

P. W. D.

Gobt. of 1885 Madras.

FINANCIAL.

August
N^o 1923 Wd/19 ~~July~~ 1885

Communicated to
the Supdy. Engr. III Circle.

(Signed) *W. H.*

Issued

Recd.

Encl.

G.O., 6th July 1885, No. 248 M.

August
N^o 1923 Wd/19 ~~July~~ 1885

JULY.

The S. E. III Circle

Water Project.

Passing orders on the papers relating to — in
the Cuddapah town.

With Order

GOVERNMENT OF MADRAS.

MILITARY DEPARTMENT.

et
31 July 1884, No. 3653

Clothing—Compensation.

Read the following paper:—

No. . From Colonel C. CARTER, Controller of Military Accounts, Madras,
to Lieutenant-Colonel A. KENNEY-HERBERT, Officiating Secretary to
Government, Military Department; dated Fort St. George, 11th July 1884, C.

In acknowledging receipt of Proceedings of Government, No. 6893, of 22nd December 1883, I have the honor to inquire whether the ruling of the Military Department therein contained is to be considered as cancelling the concession granted in Proceedings of Government, No. 3067, of 18th August 1865, and confirmed in Proceedings of Government, No. 4202, of 14th November 1865.

No. . ORDER THEREON, *et* 31 July 1884, No. 3653

All that was intended by Military Department No. 6681, dated 11th December 1883, recorded in Proceedings of Government, No. 6893, dated 22nd idem, was to declare that O.G., Military, No. 3880, dated 12th July 1883, sanctioning the issue, at the cost of the Public Works Department, of special warm clothing for the sick of the company of Sappers and Miners at Ootacamund did not entitle the medical subordinate attached to that company to compensation at the cost of the Public Works Department in lieu of such warm clothing.

2. The man is entitled to an allowance of Rs. 2-8-0 monthly for ordinary warm clothing to be provided by himself, and this amount should be passed to him.

(True Extract.)

(Signed) A. KENNEY-HERBERT, Lt.-Col.,
Offg. Secretary to Government.

To the Controller of Military Accounts.
„ Public Works Department.

Exd. E. C. Shunker.

P. W. D.

Gobt. of 1884 Madras.

MILITARY.

To THE CONTROLLER OF MILITARY
ACCOUNTS,
&c., &c., &c.

Dated July,

Issued

Recd.

Encl.

G.O., July 1884, No.

JULY.

Nos.

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With order

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MILITARY DEPARTMENT.

31 July 1884, No. 3653

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(True Extract.)

(Signed) A. KENNEY-HERBERT, Lt.-Col.,
Offg. Secretary to Government.

To the Controller of Military Accounts.
,, Public Works Department.

Exd. E. C. Shunker.

N^o 1924 Wd/ 7 August/84

Communicated to the
officers concerned in
Continuation of G. O.
3575 Wd/ 14th December
1883.

(Signed) J.H.

P. W. D.
Govt. of 1884 Madras.
MILITARY.

To
THE CONTROLLER OF MILITARY
ACCOUNTS,
&c., &c., &c.

Dated July, .
Issued
Recd. Encl.
G.O., July 1884, No. .

N^o 1924 Wd/ 7 August/84

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With order

S.S. IV Circle
Ex am^r P. W. Accts.

GOVERNMENT OF MADRAS.
MILITARY DEPARTMENT.

31st July 1884, No. 3653

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A. Kenney Herbert. Lt.-Col.,
Offg. Secretary to Government.

To the Controller of Military Accounts.
,, Public Works Department. Wd/ 108 C

Exd. E. C. Shunker.

102046.26.7.83.

1924 was a 7th August

Communicated to the
Officers concerned
in continuation of G.O.

3575W of 14th December 1883.

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1-8-84

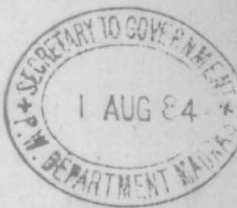
S. E. IV Civil
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S. E. VI Civil

102046.26.7.83.

