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MADRAS RECORD OFFICE

Government of Madras

Public Works DEPARTMENT

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Read the following:—

No. 69 W.

No. 203.

MEMORANDUM.

THE following observations on certain works in the North Arcot district, which were inspected by the Chief Engineer for Irrigation in March last, are submitted for the information of Government.

2. *Supply Channel*—Head works.—The flood embankment in connection with the right wing of the dam across the Cheyair requires raising at and near the Poloor Tank. The revetment below the left wing has been built at too steep a slope, and some of it has fallen. At the foot of this revetment an apron about 9 feet wide should be laid to prevent scour, which would undermine the foundations. As a rule revetments, along the face of which there is a current, need such protection.

Head Sluice.—No shutters were visible: they are probably kept at a neighbouring village, but it is doubtful whether under that arrangement they would be found in their places when required, and should there be any difficulty on this point, it will be better to suspend them in their places at 2 or 3 feet above the silt, so that on the occurrence of a fresh they may be readily adjusted to the requirements of the circumstances.

Channel.—There is a good deal of silt in the first 200 yards or so, and the channel is very crooked.

At about three-fourths of a mile from the head there is a drop, the wings of which have been extended with rubble stone in chunam.

First Drop.

At about $1\frac{1}{2}$ miles there is an under tunnel out of repair, and a palmyrah aqueduct has been put up alongside for conveying tank water to fields to the right of the

Under Tunnel.

channel; the requisite repairs should be carried out before the next irrigation season, and prompt attention should be paid to such matters generally. A short distance below this a bowry or square well was being excavated immediately behind the right bank; unless carefully revetted it may be a source of danger to the channel, and it is a work which should have had the District Engineer's concurrence as to the details of the arrangements.

At $1\frac{1}{2}$ miles or a little lower down there is a second drop round which water has passed to the left, the ground being low.

Second Drop.

A stop bank is required, and this should be carried clear of the nunjah to ground above M.W.L. in the channel. Not far below this the bund of a tank comes up to right bank of channel; the bund is in very bad order, and the escape stands well up above the bund. The repairs necessary should be attended to.

At about 2 miles there is a third drop on the channel and a head sluice for the supply of a tank lying a short distance

Third Drop and Head Sluice.

below. Both works are modern and are not well designed to suit the circumstances. The wing returns of the drop are too short, and the sluice needs water wings in rear.

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At about 3 miles, opposite to the remains of a bridge or regulator of some kind, there is a small calingulah with seven upright stones of which the crest would seem to be high enough, without any damming thereabove, to allow of a full supply passing down the channel. The over-fall is 4 feet and the apron needs early repair. The wings are about 6 feet above crest. The discharge is into the tank which is supplied by the head sluice at drop No. 3. It appeared doubtful whether the dimensions of this surplus work are adequate.

At the north end of the same tank and apparently discharging into it there is in the channel bank a small calingulah of about 9 feet clear waterway and with a sluice vent. Some indifferently executed new stone revetment has been put up at the front wing returns. Here also there was formerly a bridge or regulating work on the channel. Another tank lies below the channel to the right, in continuation of the tank above-mentioned. About half a mile further down there is a sluice the design of which had no relation to the conditions of the site. It will be well to remove the upper 3 feet of the front and rear walls and to slope the earthwork of the bank properly. Hereabouts the channel bank is revetted on the interior slopes in an inconsecutive sort of way, and the object of the revetments is not apparent. Some turfing has also been done, which for want of rain has been hitherto a failure. Bushes were not cleared away before the turfing was done, and this should have been attended to.

A little further down there is an under tunnel which looks to need repair; the design of the east wings is inappropriate. The channel is here double banked.

A little lower down there is a patch of new revetment on the inside face of the left bank. It would appear as if the channel bank had here been breached by accumulation of water behind the left bank, and if so a revetment is useless, and an inlet is what is wanted.

The channel then enters a considerable cutting, and is crossed lower down by a bridge of about 12 feet span on the Poloor and Nachinteraccoil road.

