 Platform Bullock Carts 5 Wheel barrows.
1 Low truck 1 Sampsons Post.
Doors Windows Roof and sundry fittings for the New Workshops and shed.
Doors Windows Roof and sundry fittings for the New Office.
Doors Windows Roof and 6 Almiras for the New Library.
Ornamental wood fence in front of do. with gates ; Doors and windows for Captain Orr's new Room.
Ornamental Wood for 1 channel Bungalow at Peddaravoor.
Do. do for the Collectors new Cutcherry.
New roof for Carza Court house.
A large number of sluice shutters and hand shutters for various places.
Large new Crane in Workshop yard.
Large Pair of Workshop gates with wicket and iron work complete.
Do. do. for New Store.
5 New Ladders and sundry small articles for Workmen.
A large number of wood troughs for irrigation channel.
Doors windows roof &c. for new store.
Making several new Office tables with drawers &c.
Sundry other articles of furniture &c.
Pair of gates for Bath garden.
Do. do. for New Burial ground.
2 Large stone Rollers for roads.
Cleaning and refitting small portable Engine.
Cleaning and erecting the work-shop Engine.
Building in new Boiler and Chimney and 3 New brass furnaces.
Building new forges in Smiths Shop making iron Work for large crane for the Kistnah Bridge.
Making a large quantity of iron spikes boat nails reaper nails hinges &c. &c.

9. Although the foregoing statement exhibits the chief part of the work performed in the Bezoarah Workshop during the past 2 years yet it conveys but a very inadequate idea of the real value of the establishment under the head of repairs may be classed those of the Quarry cranes chains blocks jumpers Railway Waggons Boats and many others too various to enumerate these are constantly liable to derangement or injury and although many of the repairs are done

upon the spot by other Departments yet it is to the Workshop that the entire staff of the Kistnah Division has to look for the supply of every article of a more difficult or complex character and upon this establishment the Department must always depend for maintaining the efficiency of its working stock.

10. In addition to this the erection of the permanent premises has enabled us to adopt a far better system of supervision to prevent the assemblage of a promiscus body of village loiterers, to enable the Workmen to continue their labour protected equally from Sun and Rain to take better care of the materials and to facilitate the more speedy execution of complex operations these advantages are even at present but imperfectly attained but they are nevertheless carried out as far as the limited means at our command will allow and with more extended means and more enlarged powers might be attended with far more satisfactory results.

11. The Kistnah Bridge works were conducted entirely independent of the Workshop but even here the Workshop has frequently been applied to, to furnish from time to time such necessary articles as the latter establishment was deficient in.

12. During the past eighteen months the latter establishment has prepared the timber for nearly 90 bays of the Kistnah bridge 30 of which have been permanently erected and the Longitudinal timbers fixed on them upon the Annicut, the large travelling crane for lifting up the timbers of the bridge was also prepared here the new roof for Masulipatam Church and all the Carpenters and joiners work for my new house with several minor jobs of a less important character.

13. The number of Artificers employed in the workshop frequently amounted to nearly 100 persons and the amount of the monthly pay Abstracts was often Rupees 600, the number of workmen on the bridge was generally about 40 or 50 with the addition of a large number of coolies often 200 or more.

14. The writers establishment in each Department seldom exceeded 6 or 7 persons.

15. If to this be added the bricklayers plasters quarrymen and daily coolies we shall have a total of nearly 500 persons who during eighteen months have found constant employment on these two works.

16. Of this number there were but one European besides myself 2 East Indians and all the others natives, only about 6 or 7 of whom could speak and understand English.

17. Of this large number of Workmen it would be difficult to point out above 12 persons who were according to the usual acceptation of the term *good Mechanics*, in the Workshop we have about 3 very good Carpenters 2 good Blacksmiths 2 good filers and 1 Brass founder on the bridge establishment we had 2 very good Carpenters and one excellent native smith, if to these were added 2 or 3 tolerable Native Maistrys we should include the whole of those to whom any superior work could with safely be intrusted; several of the so called Carpenters were rather clever at making small Articles of furniture but entirely ignorant of any work of Magnitude, and none of them appeared to have a correct idea of any operations requiring combined exertion probably one of their largest previous works had been the construction of a Coupled Palmyra roof, of the Bricklayers most of them were little better than Coolies and numbers of the Carpenters knew little else but chopping wood with the small Native adze.

18. Many of these Workmen however possessed in a remarkable degree the talent of imitation, more especially in small and neat works but they were quite destitute of original ideas, they would imitate any given work with all its defects, they had no knowledge of drawing and very little of measurement and the men who could make a chair or table very neatly were quite unable to cut a tenon or mortice with sufficient accuracy to fit properly.

19. The whole of their tools were likewise of a most defective character, indeed it appears to an Englishman quite incredible how they could do any work at all with such miserable implements.

20. Many strangers upon visiting India have been so struck with the skill apparently manifested by the Natives with such imperfect appliances that they have become impressed with the idea that such persons must necessarily possess and extraordinary amount of Mechanical skill;

nothing is however more erroneous than such an assumption, the rudest savages will often carve with a piece of sharp flint their clubs and other weapons in the most complicated and even beautiful patterns the barbarous tribes of Africa and America often excel in bead embroidery, and our most uneducated Sailors will often carve with a rude clasp knife a model of a ship in the most masterly and correct manner, as well might we assert that these persons were good Mechanics as to suppose the Hindoo to be entitled to that designation because he is able to produce similar results, their success in these particulars depends almost entirely upon the fact that they sacrifice to their productions an almost incredible amount of time and patience and work quite regardless of the wastage of materials, when entrusted with works of a more original or complex character these disadvantages become strikingly apparent.

21. If we compare the wages of a Native of India with those of an English workmen we shall find that the former receives for his labour about $\frac{1}{8}$ of what the latter is usually paid, the wages of an Hindoo Carpenter or Smith being about Rupees 10 (£1) per month for first class workmen while the Englishman occupying a similar position would be quite satisfied with £2 per week and in many cases less, it must be remembered that if we take into account the relative difference in the value of the necessaries of life the one is nearly as well paid as the other money in India being to the Natives nearly 6 times the value of what it is in England.

22. But while the Hindoo is in the actual receipt of $\frac{1}{8}$ of the pay of an English workmen he very rarely does one *tenth part* of the work in the same time and very often much less this difference may at first appear exaggerated but the following facts will prove that it is nearly correct.

23. An English Carpenter will generally make a moderate sized door in one day a Hindoo never completes a similar work in less than 12 or 14 days.

24. My European Foreman completed a good teak wood Carpenters Bench in 3 days 2 Natives took 14 days to do a similar job.

25. An ordinary Navvies Wheelbarrow is generally made in about $1\frac{1}{2}$ days the time occupied by the Native Carpenter for the same work is 14 or 15 days.

26. I have seen a good Native Carpenter with the assistance of a boy take one or sometimes 2 days to hang 2 pairs of Butt hinges. I could without any assistance do the same work myself in two hours.

27. An English Bricklayer will lay from 1000 to 1500 bricks in a day the Native Bricklayers here seldom lay above 240 and the work is very badly executed.

28. When some of the Sapper Sepoys were engaged here in removing the earth in front of the lock they could but rarely excavate more than one cubic yard each per day under the most favorable circumstances, a good English Navvy would readily undertake to turn out 6 or 7 yards under similar circumstances.

29. In Iron work the difference was often greater, 2 of our best Native Smiths took 9 days each to forge a cranked axle for my saw Machine and I feel quite certain that one good English Smith would have completed the work in one day.

30. In the manufacture of nails they seldom made more than 70 or 80 per day and often not so many.

31. I might particularize numerous other instances of the same character but the foregoing may be deemed sufficient.

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31. I might particularize numerous other instances of the same character but the foregoing may be deemed sufficient.

32. But it is not merely the time employed in the work but the fact that when performed it is much worse done often it becomes a complete failure and in general there is an enormous waste of materials.

33. Many works will drop to pieces directly they are finished if they put in a screw or drive a nail the hole is made too large and not deep enough the consequence is from the superior hardness of the wood that the screw or the nail very seldom holds the parts securely together, the Natives seem aware of this and therefore frequently have recourse to dovetailing but this is often so badly done that they also drop to pieces unless secured by iron clamps.

34. One of our best smiths spoiled 12 successive forgings in fruitless attempts to make a small wrought iron ratchet wheel and the 13 attempt succeeded very well another failed 3 times in a very simple piece of iron work and the cranked shaft of my new Saw Mill before mentioned separated at the welding part very soon after it was completed and is now quite useless.

35. These are by no means uncommon occurrences I could multiply them by the dozen if necessary.

36. In casting brass they frequently employ 2 or 3 days in preparing the metal and they mould for a simple casting of 4 or 5 lbs weight and as frequently spoil it 2 or 3 times before it is properly done.

37. The wastage of material is likewise enormous the Carpenter ignorant of the use of a saw, employs his axe to chop the wood into the required form and thereby often spoils at least two thirds of the material and accumulates around him a mass of chips quite frightful to contemplate when it is known that teak wood sells for 1 or 1½ Rupees per foot the Smith generally spoils one third sometimes or half of the iron while at the same time he consumes an enormous quantity of Charcoal in burning the iron and rendering it brittle and worthless the iron for the Saw Mill shaft before alluded to weighed 20 lbs before forging and 60 lbs was lost in that operation, besides which it was so clumsily made that I spent 3 days in turning it in the lathe and turned off 26 lbs more in iron shavings and with all this labour and expense it turned out worthless as before stated.