Govt. of (1884) Madras.

MILITARY.

To
THE CONTROLLER OF MILITARY
ACCOUNTS,
&c., &c., &c.



Dated July,

Issued

Recd. 4/8/84

Encl.

G.O., July 1884, No.

1924 was a 7th August

JULY.

Nos.

Clothing—Compensation.

The Controller of Military Accounts informed that the medical subordinate attached to the company of Sappers and Miners at Ootacamund is entitled to an allowance of Rs. 2-8-0 a month for ordinary warm clothing.

2 Copies sent to P.O.

6TH JULY 1885, No. 248 M., FINANCIAL.

GOVERNMENT OF MADRAS.

FINANCIAL DEPARTMENT.

READ—the following papers:—

From C. A. BIRD, Esq., President, Municipal Commission, Cuddapah, to the Chief Secretary to Government, dated Cuddapah, 2nd March 1885, No. 61.

I have the honor to submit, for the consideration of Government, Major Brockman's report on the Boogga water project, together with papers noted in the margin.

1. Report.
2. Estimate.
3. Specification for masonry.
4. Specification for pipes.
5. List of special castings.
6. One survey map showing location of works.
7. Plan showing details of construction.
8. Plan showing sections of main and distributary pipe alignments.

2. The commissioners, at a special meeting held on the 19th February 1885, approved of the scheme submitted by Major Brockman, and resolved to solicit a contribution from Government towards the cost, but if Government were not prepared to give the whole or a portion of

the cost, to ask for sanction to raise the sum of Rs. 80,000 required for the purpose by debentures at 5 per cent. per annum.

3. Since the passing of that resolution, I have received the order of Government, No. 391, dated 14th February 1885, passing orders on proposals for an improvement in the health of the town of Cuddapah, in paragraph 2 of which it is promised that the Government will endeavour to make a substantial grant-in-aid from Provincial funds for the furtherance of the scheme.

4. As the interest payable annually on the whole sum would considerably cripple the commissioners in endeavouring to carry out the other sanitary arrangement proposed in addition to the usual municipal expenses, this promised assistance will be a great boon to the commissioners and inhabitants of the town, and I thank the Government in their name, and request that sanction may be accorded to the commissioners to raise the rest of the sum required for the purpose by debentures as stated above.

ENCLOSURE.

REPORT to accompany the plans, estimates, specifications, &c., of the Cuddapah Water-supply Project.

General remarks.—The subject of an improved drinking water-supply to the town of Cuddapah has for very many years engaged the attention of the local authorities and of the Government. The necessity for taking some steps for the amelioration of the present condition of things has more vividly shown itself year by year by the continued unhealthy condition of the town during certain recurring seasons of the year, and by the fact that the inhabitants of those suburbs that are obliged to use water from sources of supply other than the best constructed wells suffer more markedly from any epidemic that may be running its course.

2. Present supply—Its quality.—The water in the greater part of the wells in the town itself has been shown to be from a chemical point of view unfit for use, but as the late Chemical Examiner, Dr. Rogers, has remarked in his report upon the analysis of the well waters of Cuddapah, "the presence of infective matters in water, in quantity so exceedingly minute as to be beyond the reach of analysis, is sufficient to enable water to cause disease," so it is manifestly to the surroundings of any source of supply, and the power they have to injuriously affect it, that investigation should particularly be directed.

3. *Reasons for above.*—That the surroundings of the best of the wells constructed in the town are of the most objectionable nature is evident to the most casual observer. Not only is the drainage of the town itself very defective in that surface waters are allowed to stagnate and infiltrate the soil, but none of the wells in use are revetted or built up in such a manner as to counteract this infiltration. Mere loose stone in layers without mortar or a concrete backing is used instead of an impervious envelope carried down to a depth below the point at which the filtering water retains its noxious properties.