This supply channel evidently intercepts a great deal of drainage from the country lying above it, and the means of disposing of surplus are clearly inadequate. What the area of drainage intercepted is does not appear from the atlas sheet, as many tanks lying near the channel are not marked thereon, and the exact line of the channel cannot in their absence be laid down, but it seems to be probable that this area is not less than 15 or 16 square miles, and if so about 2,500 cubic feet a second is the amount of surplus to be got rid of. Apparently the channel should be capable of carrying 4 feet of water ordinarily, and the crest of the surplus weirs should be at that height above the bed (after such adjustment of its slope as may be found desirable). The maximum water-level should not exceed 6 feet above the bed, as with that depth the velocity will be as great as the soil will stand, and the corresponding height of the banks should be 9 feet above bed. Consequently the depth of water to pass over the surplus weirs will be 2 feet, the discharge per foot $9\frac{1}{2}$ cubic feet

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a second, and the length required on the above supposition 263 feet, of which about 34 feet exist. The additional weirs should be so placed as to discharge into the several tanks the supply of which has been intercepted, and the lengths should be fixed approximately with reference to the areas draining into the channel in their neighbourhood. The sites for the several weirs may be selected, within the limits thus indicated, where the soil is most suitable, and the ground level as near to 4 feet above channel bed as may be.

An inlet in the left bank where the channel is double banked has already been intimated to be necessary by way of supplementing the under tunnel.

Mile and furlough stones are necessary; first, for convenience; 2ndly, as references for levels; 3rdly, for the specification of work to be done. The levels of all

Mile and Furlong Stones.

masonry works also should be noted thereupon.

Surplus Weir.—This has been lengthened from 59 feet to 250 feet, additions having been made at both ends of the old work. The drops are 3 feet on to first

Tank.

apron, 3 feet on to second apron, and 2 feet on to the lowest apron, which is of dry rubble. The stone used for the latter is much smaller than it should have been, especially as there is an abundance of large stone close at hand. It seems probable that after a little while a third masonry apron and a fourth drop will be necessary, the soil in rear of the lowest apron not being apparently hard, and the fall being considerable. The weir had just been whitewashed to obliterate the scribbling of herd boys and others, and so what the work was really like was not to be seen. The wing revetment has no backing, and the soil being cotton, its stability is not likely to be satisfactory.

New Sluice.—The design of the new sluice near the south end of the bund is faulty and not well adapted generally to the circumstances of the site. When the plan was submitted with the estimate for the tank repairs and improvements, the modifications required were noted thereon, but it appears that the work was carried out in anticipation of sanction, and consequently the defects were not remedied. It will now be necessary to construct a platform at or above F.T.L., which may be done either by throwing an arch across between the front wings so as to give a platform 3 feet wide as a maximum, or the same object may be attained by placing beam stones across in lieu of an arch, and this latter arrangement the Range Officer considered could be more readily carried out.

The earthwork of the bund has been raised 4 feet, and the revetment 3 feet. The old revetment is not in very good order, and the new work has, it is understood, no backing, and is otherwise not up to a reasonably good standard for such work, the stones not having been well packed and there being considerable spaces which ought to have been carefully filled in. The gibbet stones of the sluice near the north end of the bund are much below F.T.L., and if the head of the sluice be efficient a platform at F.T.L. whence to regulate the sluice should be provided. At the north end of the bund there is a calingulah, the crest wall of which has been raised nearly to the tops of the upright stones. Its length is 80 feet. There is a sluice under the right end and a high level channel in connection with the left end.

Gauge at Sluice.

A gauge at the low level sluice is requisite; the zero to correspond with the sluice sill.

3. The tank is said to have been repaired thirty-six years ago. The bund wants clearing, a good deal of raising in places, and the soil should be taken from the bed. There is no surplus weir; a pavement will meet the requirements.

Baghmapett Tank.

The revetment and a sluice also need repair.

4. A short distance from the bifurcation of the Vellore and Arnee roads there is a rather large tank, the greater part of which lies to the east of the latter road, but a portion of the bund and a calingulah are to the west of the road. The bund is in very bad order and needs thorough repair.

Maddemangalum or Yelavady Tank.

5. *Supply Channel* from Secar.—Head Sluice.—The shutters have rings at the top, and want two or three holes at intervals of a foot or so for the adjustment of the shutters when the river is in fresh, so that the full supply level in the channel may be allowed, but not exceeded. What this F.S.L. is to be should be marked on the rear wings (Circular No. 32). The front wing revetments of this sluice are indifferent. Gauges should be placed above and below the sluice.