38. In like manner the Sawyers seldom cut above 60 feet super of teak wood in a day, they require 5 men to each saw viz. 1 above and 4 below they often deviate nearly 1 inch from the line and the timber when cut requires an immense amount of labour to reduce it to a fair level surface.

39. I lately employed a Moochee to paint my Palanquin, he worked at it nearly 2 months and wasted above 5 Rupees worth of paint and in the end left it unfinished I could have done it myself in 3 or 4 days and an English painter would have completed it in 2 days and made a good job of it with about half the quantity of paint.

40. Almost every kind of work is done here in the same manner the time occupied is incredible, the wastage of materials enormous, and the success or failure of the work when finished quite a matter of speculation, a Native workmen thinks nothing of spoiling his work 2 or 3 times, to him it is a very ordinary occurrence.

41. The following is the total cost of various machines and other articles manufactured at Bezoarah including all labour and materials viz. 1 pair of double action Pumps 1′ 8″ diameter 7-6 long and 3 feet stroke to make 16 strokes per minute and dischrrge 600 gallons per minute lifted about 7 feet high, frame and troughs included.

Rupees 457.

1. Overshot Water Wheel 8 feet diameter and 9 feet Wide with wrought iron axle and cranks and frame trough &c., included to make 16 revolutions per minute.

Rupees 355.

1. Pair of small lock gates 6-6 high for an opening 10 feet Wide and finished with straps pintles, Balance beams &c., &c.,

Rupees 110.

1. Large travelling Crane 30 feet wide and 30 feet high capable of lifting 7 tons (exclusive of the iron wheels and axles.)

Rupees 1310-10-7.

(N. B The cost of the timber of this crane was Rupees 876 the whole of which will be available for the completion of the Bridge.)

1. Vertical Saw Machine capable of working.

6. Saws and cutting timber 30 feet long and 1-6 Square at the rate of 9 feet per hour.

Rupees 1270.

(N. B. This Machine has hitherto been very partially snccessful from the constant breakages of the cranked axle and the difficulty of procuring good European saws.

1. Fitt hammer 150 lbs weight with a vertical fall of 2′ 6″ to make 20 strokes per minute.

Rupees 234.

1. Bullock Bandy Painted complete.

Rupees 35.

1. Wheel barrow Rupees 5.

Large drawing spikes per ton.

Rupees 340.

Pair of large sized teak wood sash doors with frame complete but without glass.

Rupees 14.

Wrought iron forgings of various kinds.
from Rupees 500 } per ton.
to Rupees 560 }

Large timber Wrought and framed in Trussed Roofs &c. per foot cubic.

Rupees 2½.

42. If we compare these prices with similar works in England we shall probably find the difference but very small notwithstanding the low rate of wages at which the Workmen are paid and if we take into account the superiority of the Englishman's work and the superior economy of material and of time it will appear that the English workmen at 5½ per day is in reality cheaper than the Hindoo Mechanic at ⅛″ or $\frac{1}{10}$th that sum.

43. This deficiency on the part of the natives of India cannot be satisfactorily explained on the ground of mere physical inferiority, the Hindoo is often as tall, as mascular and as well formed for labour, as the European, in many cases his limbs are more delicately formed and his hands smaller but certainly the difference is not sufficient to account for the great descrepancy in his work, climate may probably have something to do with it but even in India the European is far superior in his work.

44. The main cause must be sought for in the extremely idle habits of the Natives in their unwillingness to adopt improvement however palpable, in the constant practice of sitting to every kind of work whereby it becomes almost impossible to exert the muscular system with advantage and in the miserable state of their working tools, the latter alone is sufficient to explain in a great measure the reason why they progress so slowly with their work their tools re-

semble childrens toys rather than workmens implements, and even with these weak and inefficient as they are the Hindoo Mechanic never dreams about exerting the smallest amount of strength.

45. And yet the native Carpenter from the fact that almost every kind of wood used in India is harder and heavier that those in common use in England or America, actually ought to be furnished with stronger and heavier tools than ours and to exert more strength in the use of them in order to produce the same result but with his ideas of labour this is out of the question.

46. It may perhaps be supposed that his pay is not sufficient and that an increase of wages would have the effect of stimulating him to increased exertion, experience however often proves that this has but very little effect and indeed it often acts in quite a contrary way by inducing more idleness and inattention and leaving him to suppose that he has secured the favour of his Employer and his therefore more at liberty to do as he pleases, he has no idea of the reward due to merit if he is paid but little it is always in his estimation his misfortune, if he is paid much it is good luck to imagine that his renumeration is regulated by his own idleness or industry is beyond his comprehension.

47. It is also much to be regretted that the native workman generally appears to feel so little interest in the work upon which he is employed success or failure are to him matters of little consequence, I believe in many cases the latter would be quite as agreeable to him as the former.

48. When I first commenced the works of the Kristnah bridge a general rise took place in the price of labour and compelled, of necessity a corresponding increase in the cost of many kinds of materials carpenters and Smiths who before worked for 7 or 8 Rupees per month could not be procured for less than 10 or 11 Sawyers who formerly received Rupees 1-12 per 100 feet super of teak wood and Rupees 2-4 for Yapee, now demanded Rupees 2-8 for the former and Rupees 3 for the latter, coolies even demanded 4-8 per month instead of Rupees 4 and bandy hire could hardly be obtained at any price we were thus compelled to increase the price of firewood from 8 to 12 annas per load chunam was nearly double and almost all the teak timber used in the construction of the bridge cost when landed Rupees 1-12 per foot cubic and even country timber although Stationary in price was vastly inferior in quality, palmyra vassums rose to 8 annas each and grass and jungle wood was scarcely to be procured at all, but all this appeared to have but little or no effect upon the workmen except that it rendered them more independant and more ready to take holidays, the sawyers very properly remarked that as they earned more money they could afford to be occasionally idle and all the workmen finding that there was plenty to do were more indifferent about pleasing us, rightly judging that if they left we could not easily supply their places with others ; in the workshop this became occasionally so annoying that I was obliged on two or three occasions to dismiss workmen whose services I really required in order to prove to them that we could do without them and thereby keep the rest in order.

49. The fondness of the natives for assistants is also another great drawback to their usefulness, a blacksmith must have his own bellows boy and hammer man or else he must be idle, a carpenter must be attended by a boy or cooly or a borer, and sometimes he wants all three, and if one member of a set of five sawyers is sick or absent the rest prefer being idle to seeking another to supply his place.

50. These facts will prove at once the great importance of establishing workshops at suitable places where the workmen may be better instructed and acquire by degrees more correct ideas of the value of time and the importance of adopting better methods of executing their work. But such establishments will be of but little real benefit unless they are formed upon some fixed principle well provided with suitable Machinery and tools and placed under the direction of suitable Officers well acquainted with practical business and not *above* giving *their personal attention* to the work.

51. The native youths appear to me to be remarkably impressable and intelligent but let them once arrive at 18 or 20 years of age and all their intelligence vanishes, they have by that time learned all that they wish to know and they consequently become bigotted conceited and obstinately opposed to any further improvement, show them how much superior an European workmen is and they at once refer to the superiority of his tools, give them our tools and they either destroy or at least damage them so much that they soon become useless show them how to use them with the best effect and they at once reply that they have been accustomed to such a mode of working and cannot adopt it now endeavour to introduce improvements and they reply that their caste forbids them from following your instructions, the Native Maistrys all come forward to vindicate their men and confirm them in their prejudices and indeed it is with the greatest difficulty that you can compel the introduction of even the simplest and most obvious improvement.

52. The difficuties I have met with on this head are beyond all description when working the saw mill and the till hammer or erecting the Engine and boiler I have often been compelled to work with my own hands as a Carpenter, Smith, Filer, Bricklayer &c., to show them even the advantage of the slightest improvement but let me be absent for only a few Minutes and they all return to their old ways and often thereby spoil their work and render all my labour fruitless.

53. Another great drawback is the difficulty of obtaining suitable foremen or Superintendants, as well might we look for efficiency in a Native army without European Officers as expect Native Mechanics to improve under their own Maistries they require good European superintendants, and they require a much larger number of them than do the English workmen, but unfortunately our present arrangements do not supply this want most, if not all the Overseers are Soldiers who possess but a very limited amount of Mechanical knowledge, as few good Mechanics if sober and steady men, even enter the Army or two or 3 cases I have been fortunate but in the majority of instances our Overseers however willing are but very imperfectly acquainted with the business of the Workshop and indeed most useful men possess merely a Superficial general knowledge instead of real practical skill in some one branch, they have a smattering of Carpentry, of Smithery Masonry &c., but a perfect and accurate knowledge of none of these operations under these circumstances it can hardly be expected that such persons are at all qualified to instruct a class of men who are notorious for obstinacy stupidity and unwillingness to learn even under the very best instructions.

54. And yet the vast importance of a good body of efficient Mechanics can hardly even be over rated, without these the Engineer, the Architect, the buildier and the Mechanic, finds himself almost powerless to execute his work, all his Scientific abilities are mere empty shadows unless he can meet with men qualified to carry out his ideas, in England this want would soon be supplied by private enterprise but in India it must be done by the Government or else it will not be done at all, and if left to the mercy of the present race of workmen at least as far as I have seen our works will not only be found immensely expensive but inferior both in efficiency and durability.

55. To improve the efficiency and to elevate the character of the Indian mechanic is then a work of the greatest importance not only to the people but also to the Government, by its means we shall be enabled to mitigate the evils of the climate, to carry out national improvement in such a manner as to render them valuable to the people and profitable to the Government, to avail ourselves of the hitherto unknown resources of the country, to reduce expenses shorten the fatigue of travelling and guard against contingencies that are constantly arising in every country and more especially in India, we shall enrich ourselves while we equally enrich them and render our hold upon the vast community over which we preside less liable to interruption or disturbance.