4. *Other sources of supply.*—Those inhabitants who do not use wells have recourse to the Boogga river, which during the hot weather is dry, with here and there deep pools in its bed containing stagnant water which is used for all purposes both by man and beast.

5. *Subsoil and position of Cuddapah town.*—The soil on which the town is built consists of a layer of alluvium overlying a stratum of nodular limestone impregnated with marl and yellowish clay. This stratum is not a very pervious one, and as though to increase the evils caused by a water-logged soil, a large tank, named the Dongalacheruvu, lying to the south of, and above the town irrigates a large area of land eastwards, whilst the water of the low-lying Patha Cuddapah tank, which derives its supply from the Boogga river, backs up for some considerable distance into the drains of the town on the north.

6. *Results of above.*—These agencies combine to keep the subsoil of the town site during the cold months of the year in a water-logged and damp condition. In the introduction to the pamphlet containing "Suggestions in regard to improving the Sanitary Condition of Indian Stations," published by the Army Sanitary Commission, great stress is laid upon the necessity of subsoil drainage wherever, as in Cuddapah, malarial fever indicating a malarial-generating condition of the earth prevails. But this water-logged condition of the soil has again a very injurious effect upon the water in the wells. Where the springs which supply the well deep seated and independent of any surface percolation the mischief done would not be tangible, but as the water level is lowered by use, the water which first finds its way into the well is that that has lodged in the upper strata and that has been stagnating for a more or less lengthened period, and become, in consequence, unfit for consumption.

7. *Source of improved proposed supply* situate about three miles due south of the town, however, a natural, and, as experience has proved during the years of greatest drought in the district, an unfailing supply of water of the purest quality exists in the shape of the so-called "Boogga" springs. The adjunct "springs" is a superfluous one, for the very name itself signifies in the Telugu language, "a spring," and this, in turn, gives the name of Booggeru, or the "River of Springs," to the stream that flows by them and thence in a northerly direction round the town until it joins the Pennér river.

8. *Geological considerations to account for its existence.*—It is not difficult to account for the existence of these springs, which, as far as they have been opened up, are six in number, for they are located in the left bank of the Booggeru under a high and undulating area of country composed mainly of red alluvial soil and water-worn gravels, superimposed upon a bed of yellowish clay and "kunkur." This ground is an excellent filtering medium for the rain water which passing through it and meeting the impervious clay pan below is tapped by the Booggeru, the sandy bed of which absorbs it and carries it away. Mr. W. King of the Geological Survey of India, in his paper contributed to the Cuddapah Manual, refers to these springs as "thermal" (and this peculiarity has certainly been observed), and he ascribes their source to a fault occurring between the crystalline and quartzite systems of rocks lying within the Cuddapah-Govulcheruvu road and the Papagni river. Perhaps the tepid nature of the spring water supported this conclusion, but I think it right to draw attention to the fact, which a reference to the Atlas sheet will show, that the Booggeru takes its rise at a cataract in the hills above which has worn out at the foot of its fall a deep unfathomable basin of considerable extent, and is distant about seven miles from the site of the springs. This basin is always full of water, and has doubtless a powerful compensating influence on the water level at the springs themselves. Were Cuddapah a town of sufficient magnitude and importance to warrant the expenditure, the fountain head of these springs would ere this have been tapped and the pure supply brought from it by a masonry or other conduit.

9. *Capability of the springs for supply of the town.*—The point which in connection with the subject of the supply of water to the town required to be established was the capability of the springs to furnish the minimum quantity of five gallons per head of population daily throughout the year. Steps were accordingly taken for doing so in the year 1882, when an experimental weir was constructed and the gauging of the discharge carried out from the 13th May to 30th September of that year. The results of these have been referred to in Mr. Burrows' letter to the Chief Secretary to Government, No. 198, dated 8th May 1883. No observations were made during the following year, but from the 13th May this year they were resumed and carried down to the date of my taking up the investigation of the project in the beginning of October. The monsoon setting in soon after they were discontinued. The gauge readings and discharges for these years (calculated from formulæ, and check-measured by me by receiving the overflow into a vessel of ascertained capacity) are given in the table accompanying this report.