Seesamangalum Tank.

The *Syphon tunnel* to carry irrigation water under the channel just below the head sluice is not in use, the masonry work having given way. The cistern drop walls are a good deal too low; their crests should be at the proper level of the small channel bed, and at the present level of the upper one this bed would be cut down and the soil would be washed into the tunnel and probably choke it.

Aqueduct, 1st Mile.—The masonry shows several small cracks, and the settlements to which they are due should have been prevented by careful construction in the first instance, for cracks even though of no importance in themselves often lead to deterioration, especially if tree seeds lodge in them.

Inlet, Right Bank.—This is just below the aqueduct, and being formed of dry stone revetment and paving, the latter at a level considerably above F.S.L. in channel, is not likely to stand long. Either the water will have to be run down a paved shoot which, if formed of carefully packed stone, might be stable; or it will need to be dropped over a crest wall on to a masonry apron, and then masonry wings will be required.

The Jaghiredar's aqueduct, which was built without permission and on a design which obstructed waterway, has been dismantled; if he wishes to reconstruct it he should be furnished with an appropriate design and estimate of quantities.

The channel is rocky throughout.

Tank.

There are a rough stone escape and a masonry calingulah at the north end; the former is not suitable to the site, the overfall being considerable.

There are some curious ends of bund hereabouts, and there have been two considerable changes made in the alignment of the bund at some former period. There is another calingulah further south, which being situated at a deep part of the tank, it is intended to close and to substitute a large weir at the north end. It

appears to be worth consideration whether it would not be better to close the gap by which the water from the escapes in the north return bund passes, and to construct a weir at the high ground beyond, especially if the soil there be found to be hard, and room enough can be obtained without much excavation in excess of the quantity of soil necessary for filling the gap.

6. *Anicut.*—This did not suffer much from the flood of 1874, although the trial was a severe one, for the water rose to 9 feet above the crest, and the springing

Cheyair Anicut Irrigation.

line of the bridge arches is very much below that level; indeed the arches must have been entirely submerged. The rough stone apron has been a good deal disturbed, but very little of the stone has been lost. It was intended to build another retaining wall at the edge of a cut stone apron (long stones) which appears to have been an addition to the original work, but on further consideration it has been deemed unnecessary to incur the expense, as a little underpinning will make this apron quite sound, and it has stood very well for a good many years. In repacking the rough stone apron it will be better to place its surface a foot or so lower than before at the junction with the masonry apron, and a foot lower still at the outer end. The stones should be packed with their length nearly vertical or at right angles to the slope of the apron.

7. *Main Channel.*—The spoil banks were originally very irregularly thrown up, and as a consequence they are at present* incapable of being used as a bridle path,

* March 1876.

added to which the wash from them into the channel is considerable. Advantage should be taken of the present opportunity, afforded by the extensive clearances in progress, to bring them into section on the inner slope and top, and the drainage of the latter should be away from the channel.

The channel apparently was not in the first instance cut to a full and regular width, or to the proper depth, and a good deal in the way of improvement of this kind was being carried out as repairs. It would have been better to provide for this under new works by a separate estimate, because then some points of importance would more readily have come under notice; and moreover the repair funds of the district are not adequate to the carrying out of anything more than very petty improvements which are not worth separately estimating for.

This channel receives the drainage of a considerable extent of upland, and more or less silt is thus brought into it. It is necessary that the area draining into the channel in the several sections or miles should be computed, and due provision made for the discharge of surplus. The arrangements of such works will depend upon the difference to be allowed between ordinary F.S.L. and M.W.L., which should not exceed 2 feet. There were several surplus weirs; but a Range Officer, understood to be Mr. Bevan, blocked them up, and so has left the channel without even the small and probably very inadequate safe-guard which it once possessed. The walls of these weirs should at once be cut down to ordinary F.S.L.

Where the channel water rises above ground level, and where there is no right bank it will, it is thought, be generally desirable to prevent submergence of lands where cultivated or in occupation by forming a small bank, about 1 foot above F.S.L., with material obtained from clearing; drainage can then be admitted at fixed points only, and at such points as may present favorable conditions, care being taken that

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the spaces reserved for such admission are in all cases of ample dimensions, so that there may be no considerable depth or rush of water.