56. In order properly to accomplish these ends we must, if we hope for the least chance of success begin with the youth of the country disregarding all the absurd nonsense of cash we must seek among pariahs and half castes for pupils who must be legally bound to serve us for a term of years upon the receipt of a small allowance just enough to enable them to subsist, their labours must be carried on in a building erected and fitted up more in the European style and

secured from promiscuous intrusion, they must be placed under proper European Foremen instructed in some definite branch of business provided with European tools and compelled to work regular hours and according to the instructions given, I would not object to the admission of Native workmen of more advanced years but it should be distinctly understood that if admitted they should conform in every respect to the rules of the establishment, and any objection thereto should subject them to immediate dismissal without the chance of re-admission the establishment should be well provided with good working Foremen in each distinct branch permanently enlarged by the Government men of good character and practical ability (and such are readily to be found in great Britain) and they should be Superintended by an Officer of experience who should devote his whole time to his duties there and be responsible to no one but the Government.

57. This person should be provided with at the least one good European draftsman one European Accountant, a Foremen of Carpenters, one of pattern Makers, one of Smiths, one of founders one of Fitters, and one of Copper Smiths tinmen and Braziers, making a total of eight persons besides the Principal, all of whom are indispensable each of these should be provided with a native writer well conversant with English who should act as his interpreter, keep his separate accounts, and at leisure hours give him instructions in the native tongue.

58. The Building should be situated at some central spot having if possible the advantage of water carriage, it should be furnished with Machinery from England worked by Steam Power and contain apparatus for planning boring drilling, turning, Casting, Forging, Sawing, &c. &c., and Machinery for lifting heavy weights and moving large bodies from place to place, a model room should be attached and a small department for the construction and repair of Mathematical and Philosphical instruments.

59. It should be governed by bye laws drawn up by the Superintendant and submitted for the approval of the Government and should be permanently maintained for at least several years to come.

60. Such an Establishment would in a short time be able to supply uumerous articles which we are at the present time either compelled to procure from Europe with great expense of both time and money or else to manufacture so imperfectly upon the spot, the military as well as the Civil and naval branches of the Empire would speedily feel the advantages of its operations and in a few years it would be capable of supplying the entire Public Works Department with native Foremen well skilled in the useful arts and competent to undertake the direction of the more difficult portions of most important works.

61. I am well aware that it may be alleged that Workshop already in existence at Bezoarah at Dowlaiswaram and other places are intended to supply the wants of the community, but notwithstanding the advantages that have already accrued from these Establishment, their progress as far as I have been able to ascertain is far from being satisfactory, they are formed upon no acknowledged principle entirely dependant upon the district Officers and far too limited in their operations, at Bezoarah without funds, without authority, or Government Sanction my career has been a constant succession of struggles with difficulties which I had no means overcoming, and failures of a most disheartening character, as far as we have been able to go our progress is perhaps as great as might reasonably be expected, but although we have been able to do much for the district we are powerless to benefit the Presidency at large our works although some what improved are to me sadly defective and unsatisfactory.

62. Of the Dowlaiswarum works I know but little, having never been able to visit them but when I have upon a few occasions sent them for such things as we have ourselves been unable to supply an immense time is taken to fulfil the most simple order the work when performed is costly and often sadly defective, I once ordered a crab for the Kistnah bridge it took above 6 months to make and when it reached me it broke upon the very attempt to raise a moderate wright and has ever since been quite useless I took off the small trainway wheels and rigged out a Crab from one of the Quarry Cranes which we have used ever since.

63. As I have heard a very high character of the gentlemen in charge of that establishment I cannot but think that they must have had to content with difficulties similar to my own and that the want of systematic and efficient training in the first instance has never been properly made good, and indeed without this success is never to be hoped for.

64. In conclusion I may be permitted to advert to another subject intimately connected with the foregoing namely, the supply of Ironmongery for ordinary building purposes in this part of the country we generally manufacture these things overselves and tlthough they are much better done than might be expected from our inefficient means yet they are vastly inferior to those that are in common use in England and much more expensive and many highly useful articles of common use appear to be quite unknown, if we order these articles from the European Merchant at Madras we hardly even get what we want and consequently many of the articles are useless.

65. The following is a list of the articles of this description which would be found most useful in this Country and which can be supplied from England for a much less sum than they can be made here and of far superior quality.

66. Articles of Ironmongery &c, most serviciable in India that can be supplied from great Britain.

Hinges. Cast and Wrought Iron Projecting Butts.
Wrought iron cross garnets.
Do. Parliament hinges.
Do. Bent Box hinges (stout and thin.)
Locks. Wrought iron dead locks (double keys.)
Do. Good Padlocks (Do.)
Brass Mortice locks for doors.
Brass and Iron Cupboard locks.
Do. Good Box locks.
Brass draw locks (large and small.)
Latches. Brass Pulpit latches Crank handles.
Wrought Iron Norfolk latches (japanned.)
Bolts. Brass flush bolts from 6″ to 2 feet long.
Wrought iron bright and rough bolts.
Nails. All kinds of Patent cut nails large and small.
Clout nails and Tacks.
Cast lath nails (long for reapers.)
Brass headed Nails.
Screws. All kinds of Wood screws.
Miscellaneous. Wrought iron Box handles large and small (japanned.)
Brass Do. Brass flush Do. Iron and Brass buttons for Cupboard doors.
Cold drawn Iron, Brass, and Copper Wire.

67. Many of these articles are greatly needed by the Natives as well as by the Europeans, and if introduced would speedily find an immense consumption they are mostly very cheap in England and easily Packed and far superior in finish to the articles made here.

No. 117. ORDER THEREON, No. 727 ; dated 19th April 1858.

Para. 1. With this letter, the Chief Engineer submits copies of one from the Acting District Engineer of the Kistnah Division, and of a communication from Mr. E. E. Merrall, Covenanted Civil Engineer, together with a copy of a separate letter addressed by the latter Officer to the Head of the Department, dated 26th August 1857, all bearing on the subject of improving the efficiency of the Bezoarah Workshop.

2. This subject was brought under the consideration of Government at a former period,

E. M. Cons. 13th Feby. 1857, No. 305

but the Governor in Council declined at the time to give his assent to the plans then proposed, on the ground that the Government had agreed to a separate proposal for greatly enlarging the Dowlaishweram Workshop, in order that it might be made thoroughly efficient, and capable of supplying the works of all parts of the Presidency as far as distance might permit. The Government did not consider it advisable to incur expense in creating large Workshops at Bezoarah also, and preferred making the establishment at Dowlaishweram thoroughly efficient to having two of an inferior character.

3. In the paper now before Government, the Chief Engineer observes that this decision was given "under a misapprehension of the extent and character of the proposed improvements at Bezoarah, and of the facilities that the Workshops at Dowlaishweram afford." He says that on whatever footing the last mentioned establishment may be placed, it is highly necessary, if not indispensable, that the small one at Bezoarah should be put on such a footing of efficiency as to enable it to undertake the repair of all the tools, machinery, and apparatus employed in the Division, of which it is the Head Quarters. He shews the stock of tools, machinery and steam Engines already in use; he adverts to the addition which will soon be made to this supply in steam Dredges and Tugs; and to the probability of the establishment being called upon, at no distant time, to undertake work of a character that will need the use of more mechanical appliances than are now available; and he therefore strongly supports the application of the local Officers for additional apparatus.

4. Colonel Faber recommends 1st, the grant of a sum of Rupees 2,000 for the immediate erection of a Cupola, and 2ndly, that he may be permitted to submit a special Indent on the Honorable Court for the tools and machinery specified, which it is assumed will not exceed in cost 10,000 Rupees or 1,000 £ Sterling.

5. The valuable communication addressed by Mr. Merrall to the Chief Engineer under date the 26th August 1857, has afforded the Government a more clear insight into the precise position, circumstances, and requirements of the Bezoarah Workshop than they heretofore possessed, and this paper and the explanation afforded by Colonel Faber, of which a brief notice has been given above, have induced them to modify their former views. It is not intended that the Bezoarah Workshop shall be on the footing of that contemplated for Dowlaishweram, which it was proposed should supply all parts of the Presidency; it is shewn that the resort heretofore to the Dowlaishweram Foundry for help in cases of emergency that have arisen at Bezoarah has been unsatisfactory, and has been attended with considerable delay and inconvenience; and it is shewn, that, irrespective of other considerations, the Bezoarah Workshop, if only required to fulfil its ordinary duties, must be put on a more efficient footing, and the Government think with the Chief Engineer that the expenditure proposed on this account is insignificant in comparison with the advantages to be gained by the outlay.

6. The Governor in Council resolves therefore to sanction from the one lac fund of the ensuing year, a sum of Rupees 2,000 for the erection of a Cupola.

7. As regards the second proposition, the Chief Engineer will submit a special Indent for the tools and machinery required for the Bezoarah Workshop, and the Governor in Council will forward it to the Honorable Court accompanied by Mr. Merrall's report.

8. The Government cannot but complain of the careless manner in which Mr. Merrall's letter has been transcribed in the Central Office; although initialled as having been examined, it abounds in errors of every description, which make the reading of the paper difficult; and the Government consider its very numerous inaccuracies discreditable to the Central Office. Mr. Merrall's letter will now be returned to the Chief Engineer with a request that he will submit a correct copy when forwarding his Indent for tools.

(Signed) H. FORBES,

Acting Secretary to Government.