10. *Previous gauging experiments not sufficiently accurate.*—The arrangements that had been made for the gauging of discharge did not commend themselves to me as wholly reliable or the best that could have been devised. The bank which was thrown up in front of and parallel to the line of springs, and between it and the river-bed, consists of sand and gravel and rests upon the sandy grass-grown bed of the river. No attempt was made at puddling this bank or making it water-tight so as to intercept the whole flow from the springs. There was every reason to believe, therefore, that during the whole period of gauging the discharge, the results did not show the full amount of water that flowed from the springs, as a considerable portion, greater as the head of water increased, must have escaped by percolation into the sandy bed of the river to appear below in the form of spring water.

11. *Results of comparison of two years' gaugings.*—A comparison of the discharges of the two years shows that notwithstanding that the current year has been one of exceptionally short rainfall during the months over which the experiments extend, the endeavour to more accurately gauge the capability of the springs and the opening up of them has resulted *pari-passu* in an increased discharge, and it may reasonably be concluded that any further measures taken to open up the springs will increase the supply considerably.

12. *Method to be adopted for utilising the full supply of springs as well as the Booggeru.*—But taking into account that the whole of the river-bed itself in the proximity of the springs contains a water-bearing stratum situated at no great depth below its surface, it appeared to me that, not only would it be advisable to take advantage of the chance circumstance of the springs as at present located, but also of the whole amount of water that was passing away from them and from above them in the bed of the river itself, by arresting this flow by means of an infiltration gallery constructed in a diagonal direction across the river.

13. *Infiltration gallery.*—The upper end of this gallery will abut on the left bank of the river just below the springs, whilst the lower end will be carried into the right bank and communicate with a well from which the water will ultimately be raised by mechanical appliances.

14. *Details of infiltration gallery.*—The floor of this gallery will be placed at 471.00 + M.S.L. or about three feet below the average bed-level of the springs as at present excavated. The upstream side wall will be built with openings whilst the lower side will be of solid masonry so as to prevent any water flowing through the structure. The whole of the water therefore that is arrested by and enters the gallery which has a sectional area of three square feet will be carried down along it to the pumping-station well. To prevent the gallery from becoming choked by sand from the river-bed, the interstices between the piers in the upstream side wall will be filled in with stone packed dry, and a lean-to bank of rough cobbles found in large quantities at site, thrown up in addition.

15. *Water-lift at pumping-station well.*—The means whereby the water will be raised out of the pumping-station well will be the improved water-lift of Messrs. Burgess and Key, which consists of galvanized iron buckets working on an endless chain over a spocket wheel and actuated through level-gearing by bullock power. Such a machine calculated to raise 300 gallons a minute from a depth of 10 feet, or something more than the full supply demand of 10 gallons per head of population per diem costs in England about £500, and can be obtained through Messrs. King and Co., at an estimated cost at site, including all charges, of Rs. 750.

16. *Masonry conduit and supply pipe.*—The water will be raised by this machine into a cistern at the head of the masonry conduit, 8,840 feet in length, terminating in an 8-inches cast iron pipe, 2,150 feet in length which supplies the service reservoir.