The *Mookoor tank* is the first into which the main channel runs, and thereafter it enters and leaves a succession of tanks.

The *Chengadoo large tank* lies immediately above the channel, and discharges into the latter just below a bridge. The water passes down the channel into the *Chengadoo Naickenary tank*, which latter at the lower end has a weir which has been lengthened from 30 to 70 feet. It should be ascertained what the drainage area is, and whether the means of disposing of surplus are adequate; if not a weir just below the bridge should be given if the discharge of surplus at that point will do no harm to cultivated lands below; or it may be desirable to discharge the surplus of the large tank at the east rather than at the west end.

The *Coviloor tank* has been much enlarged. It has a small weir at the north end, and at the south end there is a comparatively new sluice of indifferent design.

8. The designs of most of the masonry works of this part of the country are bad, and they are made worse by the way the earthworks are joined to them. There is much need of exact sections of the ground and banks on which such works have to be built, or with which they are to be connected, and the water-levels should always be duly considered.

9. The main channel ends about $2\frac{1}{2}$ to 3 miles west of the Arcot and Wandiwash road. The right branch falls into the *Poorasay tank*, over the bund of which that road passes, and the left branch runs nearly on the water-shed between the Cheyair and the Cheaur to the Tetry tank.

10. An estimate had been framed for raising the F.T.L. about 2 feet and the bund 4 feet. In 1864 the small escape under the north tunnel at the south end of the bund was much crippled by raising a body wall 3 feet high on a line with the face wall of the tunnel. Had this wall been placed 3 or 4 feet distant on the tank side, it would have left the discharging power of the escape with a given depth of water passing over unimpaired, and, if this escape be retained, the wall should be so removed. The evidence is not very clear as to what was the former full level of this tank, and it is said that the upright stones at the tunnel escape have been buried in the crest wall. However this may be, it is probable that the former M.W.L. did not exceed the present F.T.L., and that the alteration of the escape so as practically to raise the M.W.L. considerably should not have been carried out without at the same time altering the level of the bund to correspond. Moreover alterations having for their object a material increase of the capacity of a tank are not works properly chargeable to ordinary repairs, but when considered desirable they should be brought forward for sanction as new works, and should be supported by proper information. The intended arrangements of the work under execution in anticipation of the sanction of the estimate, with a view to the safety of the tank which had been seriously endangered during the floods of 1874 owing to the inadequacy of the escapes, which inadequacy had been enhanced by the alterations above referred to, being under the circumstances more costly than was needful, certain modifications were

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considered desirable, and instructions were given to the District Engineer at once, in order that the work might be carried out accordingly. The estimate which had been submitted was returned shortly afterwards for revision.

The floor of the north tunnel escape and the corners of the abutments on the lower side require underpinning, and an additional apron (rough stone) about 12 feet wide should be added, the surface being placed 1 foot below that of the floor.

There is a road tunnel a little further south which acts as an escape and also as a head sluice to a high level channel. Its floor is about 1.77 feet below present F.T.L. The means of disposing of surplus require to be very largely increased, and the additional escape may, it is considered, take the form of a road dam, and it should be of sufficient length to restrict M.W.L. to 2 feet above F.T.L. The District Engineer was informed that an estimate for further raising the F.T.L. may be prepared and submitted for sanction on its merits, but that the work to be done at present should be confined to that necessary to make the tank safe with its present F.T.L.

In reconstructing the revetment a good backing should be provided, and the slope should be 1 to 1, as then the quantity of earthwork required will be much reduced, and this is of importance, seeing that soil has to be brought from a distance, the ground in rear of the bund being cultivated, and the tank water seldom falling low enough to allow of earth being obtained from the bed.

11. This channel runs through several tanks, and it seems to be probable that its share of the supply is less than it should be; for while the *Poorasay tank* which is under the other branch always gets an abundance of water, the tanks under the Tetry branch are not well supplied. With gauges at the heads of the branches and information as to their discharging capacity with given depths of water, the requisite detailed instructions for the management of the regulation may easily be drawn up.

Tetry Channel.

Veerapaukum Tank.