Public Works 1858 Dep.tt
Pro. of Govt. for April
No. 727.

Pro: of the Madras Govt.
Dated 19th April 1858

From the Committee for devising a
Scheme of Accounts for the
Workshops at Vaniambaddy
Dep.t 8th March 1858 &
in Pro.

Sanctioning from the one
Lac Fund of the ensuing year, a sum of
Rs. 2000, for the creation of a Cupola
in the Rajahmundry Workshop; & directing
the Chief Engr. to submit a special
Indent for the Tools and Machinery
required for the above Workshop
which the Govt. will forward
to the Hon.ble Court accom.d
by all the Memorialists Report.

No. 116 & 117

17

To
The Chief Engineer in the Department
Public Works. Madras

Bezoorah
Kistnah Division
August 26. 1857.

Sir

Having for the last eighteen Months been connected with the Workshop Establishment at this place I thought it might not be deemed uninteresting to commit to writing a few observations upon the present state of the Mechanical Arts in this district more especially with reference to those branches which are most intimately connected with Engineering and Building operations.

2 For several years past I have been accustomed to the Superintendance of large bodies of workmen in great Britain and Ireland, and I have been thereby enabled to form a tolerable correct estimate of the relative efficiency of the working Departments of these two Countries, and to enquire how near the Mechanical Arts of European India approach to this standard will

be

be the principal object of the present Paper. Before however I proceed further a short description of the Workshops may not be deemed unsuitable. When I first arrived at Bezoorah in April 1855 the Workshops here consisted of merely two tolerable sized sheds situated in an open space of ground of about one acre in extent on the north side of the Bezoorah Lock at the head of the Kistnah Channels. This plat of ground was but partially closed in and a small Office at its western extremity for the Chief Engineers Establishment and the two sheds beforementioned formed the whole of the Buildings, in one of these sheds the operations of forging Brass foundring, and filing were carried on, and in the other Shed, which was of somewhat better Character all the Carpentry and joinery works were executed all the Machinery consisted of only one excellent Lathe purchased (I believe) from Forester of Liverpool, together with a good stock of tools for iron turning a few Vices and European forge Bellows and Anvils and a small stock of Carpenters tools completed the catalogue of useful implements, and the stores of various kinds required for the different works were deposited in a Building at a somewhat inconvenient distance in the stone Quarries; towards the close of the year

year 1855 the District Engineer commenced the erection of the present Workshops which were originally laid out and partly constructed under the Superintendence of Lieutenant Farewell 1st Assistant Civil Engineer, in January 1856. upon the latter Gentlemen proceeding into the district I was appointed by the District Engineer to the charge of the Workshop Establishment in addition to my other position as Engineer to the Kistna Bridge, and in this Capacity I contemplated the unfinished Workshops and under the suggestions offered from time to time by Captain Orr made several additions until the entire mass of Buildings reached its present state.

3 These Buildings now consist of the following, Viz.t on the North side of the plot of ground before mentioned a small Store for Tools &c.a a filers shed intended ultimately for an iron foundry a small Brass foundry with 3 furnaces, a Boiler house with high Pressure circular flue Boiler and Chimney about 45 feet high, a large Machine shop with 6 H. P. High Pressure horizontal Steam Engine by Rennies with fly wheel Water tank &c.a gateway entrance Carpenters shop with 5 double Benches, Smiths

shop

shop with 6 European forges, at the eastern extremity is a continuation of the smiths shop running at right angles to the preceeding until it reaches the back wall and sufficiently capacious to contain 10 or 12 Native forges; the south side is bounded by the back wall near the middle of which is a large traversing Crane capable of lifting several tons and reaching over to the Middle of the back, at the western end of the enclosure is a new Office divided into two unequal parts the larger of which is appropriated to the staff of the District Engineer and consists of one very large Room for writers and Draughtsmen and a smaller room behind for Printing and Lithographic operations, the smaller portion of this Building is occupied as an Office and Bath Room for the Engineer Superintending the Workshops near the centre of the enclosed area is a large shed under which is the Vertical and Circular Saw mills with Longs portable 3 horse steam Engine, a grindstone and double screw jack for tapping bolts &c. at the rear of the Offices before mentioned is situated the former Office which is now principally used as a depository for Records &c. around and behind this

this is a large triangular Space of ground chiefly occupied as a Timber yard and Charcoal store and at the Extremity of this are two large Lime Kilns..

Returning to the gateway entrance on the North side is the Road from Bezoorah to Condapilly and Hyderabad on the opposite side of this Road a new Store has been erected consisting of a large Rectangular Building having an entrance gateway and doors corresponding with the Workshop entrance interiorly it consists on the right of the entrance of a Treasury and guard Room on the left a storekeepers Office behind which is an open shed in the middle a narrow open court and at the back one large central Room for the deposit of stores of various kinds among which is a tar tank with upwards of 20 Barrels of tar on each side is a smaller store for large tools iron work &c. &c. and directly behind this is a small cookhouse for the sepoy guard to prepare their food this last is not however yet finished..

5 From this brief description it will be seen that the entire workshop is enclosed in and protected from promiscuous intrusion and that the stores are close at hand instead of being

being as heretofore at a considerable distance.

6 The whole of the Buildings here enumerated are durably constructed of Brick and Stone in Chunam the Roofs of Palmyra wood covered with tiles, all parts of the structure are uniform with Verandahs supported upon Square brick piers running all along the interior and all the walls are plastered with Chunam and whitewashed; the Machine shop Offices and Store have doors and Windows of teak wood glazed, and the whole presents a neat and by no means unpleasing appearance. drains have also been laid down at suitable points for carrying off the water and Ventilators in the Roof for the escape of the smoke from the forges &c...

7 Previous to the erection of the new Buildings the only Machine on the Premises was the large lathe before mentioned. since then we have received from the Government / Small portable 3 Horse Steam Engine / Longs Patent / with double pump attached; / Small circular Saw Table and 2 double action Hand Pumps / Nasmyths / / Drilling Machine / Whitworths / and 1-6 Horse Power stationary Engine / Rennies / with Boiler and fly wheel complete. 6 large 36 inches circular saws

/ Turtons /

/ Turtons / and a stock of Carpenters Smiths and other tools from Fenns. we have constructed on the premises / foot-lathe for turning wood, / Tilt-Hammer, / Large crane, / Vertical Saw Mill together with several pumps. Benches trucks Ladders Wheelbarrows and numerous other minor articles we have obtained from Dowlaswaram. 8 Cast iron Europe Forge Cranks and several Riggers for Shafting. an American weighing Machine and various articles of ironmongery from England; notwithstanding these additions to our stock the Establishment is nevertheless still very incomplete and indeed until we obtain a further supply of Machinery it will be quite impossible to avail ourselves of the steam power at present at our command or to complete the efficiency of the concern..

8 In order however that some idea may be formed of the value of the Workshops in connection with the Public Works department the following is a list of some of the principal articles constructed therein since my arrival at Bezoorah..

/ Pair of double action Pumps. 10" diameter. 3 feet stroke.

Pair

1 Pair of double acting Pumps 1-6 diameter. 3 feet stroke.

1 Pair of — Do: — Do: — 1-8" diameter 3 feet stroke.

4 Water Wheels and framers diameter from 9 to 16 feet.

1 Vertical saw Machine capable of holding —

6 Saws and cutting Timber 30 feet long and 1-6 Square

1 Tilt Hammer 150 lbs weight to make 20 strokes per minute..

1 Wood turning Lathe ——— 2 Tool Boxes

6 Carpenters Benches ——— 3 Vice Benches

2 Pairs of Lock gates for Doogeralla with iron work complete.

2 Pairs of Do: for Kuntakpand with iron work complete.

1 Small pair of Do: for small Channel at Peddaravoor

24 Platform Bullock Carts. 5 Wheel barrows.

1 Low truck. 1 Sampsons Post:

Doors. Windows. Roof and sundry fittings for the New Workshops. and shed.

Doors. Windows Roof and sundry fittings for the New Office.

Doors. Windows Roof and 6 Almiras for the New Library.

Ornamental wood fence in front of Do: with gates; Doors. and windows for Captain Gré new Room.

Ornamental

Ornamental Wood for 1 Channel Bungalow at Peddaravoor.

Do: Do: for the Collectors new Cutcherry.

New Roof for Cazza Court house.

a large number of Sluice Shutters and hand shutters for various places.

Large new Crane in Workshop yard.

Large Pair of Workshop gates with wicket and iron work complete..

Do: Do: for New Store.

5 New Ladders and sundry small Articles for Workmen.

A large number of wood troughs for irrigation Channel.

Doors. Windows Roof &c: for new Store,

Making several new Office tables with drawers &c:

Sundry other articles of furniture &c:

Pair of gates for Bath garden

Do: Do: for New Burial Ground

2 Large Stone Rollers for Roads.

Cleaning and refitting Small portable Engine

Cleaning and erecting the Workshop Engine.

Building in new Boiler and Chimney and 3 new Brass furnaces.

Building new forges in Smiths Shop

Making

Making iron Work for large crane for the Kistnah Bridge..

Making a large quantity of iron spikes Boat nails. pea per nails. Pinges &c. &c.

9 Although the foregoing Statement exhibits the Chief part of the work performed in the Bezwarah Workshop during the past 2 years yet it conveys but a very inadequate idea of the real value of the Establishment under the Head of repairs may be elapsed those of the Quarry Crane Chains Blocks jumpers Railway Waggons Boats and many others too various to enumerate these are constantly liable to derangement or injury and although many of the repairs are done upon the spot by other departments to get it is to the Workshop that the entire staff of the Kistnah Division has to look for the supply of every Article of a more difficult or complex character and upon this establishment the Department must always depend for maintaining the efficiency of its working stock..