17. *Service reservoir.*—The service reservoir is designed upon the form lately advocated in a paper recently read before the institution of Civil Engineers. It will be seen that no openings are afforded for the admission of light or air to its interior, except through the man-hole in the centre vaulted arch, which is only opened for purposes of inspection and during the process of cleansing out the reservoir. It is an acknowledged fact that where these natural agencies are not at work, the growth of vegetable and animal life is much retarded, if not rendered impossible, and in a country like India, where the heat is so great at certain times of the year, it becomes the more essential that this latter desideratum should be secured to insure the wholesomeness and purity of the water, which in this instance is intended for drinking purposes only. The capacity of the reservoir will be about 175,000 gallons, or three-fourths of one day's maximum demand. It is not necessary to have a larger reserve supply than this, as the pumping-station is at no great distance, and there is very little probability that any accidents will occur to the machinery there which is of the simplest description. The outside of the reservoir will be covered with two feet depth of earth taken from the excavation. This will prevent the masonry of the structure from being unduly heated by the sun's rays, and keep the water in it fresh and cool. As the subsoil is hard and compact, no puddle layer has been provided for either under the foundation or round the side walls. The Portland cement plaster which will cover the whole interior of the reservoir, and the artificially hydraulic mortar concrete of which the foundations and backing to the sides and ends of the vaulted are composed, will, it is considered, prevent all percolation, as the depth of water retained in the structure will never exceed six feet.

18. *Valve well.*—The valve well will be constructed outside the reservoir on the east side and distinct from it. It will contain a connecting pipe between the inlet and outlet mains, so that during the period of cleansing out the reservoir the supply may be carried directly through without the medium of the latter.

19. *Main pipe.*—The main pipe leading to the town will be 7,370 feet in length and terminate at the junction of the Madras road. It will be 11 inches in diameter, and, laid at an inclination of four feet a mile, will discharge 47 cubic feet per minute. The upper end of the pipe will be fixed at a level of 436 + M.S.L. in the service reservoir. Full supply level in the reservoir will be maintained at 441.00 + M.S.L., and the inclination at which the main will actually be laid being at the rate of 13 feet a mile, gives an effective head at the end of that pipe of 17 feet for the purposes of distribution.

20. *Sub-mains.*—The two sub-mains, 7 inches each in diameter, will be connected by a breeches piece with the main, and will be carried down the Vethala Vencatachellam street, and the cantonment road to distances of 1,475 and 1,365 feet respectively. The several services will be connected by special castings to the main and sub-mains respectively.

21. *Fountain-hydrants.*—The description of fountain-hydrants to be used is given in the specification that accompanies this report.

22. *Details of supply.*—It is assumed that the demand for water will be made during the hours of 5 to 11 A.M. and 2 to 8 P.M. At the full demand supply of ten gallons per head of population, this will require that the main should discharge $\frac{100000}{360}$ gallons or nearly 280 gallons per minute. Its actual discharge will be 305 gallons per minute. The 8 inches inlet main when connected with the 11 inches outlet main for continuous supply has a nearly equal power of discharge, or 44 cubic feet per minute.

23. *Flushing drains, &c.*—For drain-flushing and street-watering purposes, the water-lift at the pumping-station may be in use to furnish a supply during those periods of the day when water is not being drawn off for drinking purposes. Hydrants are provided accordingly for this purpose.

24. If considered necessary the supply-pipe across the Dongal Cheruvu surplus channel may be carried on masonry piers instead of under the bed of the channel at an extra cost of about Rs. 2,000 over and above the estimating cost of the project of Rs. 75,000. The details of this arrangement are shown in plan No. II accompanying this report.

CUDDAPAH,
5th January 1885.

(Signed) R. R. E. DRAKE-BROCKMAN, Major, R.E.,
Executive Engineer, P.W.D.

No. 610.

Referred to the Public Works department for examination and report whether the proposed scheme should be approved and sanctioned.

FORT ST. GEORGE,
14th March 1885.

(Signed) E. F. WEBSTER,
Chief Secretary.

Memorandum by the ~~Secretary to Government~~ *Chief Engineer*, Public Works department, dated Ootacamund, 1st June 1885, No. 168 E.

In returning the papers relating to Major Drake-Brockman's Water-supply scheme for the town of Cuddapah, referred to the Public Works department under No. 374, dated 19th May 1885.