This has been recently repaired and is in fair order. The villagers complain of scarcity of water, and appear to interfere with the supply to tank slower down by

Nurmapullum Tank.

binding the regulating weir at the off-take of the channel from the tank. This was it is said repaired in 1870-71. The earthwork is in fair order, but the revetment is in a mess owing to its having no backing.

Kurumboor Tank.

The supply channel for this has a head sluice which has been built in a surplus weir of the tetry channel, and has entirely closed it. This was done in 1874. The

Melmar Tank.

design of the sluice is bad, the work indifferent, and apparently the chunam was not good. The proceedings were altogether improper, and sanction to the estimate must have been given on inadequate information. Rear water-wings and a lower floor $2\frac{1}{2}$ feet below the sluice floor are necessary. Just above the sluice there is a set against the bank which can be remedied by cutting away a little decayed rock and by revetting.

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This is the upper tank.* The bund is in fair order; revetment middling. The wings of the regulating weir at the north end of the tank, and there is no other escape, are several feet lower than the bund. The water passes thence into the Tetry tank east of the road, and the channel turns at right angles after passing the road, the bank being revetted. Probably a pavement is necessary over the bed of the channel from the road tunnel to the end of the revetment, as the action of the water must sometimes be rather violent.

* Tetry Tank.
* Of that name.

12. There is a rough sketch map showing the tanks connected with the Cheyair anicut channels and those in the neighbourhood which have not as yet been supplied therefrom. This map, imperfect as it is, is of considerable value, but what is much wanted is a connected set of levels of the whole system of irrigation, and then a complete knowledge of the circumstances and requirements of the several parts of the system. As a foundation for the investigations, accurate general levels are necessary, and arrangements have been made for obtaining these. Formerly levels were neither checked, connected, nor properly recorded, and the frequent changes in the department from large divisions to districts,* then to smaller divisions,† and then again to districts‡ have rendered it very difficult to find out what has become of those technical records which at some time or another must have existed.

* 1857.
† 1863.
‡ 1872.

The levels of all the tanks—F.T.L. and level of lowest sluice sill—which are now supplied, or which it may be proposed to supply of the several sections of the main and branch channels are necessary as an essential preliminary to the proper management of the works, and to the determination of the way in which further investigations for the improvement or efficiency of particular parts of the works should be carried out. As soon as the general levels have been run and the values of bench marks determined, these levels of the Cheyair anicut system should be proceeded with, and at the same time such surveys as will allow of a fairly accurate sketch map being drawn up should be made, unless the Revenue Survey should be able to afford the information required. Applications from villages to be supplied from the anicut are frequent and are made by villagers of the Chingleput as well as the North Arcot district, so that it is probable that a material extension of the usefulness of the anicut will yet be found feasible. The accounts of past expenditure and of revenue resulting therefrom have yet to be compiled, and as yet there has been no return prepared throwing any light upon the subject. The results shown will be of value, not only as exhibiting the value of these works, but as a guide to a decision as to whether the Cheyair can be further turned to account as a source of irrigation for lands in South Arcot on the one hand, and by the construction of another anicut below the junction of the Sreaur near Mambaukum, as has been strongly urged.

13. Instructions were issued some years ago for a careful examination and analysis of the water-supply of the Cheyair, as deducible from the registers kept at the anicut, to be made. These instructions, owing to frequent changes in the charge of the district, appear for a time to have been lost sight of, and the present District

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Engineer has had much to occupy his time and attention since he took charge some three years ago, but he has promised shortly to make an opportunity for doing this necessary work not only for the Cheyair but for the Palar also.

14. The way in which the repairs to the low level sluice with improved arrangements at the head are being carried out will do very well. As a rule, it is desirable to have wider tunnels for the sluices of large deep tanks; but, as the flooring and the side walls, where lined with stone, were in good order, it was not necessary in this case to make any alteration. As the outlet from the tunnel into the rear cistern is low, a ventilator 8 or 9 inches in diameter may with advantage be placed a short distance above the cistern wall, the mouth being placed 2 or 3 inches above the rear slope of the bund.

Dusi Mamdur Tank.

Special care should be taken to rake out the joints of all brickwork which is to be plastered. The failure or falling off of plaster, which is so common, is due to the neglect of this essential preliminary, and this raking out of the joints should be done a few days after the brickwork is built, and then it can be easily and effectually performed.