10 In addition to this the erection of the permanent premises has enabled us to adopt a far better system of supervision to prevent the assemblage of a promiscuous body of

of village loiterers. to enable the Workmen to continue their labour protected equally from Sun and Rain to take better care of the materials and to facilitate the more speedy execution of complex operations. these advantages are even at present but imperfectly attained but they are nevertheless carried out as far as the limited means at our command will allow and with more extended means and more enlarged powers might be attended with far more satisfactory results.

11 The Kistnah Bridge works were conducted entirely independent of the Workshop but even here the Workshop has frequently been applied to, to furnish from time to time such necessary articles as the latter establishment was deficient in..

12 During the past eighteen Months the latter establishment has prepared the timber for nearly 90 Bays of the Kistnah Bridge 30 of which have been permanently erected and the Longitudinal timbers fixed on them upon the Anicut; the large travelling crane for lifting up the timbers of the Bridge was also prepared here the new Roof for Masulipatam Church and all the Carpenters and joiners work for my.

ing new House with several minor jobs of a less important character.

13 The number of Artificers employed in the Workshop frequently amounted to nearly 100 persons and the amount of the Monthly pay Abstracts was often Rupees 600. the Number of workmen on the Bridge was generally about 40 or 50 with the addition of a large Number of Coolies often 200 or more.

14 The Writers Establishment in each department seldom exceeded 6 or 7 persons.

15 If to this be added the Bricklayers Blasters Quarrymen and daily Coolies we shall have a total of nearly 500 persons who during eighteen Months have found constant employment on these two works.

16. Of this number there were but one European besides myself. 2 East Indians and all the others natives, only about 6 or 7 of whom could speak and understand English.

17 Of this large number of Workmen it would be difficult to point out above 12 persons who were according to the usual acceptation of the term good Mechanics, in the Workshop we have about 3 very good Carpenters 2 good Blacksmiths.

Blacksmiths 2 good filers and 1 Brass founder on the Bridge Establishment we had 2 very good Carpenters and one excellent native smith, if to these were added 2 or 3 tolerable Natives Mistrys we should include the whole of those to whom any superior work could with safety be entrusted; several of the so called Carpenters were rather clever at making small articles of furniture but entirely ignorant of any work of magnitude, and none of them appeared to have a correct idea of any operations requiring combined exertion probably one of their largest previous works had been the construction of a Coupled Palmyra Roof, of the Bricklayers most of them were little better than Coolies and numbers of the Carpenters knew little else but chopping wood with the small native Adze.

18 Many of these Workmen however possessed in a remarkable degree the talent of imitation. more especially in small and neat works but they were quite destitute of original ideas, they would imitate any given work with all its defects, they had no knowledge of drawing and very little of measurement and the men who could make a chair or table very

very neatly, were quite unable to cut a tenon or mortice with sufficient accuracy to fit properly.

19 The whole of their tools were likewise of a most defective character. indeed it appears to an Englishman quite incredible how they could do any work at all with such miserable implements..

20 Many strangers upon visiting India have been so struck with the skill apparently manifested by the natives with such imperfect appliances that they have become impressed with the idea that such persons must necessarily possess an extraordinary amount of Mechanical skill; nothing is however more erroneous than such an assumption, the rudest savages will often carve with a piece of sharp flint their clubs and other weapons in the most complicated and even beautiful patterns the barbarous tribes of Africa and America often excel in bead embroidery, and our most uneducated Sailors will often carve with a rude clasp knife a model of a ship in the most masterly and correct manner, as well might we assert that these persons were good mechanics as to suppose the Hindoo to be entitled to

to that designation because he is able to produce similar results; their success in these particulars depends almost entirely upon the fact that they sacrifice to their productions an almost incredible amount of time and patience and work quite regardless of the wastage of Materials, when entrusted with works of a more original or complex character these disadvantages become strikingly apparent..

21 If we compare the wages of a native of India with those of an English workmen we shall find that the former receives for his labour about 1/8 of what the latter is usually paid, the wages of an Hindoo Carpenter or Smith being about Rupees 10 [£1] per Month for a first class workmen while the Englishman occupying a similar position would be quite satisfied with £2 per week and in many cases less, it must be remembered that if we take into account the relative difference in the value of the necessaries of life the one is nearly as well paid as the other money in India being to the natives nearly 6 times the value of what it is in England..

22 But while the Hindoo is in the actual

actual receipt of 1/8 of the pay of an English workmen he very rarely does one tenth part of the work in the same time and very often much less this difference may at first appear exaggerated but the following facts will prove that it is nearly correct..

23 An English carpenter will generally make a moderate sized door in one day. a Hindoo never completes a similar work in less than 12 or 14 days..

24 My European Foreman completed a good teak wood Carpenters Bench in 3 days, 2 Natives took 14 days to do a similar job..

25 An ordinary Navvies Wheelbarrow is generally made in about 1½ days the time occupied by the Native Carpenter for the same work is 14 or 15 days..

26 I have seen a good Native Carpenter with the assistance of a Boy take one or sometimes 2 days to hang 2 Pairs of Butt hinges. I could without any assistance do the same work myself in two hours..

27 An English Bricklayer will lay from 1000 to 1500 Bricks in a day the Native Bricklayers here seldom lay above 240 and the work

work is very badly executed..

28 When some of the Sapper Sections were engaged here in removing the earth in front of the Lock they could but rarely excavate more than one cubic yard each per day under the most favorable circumstances, a good English Navvy would readily undertake to turn out 6 or 7 yards under similar circumstances..

29 In iron work the difference was often greater. 2 of our best Native Smiths took 9 days each to forge a cranked axle for my saw Machine and I feel quite certain that one good English Smith would have completed the work in one day..

30 In the manufacture of nails they seldom made more than 70 or 80 per day and often not so many..

31 I might particularize numerous other instances of the same character but the foregoing may be deemed sufficient..

32 But it is not merely the time employed in the work but the fact that when performed it is much worse done often it becomes a complete failure and in general there is an enormous waste of Materials..

Mauy.

Many works will drop to pieces directly they are finished if they just in a screw or drive a nail the hole is made too large and not deep enough the consequence is from the superior hardness of the wood that the screw or the nail very seldom holds the parts so securely together. the natives seem aware of this and therefore frequently have recourse to dovetailing but this is often so badly done that they also drop to pieces unless secured by iron clamps..

34 One of our best smiths spoiled 12 successive forgings in fruitless attempts to make a small wrought iron ratchet wheel and the 13th attempt succeeded very well another failed 3 times in a very simple piece of iron work and the cranked shaft of my new Saw Mill before mentioned separated at the welding part very soon after it was completed and is now quite useless.- X

35 These are by no means uncommon occurrences I could multiply them by the dozen if necessary..

36 In casting brass they frequently employ 2 or 3 days in preparing the metal and the mould for a simple casting of 4 or 5 lbs weight

weight and as frequently spoil it 2 or 3 times before it is properly done..

37 The wastage of material is likewise enormous the Carpenter ignorant of the use of a saw, employs his axe to chop the wood into the required form. and thereby often spoils at least two thirds of the material and accumulates around him a mass of chips quite frightful to contemplate when it is known that teak wood sells for 1 or 1½ Rupees per foot. the smith generally spoils one third some times or half of the iron while at the same time he consumes an enormous quantity of Charcoal in burning the iron and rendering it brittle and worthless the iron for the Saw Mill shaft before alluded to weighed 300 lbs before forging and 60 lbs was lost in that operation, besides which it was so clumsily made that I spent 3 days in turning it in the lathe and turned off 36 lbs more in iron shavings and with all the labour and expense it turned out worthless as before stated..

38 In like manner the sawyers seldom cut above 60 feet super of teak wood in a day. they require 5 men to each Saw

vide p 6

viz. 1 above and 2 below they often deviate nearly 1 inch from the line and the timber when cut requires an immense amount of labour to reduce it to a fair level surface..

39 Flatery employed a Moochee to paint my Palaquin, he worked at it merely 2 Months and wasted above 5 Rupees worth of paint and in the end left it unfinished I could have done it myself in 3 or 4 days and an English painter would have completed it in 2 days and made a good job of it with about half the quantity of paint..

40 Almost every kind of work is done here in the same manner the time occupied is incredible, the wastage of materials enormous, and the success or failure of the work when finished quite a matter of speculation, a native workmen thinks nothing of spoiling his work 2 or 3 times, to him it is a very ordinary occurrence..

41 The following is the total cost of various Machines and other articles manufactured at Bezoara including all labour and Materials viz. 1 Pair of double action Pumps 1-8 diameter 7-6 long and 3 feet stroke to make 16 Strokes per minute and discharge 600 gallons per minute lifted about 7 feet high, frame and troughs included..

Rupees 457

1 Overshot Water Wheel 8 feet diameter and 9 feet Wide with wrought iron axle and cranks and framed trough &c. included to make 16 revolutions per minute..

Rupees 355.

1 Pair of small lock gates 6-6 high for an opening 10 feet Wide and finished with Straps, pintles, Balance beams &c. &c..

Rupees 110-

1 Large travelling Crane 30 feet wide and 30 feet high capable of lifting 7 tons exclusive of the iron wheels and axles.

Rupees 1310-10-7

N.B. The cost of the timber of this crane was Rupees 876 the whole of which will be available for the completion of the Bridge.

1 Vertical Saw Machine capable of working 6 Saws and cutting timber 30 feet long and 1-6 Square at the rate of 9 feet per hour.