Financial endorsement, No. 610, dated 14th March 1885, the undersigned has the honor to forward copy of a letter on the subject from the Superintending Engineer, III Circle, and to state that he concurs generally in the views therein expressed.

2. With respect to paragraph 3 of the Superintending Engineer's letter, the undersigned is in favor of constructing the infiltration gallery across the river-bed, as proposed by Major Drake-Brockman.

3. With respect to paragraph 4 it is not possible to judge as to the necessity of protecting the pumping-station from floods, without full details as to the maximum height of water in the river, which have not been given. The point is one which can be decided hereafter.

4. With respect to paragraph 9, the undersigned concurs with the Superintending Engineer in considering it desirable to enlarge the service reservoir sufficiently to render it capable of holding two days' supply.

5. For raising the water out of the pumping-station well, Major Brockman proposes to use Messrs. Burgess and Key's improved water-lift, the cost of which he calculates, at site, including all charges, at Rs. 7,500. No provision for this outlay is contained in the estimate, the amount of which must be increased accordingly.

6. Subject to the foregoing remarks, the scheme is recommended for approval and sanction.

(Signed) J. SHAW-STEWART, Col., R.E.,
Secretary to Government, P.W.D.

To the Financial department, with copy of Superintending Engineer's letter, and the referred papers and plans returned.

ENCLOSURE.

Copy of letter from the Superintending Engineer, III Circle, No. 374, dated 19th May 1885.

In returning plans, report, &c., of Major Drake-Brockman, R.E., regarding the Boogga water supply project, I have the honor to state that the scheme generally is a very good one, and I would recommend it for sanction.

2. Major Brockman has taken the population at 10,000, whereas it appears that in 1881 it amounted to 19,000; and so water may be said to be required for 20,000. This error is rectified by another oversight, as he has inadvertently calculated the maximum discharge as for a day of 6 hours instead of for a day of 12 hours. The discharge required through the main ought to be $\frac{20,000 \times 10}{12 \times 60}$ = nearly 278 gallons per minute: the actual discharge will be 305 gallons.

3. It is proposed to construct an infiltration gallery diagonally across the river; this would increase the supply, but might tend to contamination of water. It would perhaps be better to puddle the sides of the spring channel, and conduct the water across the river in a pipe.

4. It will be necessary to protect the pumping well from floods.

5. From the pumping-station the water is led in a masonry conduit (surki plaster lined) for 3,840 feet up to the line of railway, and then carried in an 8 inches main into service reservoirs. The dimensions of the conduit are ample.

6. The 8 inches main enters the valve cistern and discharges into the reservoir, and from thence the water passes through a second pipe into 11 inches main.

7. The two mains are connected directly, so that the supply may be carried directly through without the medium of the service reservoir, when the latter is being cleaned or repaired.

8. The reservoir is as far as possible closed to light and air, the only opening being the man-hole in the centre-vaulted arch, left for purposes of inspection and cleaning.

9. The reservoir is intended to hold 175,000 gallons or less than one day's supply. It might perhaps be desirable to increase its capacity so as to hold two days' supply in case of accident to machinery or conduit. Major Brockman anticipates no accidents to machinery as the latter is so simple.

10. Twenty-one combined fountains and hydrants are proposed to facilitate supply to inhabitants several of them are endones where piping end. The dead ends of these should be supplied with scouring sluices.

ORDER—dated 6th July 1885, No. 248 M., Financial.

With his letter read above, the Collector of Cuddapah submits the plans and estimates of the scheme for the improvement of the water-supply of Cuddapah prepared by Major Drake-Brockman, R.E. The total estimate for the work, as drawn up by Major Brockman, amounts to Rs. 75,100, but the adoption of the Chief Engineer's suggestions in paragraphs 3, 4 and 5 of his memorandum read above, will raise this figure to over Rs. 87,300. The plans and estimates are approved and sanctioned, subject to the modifications proposed by the Chief Engineer.

2. It is no where stated under whose supervision this important work is to be executed. The Collector will report on the point.