With regard to the proposed rearrangement of the surplus works (calingulals) of this tank, it appears that the conditions are as follow:—

Disposal of surplus.

1st.—It is said that the south weir crest is 5.80 feet below proper full tank level—a level, however, which has not at least in recent years been attained. That similarly the crest of the northern weir is about 2.75 feet below F.T.L.; that the water in 1872 rose to 7 feet above the crest of the south weir, or to 1.20 feet above F.T.L.

2nd.—The full length of the south weir is 234 feet.

“ effective do. do. is 133 „
“ full length of the north weir is 119 „
“ effective do. do. is 89 „

There being no information as to the tail water levels in the flood of 1872, any accurate calculation of the actual discharge then is impracticable, but from a rough calculation which has been made it appears that this discharge was—

Between stones, south weir, cubic feet a second	...	...	...	4,134
Above do. do. do.	...	...	...	1,034
Between stones, north do. do.	...	...	...	1,646
Above do. do. do.	...	...	...	286
Total cubic feet a second	...	...	...	7,100

The area of the catchment basin is said to be 85 square miles, and the above discharge is therefore equivalent to 2.46 inches from the whole area.

3rd.—On the other hand Ryves' formula with a co-efficient of—

400 gives a discharge of 7,732 cubic feet.
450 do. do. of 8,698 „

equivalent to 2.87 and 3.23 inches respectively from the whole area. It does not appear that the larger of these quantities is less than should be deemed possible, and in order to err, if at all, on the safe side, the maximum quantity coming into the tank may be assumed to be 9,000 cubic feet a second.

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4th.—A tank of this size must act to a material extent as a flood moderator, and it is very probable that some of the difference between the discharge as calculated from the depth on the weirs and by the formula is due to this circumstance. On the atlas sheet the area of the tank appears to be about $5\frac{3}{4}$ square miles, or 17,811 millions of square yards, so for every yard of depth this area would absorb 17,811 millions of cubic yards, and this quantity in a day represents 1,855 cubic feet a second may be assumed to be absorbed in raising the tank above the F.T. level one yard.

5th.—According to these data then $9,000 - 2,000 = 7,000$ cubic feet a second would be the maximum quantity to be disposed of if M.W.L. were to be fixed at one yard above F.T.L. It has been already mentioned that the water rose to 7.0 — 5.80 = 1.20 feet above F.T.L. in the flood of 1872, and therefore a maximum water level so fixed would be 1.80 feet higher than the maximum level of that year.

6th.—The full length of the two escapes would, with the upright stones removed, be effective, and would be $353 \text{ feet} - \frac{7,000}{853} = 19.83$ cubic feet a second per foot of weir, which with a clear over-fall would correspond to a head of 39 inches. There would be a clear over-fall at the south weir with the crest at any level at or above 1.80 below F.T.L. Assuming the full discharge to require 4 feet of water on the aprons, (first) at F.T.L. it remains to be seen what area of sluice vent would reduce the M.W.L. from $3\frac{1}{4}$ to 3 feet above F.T.L., and it is thought that, if circumstances will allow, it will be better to put the sluices at the north rather than at the south weir.

The south weir with 3 feet going over will discharge	
$234 \times 17.458 =$	4,085 cubic feet.
The north weir under similar conditions will discharge (119 feet).	1,886
	5,971

leaving 1,029 cubic feet a second to be disposed of by sluice vents. The head available is $3 - 1.25 = 1.75$ feet, and V may be taken as $6\frac{2}{3}$. The area of opening required will then be 154 square feet. Also the height of the crest wall being 2.75 feet, if vents 4 feet wide be provided, each vent will measure 11 square feet, and 14 will be the number of vents. In this position open vents with self-acting shutters working on a horizontal axle would be unobjectionable, for the leakage would be utilized, and if the shutters be designed to open with the water at 1 foot above F.T.L., there will be plenty of margin to ensure opening before the M.W.L. is reached.

If the level of the tail water should approximate to 3 feet rather than 4 feet above apron, the discharge over the north weir will be 2,053 cubic feet, and through the sluices 1,287 or together 3,340 cubic feet against 2,915 as before calculated.