Rupees 1270.

N.B. This Machine has hitherto been very partially

partially successful from the constant breakages of the cranked axle and the difficulty of procuring good European Saws.

1 Tilt hammer 150 lbs weight with a vertical fall of 2'. 6". 6 make 20 strokes per minute.

Rupees 234.

1 Bullocks Bandy Painted complete.

Rupees 35.

1 Wheelbarrow Rupees 5

Large drawing spikes per ton.

Rupees 340

Pair of Large sized teak wood sash doors with frames complete but without glass.

Rupees 14:

Wrought iron forgings of various kinds.

From Rupees 500
to Rupees 600 } per ton

Large timber Wrought and framed in Trussed Roofs &c. per foot cubic.

Rupees 2½.

42 If we compare these prices with similar works in England we shall probably find the difference but very small notwithstanding the low rate of wages at which the Workmen are

are paid. and if we take into account the superiority of the Englishmans work and the superior economy of material and of time it will appear that the English workmen at 5/3 per day is in reality cheaper than the Hindoo Mechanic at 1/8. or 1/10. that sum.

43 This deficiency on the part of the natives of India cannot be satisfactorily explained on the ground of mere physical inferiority, the Hindoo is often as tall, as muscular and as well formed for labour, as the European, in many cases his limbs are more delicately formed and his hands smaller but certainly the difference is not sufficient to account for the great descrepancy in his work, climate may probably have something to do with it but even in India the European is far superior in his work.

44. The main cause must be sought for in the extremely idle habits of the Natives in their unwillingness to adopt improvement however palpable, in the constant practice of sitting to every kind of work whereby it becomes almost impossible to exert the muscular system with advantage and in the miserable state of their working tools

tools, the latter alone is sufficient to explain in a great measure the reason why they progress so slowly with their work their tools resemble children toys rather than workmens implements, and even with these weak and inefficient as they are the Hindoo Mechanic never dreams about exerting the smallest amount of strength.

45 And yet the native Carpenter, from the fact that almost every kind of wood used in India is harder and heavier that those in common use in England or America, actually ought to be furnished with stronger and heavier tools than ours and to exert more strength in the use of them in order to produce the same result but with his idea of labour this is out of the question.

46 It may perhaps be supposed that his pay is not sufficient and that an increase of wages would have the effect of stimulating him to increased exertion, experience however often proves that this has but very little effect and indeed it often acts in quite a contrary way by inducing more idleness and inattention and leading him to suppose that he has secured the favour of his Employer and is therefore more at liberty to do as he pleases. he has no idea of the reward due to

merit.

merit if he is paid but little it is always in his estimation his misfortune, if he is paid much it is good luck, to imagine that his remuneration is regulated by his own idleness or industry is beyond his comprehension.

47 It is also much to be regretted that the native workman generally appears to feel so little interest in the work upon which he is employed success or failure are to him matters of little consequence, I believe in many cases the latter would be quite as agreeable to him as the former.

48 When I first commenced the works of the Kistnah Bridge a general rise took place in the price of labour and compelled, of necessity a corresponding increase in the cost of many kinds of Materials Carpenters and Smiths who before worked for 7 or 8 Rupees per Month could not be procured for less than 10 or 11 Sawyers who formerly received Rupees 1-12 per 100 feet superficial of teak wood and Rupees 2-4 for Gajree, now demanded Rupees 2-8 for the former and Rupees 3 for the latter, Coolies even demanded 4-8 per Month instead of Rupees 4 and Bandy Iron could hardly be obtained at any price we were thus compelled to increase the price of

Sirewood

firewood from 8 & 12 Annas per load Cannanore was nearly double and almost all the teak timber used in the construction of the Bridge cost when landed Rupees 1-12 per foot cubic and even country timber although Stationary in price was vastly inferior in quality. Palmyra Tapsums rose to 8 Annas each and grass and jungle wood was scarcely to be procured at all, but all this appeared to have but little or no effect upon the workmen except that it rendered them more independant and more ready to take holidays. The Sawyers very properly remarked that as they earned more Money than they could afford to be occasionally idle and all the workmen finding that there was plenty to do were more indifferent about pleasing us, rightly judging that if they left we could not easily supply their places with others; in the Workshops this became occasionally so annoying that I was obliged on two or three occasions to dismiss workmen whose services I really required in order to prove to them that we could do without them and thereby keep the rest in order.

49 The Scarcity of the Natives for assistants is also another great drawback to us. Their usefulness, a Blacksmith must have his own Bellows Boy and Hammer man or else he must be idle, a Carpenter must be attended by a Boy a Cooly or a Borer, and sometimes he wants all three, and if one member of a Set of five Sawyers is sick or absent the rest are idle being idle to seeking another to supply his place.

These facts will prove at once
50 the great importance of establishing workshops at suitable places where the workmen may be better instructed and acquire by degrees more correct ideas of the value of time and the importance of adopting better methods of executing their work. But such Establishments will be of but little real benefit unless they are formed upon some fixed principle will provided with suitable Machinery and tools and placed under the direction of suitable Officers well acquainted with practical business and not above giving their personal attention to the work.

51 The Native youths appear to me to be remarkably impressable and intelligent but let them once arrive at 18 or 20 years

years of age and all their intelligence vanishes. They have by that time learned all that they wish to know and they consequently become bigotted conceited and obstinately opposed to any further improvement: shew them how much superior an European workmen is and they at once refer to the superiority of his tools, give them our tools and they either destroy or at least damage them so much that they soon become useless shew them how to use them with the best effect and they at once reply that they have not been accustomed to such a mode of working and cannot adopt it: now endeavour to introduce improvements and they reply that their caste forbids them from following your instructions, the Native Maistrys all come forward to vindicate their Men and confirm them in their prejudices and indeed it is with the greatest difficulty that you can compel the introduction of even the simplest and most obvious improvement:-

52 The difficulties I have met with on this head are beyond all description when working the Saw Mill and the till hammer or erecting the Engine and Boiler I have often been

been compelled to work with my own hands as a carpenter Smith filer Fitter Blacksmith &c to shew them even the advantage of the slightest improvement but let me be absent for only a few Minutes and they all return to their old ways and often thereby spoil their work and render all my exertions labour fruitless..

53. Another great drawback is the diffiencltty of obtaining suitable foremen or superintendants; as well might we look for efficiency in a Native Army without European Officers as expect Native Mechanics to improve under their own Maistrys they require good European superintendants, and they require a much larger number of them than do the English workmen, but unfortunately our present arrangements do not supply this want most; if not all the Overseers are Soldiers who profess but a very limited amount of Mechanical knowledge, as few good Mechanics if sober and steady men, even enter the Army on two or 3 cases I have been fortunate but in the majority of instances our overseers however willing are but very imperfectly acquainted with the business of the Workshop and indeed the most useful men profess merely a superficial general

knowledge

knowledge instead of real practical skill in some one branch, they have a smattering of Carpentry, of Smithery, Masonry &c. but a perfect and accurate knowledge of none of these operations under these circumstances it can hardly be expected that such persons are at all qualified to instruct a class of men who are notorious for obstinacy, stupidity and unwillingness to learn even under the very best instructions.

54 And yet the past importance of a good body of efficient Mechanics can hardly even be overrated. without these the Engineer, the Architect, the Builder and the Mechanic, finds himself almost powerless to execute his work, all his Scientific abilities are mere empty shadows unless he can meet with men qualified to carry out his ideas, in England this want would soon be supplied by private enterprise but in India it must be done by the Government or else it will not be done at all, and if left to the mercy of the present race of workmen at least as far as I have seen our work will not only be found immensely expensive but inferior both in efficiency and durability

durability.

55. To improve the efficiency and to elevate the character of the Indian Mechanic is then a work of the greatest importance not only to the people but also to the Government. by its means we shall be enabled to mitigate the evils of the climate, to carry out national improvement in such a manner as to render them valuable to the people and profitable to the Government; to avail ourselves of the hitherto unknown resources of the country, to reduce expenses. shorten the fatigue of travelling and guard against contingencies that are constantly arising in every country and more especially in India, we shall enrich ourselves while we equally enrich them and render our hold upon the vast community over which we preside less liable to interruption or disturbance.

56 In order properly to accomplish these ends we must; if we hope for the least chance of success begin with the youth of the Country disregarding all the absurd nonsense of caste we must seek among Parahs and half castes for Pupils who must be legally bound

legally bound to serve us for a term of years upon the receipt of a small allowance just enough to enable them to subsist; their labours must be carried on in a Building erected and fitted up more in the European Style and secured from promiscuous intrusion. They must be placed under proper European Foremen instructed in some definite branch of business provided with European tools and compelled to work regular hours and according to the instructions given, I would not object to the admission of Native workmen of more advanced years but it should be distinctly understood that if admitted they should conform in every respect to the rules of the establishment, and any objection thereto should subject them to immediate dismissal without the chance of readmission the Establishment should be well provided with good working foremen in each distinct branch permanently employed by the Government men of good character and practical ability (and such are readily to be found in Great Britain) and they should be superintended by an Officer of experience who should devote his whole time to his duties.

There

There and be responsible to no one but the Government.

57. This person should be provided with at the least one good European draftsman one European Accountant, a Foremen of Carpenters, one of pattern Makers, one of smiths, one of founders one of Fitters, and one of Copper Smiths tinmen and Brazers, making a total of eight persons besides the Principal, all of whom are indispensable each of these should be provided with a native writer well conversant with English who should act as interpreter, keep his seperate accounts, and at leisure hours give him instructions in the native tongue.

58 The Building should be situated at some central spot having if possible the advantage of water carriage, it should be furnished with Machinery from England worked by Steam power and contain apparatus for planing boring drilling, turning, Casting, Forging, Sawing, &c &c and Machinery for lifting heavy weights and moving large bodies from place to place, a model room should be attached and a small department for the construction

construction and repair of Mathematical and Philosophical instruments.

59 It should be governed by bye laws drawn up by the Superintendant and submitted for the approval of the Government and should be permanently maintained for at least several years to come.

60 Such an Establishment would in a short time be able to supplies numerous articles which we are at the present time either compelled to procure from Europe with great expense of both time and Money or else to manufacture so imperfectly upon the spot; the military as well as the Civil and naval branches of the Empire would speedily feel the advantages of its operations and in a few years it would be capable of supplying the entire Public Works Department with native Foremen well skilled in the useful arts and competent to undertake the direction of the more difficult portions of most important works.

61 I am well aware that it may be alleged that Workshop already in existence at Bezoarah at Dowlaiswaram and other places are intended to supply the wants of the community, but notwithstanding the advantages that have already accrued from these Establishments, their progress as far as I have been able to ascertain is far from being satisfactory, they are formed upon no acknowledged principle entirely dependant upon the district Offices and far too limited in their operation, at Bezoarah without funds, without authority, or Government sanction my Career has been a constant succession of struggles with difficulties which I had no means of overcoming, and failures of a most disheartening character, as far as we have been able to go our progress is perhaps as great as might reasonably be expected, but although we have been able to do much for the district we are powerless to benefit the Presidency at large our works although some what improved are to me sadly defective and unsatisfactory.

62 Of the Dowlaiswaram works I know but little, having never been able to visit them but when I have upon a few occasions sent to them for such things as we have ourselves been unable to supply an immense

time

time is taken to fulfil the most simple order the worst when performed is costly and often sadly defective. Ionce ordered a crab for the Kistnah Bridge it took above 6 Months to make and when it reached me it broke upon the very first attempt to raise a moderate weight and has ever since been quite useless. I took off the small Trainway wheels and rigged out a Crab from one of the Quarry Cranes which we have used ever since..

63 As I have heard a very high character of the Gentlemen in charge of that establishment I cannot but think that they must have had to contend with difficulties similar to my own and that the want of systematic and efficient training in the first instance has never been properly made good, and indeed without this success is never to be hoped for..

64 In conclusion I may be permitted to advert to another Subject intimately connected with the foregoing, namely, the supply of Ironmongery for ordinary Building purposes in this part of the Country we generally manufacture these things ourselves and although they are much better done than might be expected from our inefficient means yet they are vastly inferior to those that are in common use in England and much more expensive and many highly useful articles of common use appear to be quite unknown, if we order these articles from the European Merchants at Madras we hardly ever get what we want and consequently many of the Articles are useless..

65 The following is a list of the Articles of this description which would be found most useful in this Country and which can be supplied from England for a much less sum than they can be made here and of far superior quality ..

66 Articles of Ironmongery &c. most serviceable in India that can be supplied from Great Britain.

Hinges — Cast and Wrought Iron Projecting Butts.
Wrought iron cross garnets.
Do Parliament Hinges.
Do Bent Box Hinges. Stout and thin /
Locks. Wrought iron dead locks / double keys /
Do good Padlocks / Do /

Brass.

Brass Mortice locks for doors.
Brass and Iron Cupboard locks.
D°. good Box locks.
Brass draw locks / large and small /
Brass Pulpit latches Crank handles, — Latches.
Wrought Iron Norfolk latches / japanned /
Brass flush bolts from 6" to 2 feet long. — Bolts
Wrought iron bright and rough bolts.
All kinds of Patent cut nails large and small, — Nails
Clout nails and Tacks.,
Cast tacks nails / long for reapers /
Brass headed Nails,
All kinds of Wood Screws — Screws
Wrought iron Box handles. — Miscellaneous
large and small / japanned /
Brass D°., Brass flush D°
Iron and Brass buttons
for Cupboard doors,
Cold drawn Iron, Brass, and Copper Wire.

67 Many of these articals are greatly needed by the Natives as well as by the Europeans, and if introduced would speedily find an immense consumption they are mostly very cheap in England and easily

Packed

Packed and far superior in finish to the articles made here..

I have the honor to be &c.
/ Signed / Edwin E. Merrall
Civil Engineer

/ True Copy /
Colonel
Chief Engineer

1858. Departmt.

No

Enclosures in a letter from the Chief Engineer in the P.W.D.
To
The Secretary to Government
(P.W.D.)

Dated 18th
Rec.d } March 858.

No 8224

P.W. 587/58.

2.

Copy of letter from Covenanted Civil Engineer E. E. Metcalf relative to the requirement of machinery in the Bezoarah Workshops.—

Bezoorah
30th November 1857

No 125

To

The Chief Engineer
in the Department of Pub. Works.

Sir

With respect to your Official Memorandum of the 28th October 1857, without Number, calling upon me in pursuance with your Circular, date and number as per Margin, to report upon the quantity of timber and tools to be purchased for the works in this District — together with a list of Machinery required here, I do myself the honor to inform you that, to the best of my judgment we are at present well enough supplied with timber to meet all Current requirements, are equally well furnished with tools, but that with regard to Machinery our workshops would be far more efficient than they now are, were the Articles below specified procured

16th October 1856
No 7287

from.

from England

2 The Articles, as will appear from the subjoined letter addressed to the Executive Officer lately in charge of the Division by the Covenanted Civil Engineer directing the Workshops, are

1 Vare & Planing Machine.
1 Small . Do . Do.
1 Small Lathe.
1 Slotting or Grooving Machine.
1 Bolt Tapping Machine.
1 Nut Shaping — Do.

3. On reference to a letter addressed to You by the late District Engineer Number and date as per margin, giving enclosure to Mr Merrall's original communication to him respecting the Machinery granted in the Workshops, it will be evident that I am but repeating my Predecessor's application with the addition of the Bolt tapping and Nut shaping Machines.

No 104 dated 30th October 1856

4. I do not dwell upon the advantage to be obtained by purchasing this Machinery, as I cannot hope to put before you in a clearer light than the District Engineer and the Covenanted Engineer in charge of the Workshops have done, the great gain that will accrue thereby to the Kistnah Works when compared with the smallness of the outlay.

5. Mr Merrall states the cost of the six pieces of Machinery mentioned above at Rupees 7,000 to which the sum of Rs 3,000 for tools and charges and Rs 2,000 for the erection of a little Cupola must be added, making Rs 12,000 the price at which the Bezoorah Workshops can be put in excellent working order.

Bezoorah
30th Noor 1857

I have &c &c
(Signd) R.S.C. Chambers
A.g Dy Engineer Kistna Dn
Bezoorah, Nov 7th 1857

Dear Sir

As I am now getting up the
Shafting —

shafting in the Workshop here, I think it would not be amiss if you would kindly enquire of the Company as to whether there was any likelihood of our obtaining any part of the Machinery I wrote to Captain Orr about some time since, we have now in the shop the large lathe, the Drilling Machine, small Circular Saw, and Vertical Saw Mill, and I hope shortly, with a little assistance, to get the large Circular Saw fixed likewise. What we most require to complete our Machine Establishment is the following viz:-

1 Large Planing Machine slow motion.
1 Small Do quick motion with reversing gear.
1 Small lathe.
1 Slotting Machine.
1 Bolt cutting Machine.
1 Nut shaping Machine.

I think the whole of these could be obtained for about Rs 7,000.-

It must be borne in mind

mind that we have now upon the Premises 1-6- H. P. Stationary Engine fixed in the Workshop, 1-6- H P Portable Engine for District use, 1-8 H P Pumping Engine just arrived, and to these are likely to be shortly added 2 Dredgers and 1 Buoy boat.-

Should any of these at any time get out of order, we could, without such additional Machines only get them repaired by sending them to Dowlaishweram, and, to say nothing of the delay, the expense alone would amount to almost the value of the Machinery I want here, and which, if we had it upon the spot, would enable us to do a large amount of work, the value of which would very soon repay the outlay in the first instance, as well as keep all our Mechanical Stock in good repair.-

If You are writing

to

to the Company perhaps You would endeavour to get from them some definite reply upon the Subject.

I Remain Sir
Your Ob.
(Sigd) C.C. Merrall
Civil Engineer

To
Lieutenant Parewell
Ast Engineer Vce Vce

(Signed) Osb: Chambers
Acte Dpt Engr K. Dn

/True Copies/

Wd Fuller Colonel
Chief Engineer

Central Office of P. W.
No 8224 Fort St George 8th March 1838.

From
The Chief Engineer
To
The Secretary to Government
Public Department.

Public

Sir

× Letter No 888.

On the 15th December 1836, I had the honor to submit a proposition from the Civil Engineer of the Nilgiri Division, for increasing the efficiency of the small Workshops at Jenoarah, by the purchase for them of a few tools and pieces of machinery to the value of Rupees 8000, and the erection of a small Cupola, at a probable outlay of Rupees 2000, and I strongly recommended the grant of the latter sum, and authority to include the tools and machinery either in the Annual Indent then under preparation, or in a Special one.

2. The Government, under date the 13th February 1837, rejected the application, on the ground that it had agreed to a proposal for greatly enlarging the Workshops at Dowlaisheveram, but as that decision seems to have been given under a misapprehension of the extent and character of the proposed improvements at Jenoarah, and of the facilities that the Workshops at Dowlaisheveram afford, I venture, in forwarding a letter

× No 305.

lately

1838 March
From Lieutenant Colonel
The Chief Engineer
To the Secretary to Government
Public Department

Read
Recd March 1838.