The conditions* prescribed for the vent shutters will be nearly satisfied if the lower half be made 13.3 and the upper half 19.7 inches.

* To open at 12 inches above F.T.L.

OOTACAMUND,
27th April 1876.

(Signed) JOHN MULLINS, Lt.-Col., R.E.,
Chief Engineer for Irrigation.

To the Secretary to Government, Public Works Department.

*Proceedings of the Madras Government, Public Works Department,
13th June 1876.*

No. B.

Memorandum of Specification for reconstructing revetment of Poorasay Tank.

The alignment of the new revetment should be laid out as straight as possible or with curves as flat as possible. This may best be done by putting up bamboos at 15 or 20 feet intervals to denote the toe of the revetment at top of foundations.

2. The top of the foundations will for the deeper part of the tank be at 17.77,* or 6 feet below F.T.L., and the foundations will be 3 feet deep and 3 feet wide, the lower half being 1 foot in advance of the upper half.

* On datum of Tank sections, dated 10th August 1875.

It is desirable that the toe of the revetment should be about 6 feet inside the line where the present flat slope of the bund cuts the 17.77 level; but at a bund of which the slope varies much, no fixed specification can be made as regards this point.

3. The excavation for the foundations should be taken out as shown, the cutting below 15.27 being exactly 3 feet wide. If, as is not improbable, the soil at bottom of trench should be found to be soft, a firm base for the foundations must be prepared in the following way:—The bottom of the trench to be covered with small stone in lumps of about the size of the closed fist ($3\frac{1}{2} \times 4\frac{1}{2}$ inches) in a single layer, and this stone to be driven down with heavy rammers not more than 4 inches in diameter; a second layer to be then laid down and similarly rammed down, and similar layers to be added until no more can be driven down.

Then the lower 18 inches of the foundation to be laid with carefully packed stone, all the interstices being filled in with small stone and rammed in tight. Next the upper half of the foundations will be laid in the same manner; the soil to be replaced in the trench in front in 6-inch layers and thoroughly consolidated with the heavy rammers above-mentioned; also at the back of this part of the foundation small stone to be rammed into the soil to make a firm base for the revetment backing.

4. The revetment stone is to be laid with the joints at right angles to the slope, and the top of the foundations is to be prepared accordingly, something like the skew back of a bridge to give the revetment the proper cant.

5. The backing to the revetment will be 1 foot in thickness; it will be composed of small stone 2 to $2\frac{1}{2}$ inches in diameter, coarse gravel, and enough gravelly soil to bind the coarser materials together. It is to be mixed, watered, and thoroughly consolidated with rammers in the way that concrete is laid down, enough water being added to bring moisture up to the surface when beaten with the rammers. The backing and revetment are to be carried up together and equally, the backing being filled in and consolidated directly after each course of revetment is laid and before a second course is put down.

6. The revetment is to be 2 feet in thickness (measured at right angles to the slope). It is to be built of stone of as regular shape as may be procurable.

- (a.)—All stones must be laid with their length perpendicular to the face.
- (b.)—As many stones as possible should be 2 feet in length, or, in other words, through stones.
- (c.)—Every fifth stone at least must be a through stone.
- (d.)—None of the face stones must be less than 18 inches in length.
- (e.)—Every stone must be so bedded as to be firm and not liable to move when trodden on.

This will be the case if small stone be used as packing where necessary.

- (f.)—There must be no open spaces anywhere of more than an inch in width; all spaces in the face work must be filled with small stone driven in with the blunt end of crowbars; not merely bits of stone placed so as to hide the cavity and capable of being picked or kicked out, but stones fairly filling the cavities must be used and must be driven in so as to be with difficulty picked out with a crowbar.

- (g.)—By properly ramming the backing up to the back of the stone and into all the irregularities of the rear face of the revetment a perfectly firm support will be afforded, and the revetment will serve its intended purpose and will require no repairs for very many years.

(h.)—The old slope of the bund at the toe of the revetment is to be made up to its original form where temporarily removed for laying the foundations, and this is to be done as soon as the revetment has been built up to the required level. This fore-shore is then to be pitched (covered) with stone which is to be rammed in; the irregular stone which may be useless for the revetment will do very well for this pitching which is intended to prevent the soil which covers the revetment foundations from being washed away.