No 8224.

Letter from the District Engineer Nilgiri Division and Canal Division Superintending the grant of the sum of Rupees 2000 for the erection of a Cupola at the Workshops at Jenoarah.

lately received from the Officer now in Charge at the Hastiah, together with its enclosure, a second letter from Mr. Executive Civil Engineer Merrall, renewing his predecessor's application with some additions, strongly to urge a more favorable reconsideration of the subject.-

3.- On whatever footing the large Workshops at Dowlaishweram may be placed, it is, in my opinion, highly necessary, if not indispensable, that the small Establishment at Benoarah should be made capable of performing the repairs of all the Tools, Machinery, and Apparatus employed in the Division of which it is the Head Quarters. The Articles already in use consist of a large Stock of Tools of all ordinary kinds, of numerous Cranes, Winches, Railway wagons, iron and wooden pumps, boats, and three Steam Engines &c.; and there will soon be added, three large iron Steam Dredges, and an iron Steam Tug of 80 Horse Power, and ere long it will, undoubtedly, be found both expedient and economical to build iron Cargo boats for the Channels. These, as well as the iron Dredges and Tug Boat, must necessarily be put together, and the Engines and Machinery fitted into the latter on the spot, which will be difficult in the present ineffective

Condition

condition of the Workshops, but easily and cheaply performed if the additional Apparatus asked for by the local Officers be granted.-

4.- The Cupola is intended to be a small one, to permit of light Castings in iron being made.- Its want is now much felt, as on the breaking of a Cog Wheel, plumber box, or other part of any Apparatus, the whole Article is useless till a model of the broken part is made, and despatched to Dowlaish-weram and a new Casting received from thence, probably in about the same time that it might have been obtained from England. Without the means of fusing iron the only alternative is to replace breakages with Castings in brass, and this is generally done at a considerable waste of money, as a valuable material has to be purchased, while quantities of broken Wheels and other old iron are lying about, and might be profitably used up, were a Cupola erected.-

4.- The enlargement of the Workshop at Benoarah, or rather the fitting it with additional Machinery, to the extent proposed, since no new buildings are required, is, in my opinion, not only absolutely necessary for the efficient maintenance of Plant and Machinery in that important Division of Public

Works,

Works, but is a measure of sound practical economy, and I have therefore no hesitation in giving the present Application my utmost support, in recommending 1st the grant of Rupees 2000 for the immediate erection of Cupolas, and 2d. that I may be authorized to sanction a special indent for the Tools and Machinery specified, which together it is expected, will not exceed in cost Rupees 10,000; a sum bearing a very low ratio on the system of Public Works, to the efficient working of which, at all times, in its various details, the grant now solicited and strongly recommended will so largely contribute.

6. The great importance of advancing the Mechanical Arts in this Country, by Government setting the example in the Establishments attached to extensive works like those at the Kistnah, is I believe, or at all events, very soon must be admitted, and a better opportunity than that offered at Berwarah for the introduction of Machinery and improved Apparatus, cannot well be found, as labour is there both scarce and indifferent, and that place is more Centrically situated than any other, being

being on the immediate vicinity of an extensive system of Navigable Canals, and on the intersection of two great Main Roads. Finally the present time, owing to comparative inaction, is singularly opportune for the supply of existing deficiencies, so that on the career of improvement, now so unhappily suspended, being resumed, all those bars and hindrances which have hitherto proved, from time to time, so prejudicial (and not unfrequently from the most trivial causes) may in future be under complete professional Control, instead of compromising, as at present, the progress and success of one of the largest schemes of Artificial irrigation undertaken by this, or by any other Government.

7. In further support of the views I have above expressed, I take this opportunity of laying before Government a transcript of a paper addressed to me by Covenanted Civil Engineer R. C. Merrall Esquire, describing the present organization and used of the workshops at Berwarah, and, after detailing, at some length, his experiences therein, recommending its enlargement, with a view, in the first place, of facilitating and cheapening the manufacture and maintenance of such plant and simple articles of Machinery as can be prepared there for use in economizing Labour on the

Great

great works in Progress in the Delta,
and in the second place, of bringing up
a Class of Workmen trained to the em-
ployment of Appliances by which alone
improvement of the mechanical Arts
in this Country can be effected.

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

Central Office of R.W.
Fort St George
18th March 1838

A. Bolton Lieut.t Colonel
Chief Engineer

For Orders.

Public Works Department No 587.

From the Chief Engineer & Secretary to Government P.W. Department

Dated 18th
Read 20th March 1858

Encls 2. No 8224.

Sec No 727. 19th April 1858.

Forwards Copy of a letter from District Engineer of the Kistna with its enclosure from Mr Meade, & Specifications for machinery for the new Locks at Bezoada. Recommends the grant of Rs 2000 for the immediate erection of Cranes &c. and asks permission to prepare detailed Indents for the tools & Specifications specified & the probable value of Rupees 15,000.

P.W. Cons. 17th Feby 1858 No 1567 & 14

P.W. Works 1858 Dept II
Cons. 6th April
No 587.
From the Chief Engineer
To the Secretary to Government
P.W. Department.

Dated 18th
Read 20th March 1858

Encls 2. No 8224.
Sec No 727. 19th April 1858.
Forwards Copy of a letter from District Engineer of the Kistna with its enclosure from Mr Meade, & Specifications for machinery for the new Locks at Bezoada. Recommends the grant of Rs 2000 for the immediate erection of Cranes &c. and asks permission to prepare detailed Indents for the tools & Specifications specified & the probable value of Rupees 15,000.

No 116

C 25/ March R 30th & 9th April 813

75 P.W.D.

No. 727.

Extract from the Minutes of Consultation

Under date the 19 April 1858.

Read the following letter

from the Chief Engineer.

(Dere enter 18th March 1858 No. 8224)

Ch. With this letter the Chief Engineer submits ~~a copy~~ copies of one from the Acting District Engineer of the Kistna division and of a Communication from Mr. E.E. Merrall, ~~the~~ Covenanted Civil Engineer, together with a copy of a separate letter addressed by the latter Officer to the Head of the department dated 28th August 1857, all bearing on the subject of improving the efficiency of the Bezwarah Work Shops.

Ens

2 This subject was brought under the considera= =tion of Government at a former period, but the Governor in Council declined at the time to give his assent to the plans then proposed, on the ground that the Govern= =ment had agreed to a separate proposal for greatly enlarging the Dowlaishwaram work shop, in order that it might be made thoroughly efficient, and capable of supplying the works of all parts of the Presidency, as far as distance might permit. The Government did not consider it advisable to incur expense in creating large workshops at Rezoorah also, and preferred making the establish= =ment at Dowlaishwaram

Ex: Mins: Cons: 13th February 1857 No 305.

to thoroughly efficient ~~them~~ having two of an inferior character.

3 In the paper now before Government, the Chief Engineer observes that this decision was given "under a misapprehension of the extent and character of the proposed improvements at Rezoorah, and of the facilities that the work shops at Dowlaishwaram afford." He says that on what= =ever footing the last mentioned establishment may be placed, it is highly necessary, if not indispensable, that the small one at Rezoorah should be put on such a footing of efficiency as to enable it to undertake the repair of all the Tools, Machinery, and Apparatus employed in the division, of which it is the

Head Quarters. He shews the stock of tools, Machinery and Steam Engines already in use; he adverts to the addition which will soon be made to this supply in Steam Dredges and Tugs; and to the probability of the Establishment being called upon, at no distant time, to undertake work of a character that will need the use of more Mechanical appliances than are now available, and he therefore strongly supports the application of the local Officers for additional apparatus.

4 Colonel Faber recommends 1st the grant of a sum of Rs. 2,000 for the immediate erection of a Cupola, and 2nd that he may be permitted

to submit a special Indent on the Honorable Court for the Tools and Machinery specified, which it is assumed will not in cost exceed 10,000 Rupees or 1,000 £ Sterling.

5 The valuable Communication addressed by Mr. Merrall to the Chief Engineer under date the 26th August 1857, has afforded the Government a more clear insight into the precise position, circumstances, & requirements of the Bezoara Workshop than they heretofore possessed, and they must confess, that this paper and the explanation afforded by Colonel Faber, of which a brief notice has been given above, have induced them to modify their former views. It is not intended that

report.

8. The Government cannot but complain of the careless manner in which Mr. Merrall's letter has been transcribed in the Central Office; although initialled ~~W.O.H.~~ having been examined, it abounds in errors of every description, which make the reading of the paper difficult; and the Government cannot consider its enquiries sufficiently attended to by the Chief Engineer ~~should have directed the attention of the Central Office to the errors than that by his~~ ~~wide departure from the original~~. Mr. Merrall's letter will now be returned to the Chief Engineer with a request that he will submit a correct copy when forwarding his Indent for Tools.

J.G.

P. Copies to the Chief Engr
& to file with Merrall's letter

Cons= 17th Feby/57 No 1561/9

Pub. Works 1858 Dispatch
Dr to Cons. 20th April
No 727
Ex: Minr of Cons.
Dated 19th April/58

Trevelle. Chief Engr to G/I 2d June/58
Cert. in Cons 6th July

Sanctioning from the ordinary Fund of the ensuing year, a sum of Rs 2000/ for the erection of a Cupola in the Bombay Workshop, & directing the Chief Engineer to submit a special Indent for the Tools and Machinery required for the above Workshop, which this Govt will forward to the Honble Court accompanied by all the necessary Papers.

No 1168/117