(j.)—All earthwork required to make up the bund to section, behind the revetment and backing, must be rammed perfectly hard in their layer.

(k.)—When the revetment and its backing and the earthwork in rear have been completed to the section intended, a small side ridging of earth as shown should be placed over the revetment and backing to prevent any drainage from the road finding its way into the revetment or behind it. The surface of the road should be 3 or 4 inches higher at the side ridging than at the rear edge, so that all rain water may flow to the rear.

7. When the flat slope of the interior comes high up the bund, and when the tank is comparatively shallow, the top of the foundations of the revetment may be higher than the level shown in the working section. There may be places also where the foundations may have to be placed lower. Whatever the circumstances, the alignment of the revetment should be so made that the several tanks may fit well together. Thus for every foot that the foundations may be placed lower they must be advanced 1 foot to the front, and for every foot higher they must be retired 1 foot towards the bund.

CAMP AT PENNAGUR,
21st March 1876.

(Signed) JOHN MULLINS, Lt.-Col., R.E.,
Chief Engineer for Irrigation.

To the District Engineer, North Arcot.

No. 204.

ORDER THEREON, 13th June 1876, No. 1,462.

IRRIGATION, No. 15.

THE foregoing memorandum will be communicated [to the District Engineer, North Arcot, for information and guidance.

2. The observations of the Chief Engineer for Irrigation show that the past management of some of the Irrigation Works admits of improvement, and that there is a good deal to be done for the safety and efficiency of the works, especially in the very important matter of providing adequate means of disposing of drainage.

3. The improvement and extension of the irrigation under the Cheyair anicut will, it is hoped, make steady progress when the levels needed to obtain proper data on which to work have been taken. The accounts of past expenditure and of the revenue derived from these works are necessary to a correct apprehension of their value, and as a guide to the determination of other proposed schemes for further utilizing the Cheyair as a source of irrigation.

(True Extract.)

Colonel,

Offg. Under Secy. to Govt., P.W.D.

To the District Engineer, North Arcot.
" Revenue Department.
" Chief Engineer for Irrigation.
Ed. E. C. Shunker.
Square Copies

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Memorandum of Specification for reconstructing pavement of Poorasay Tank.

1. The alignment of the new pavement should be laid out as straight as possible or with curves as flat as possible. This may best be done by putting up bamboos at 15 or 20 feet intervals to denote the toe of the pavement at top of foundations.

2. The top of the foundations will for the deeper part of the tank be at 17.77 or 6 feet below F.T.L. and the foundation will be 3 feet deep and 3 feet wide. The lower half being 1 foot in advance of the upper half.

It is desirable that the toe of the pavement should be about 6 feet inside the line where the present flat slope of the bund cuts the 17.77 level; but at a bund of which the slope varies much no fixed specification can be made as regards this point.

3. The excavation for the foundations should be taken out as shown, the cutting below 15.27 being exactly 3 feet wide. If as is not improbable the soil at bottom of trench should be found to be soft, a firm base for the foundations must be prepared in the following way. The bottom of the trench to be covered with small

stone

*on datum of
Tank section
dated 16 Aug 1875

stone in lumps of about the size of the closed fist ($3\frac{1}{2} \times 4\frac{1}{2}$ inches) in a single layer, and this stone to be driven down with heavy rammers not more than 4 inches in diameter. A second layer to be then laid down and similarly rammed down and similar layers to be added until no more can be driven down.

Then the lower 18 inches of the foundation to be laid with carefully packed stone, all the interstices being filled in with small stone and rammed in tight. Next the upper half of the foundations will be laid in the same manner; the soil to be replaced in the trench in front in 6 inch layers and thoroughly consolidated with the heavy rammers above mentioned; also at the back of this part of the foundation small stone to be rammed into the soil to make a firm base for the revetment backing.

The revetment stone is to be laid with the joints at right angles to the slope & the top of the foundations is to be prepared accordingly something like the skew bank

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back of a bridge to give the revetment the proper cant.

5. The backing to the revetment will be one foot in thickness; it will be composed of small stone 2 to $2\frac{1}{2}$ inches in diameter, coarse gravel and enough gravelly soil to bind the coarser materials together. It is to be mixed, watered and thoroughly consolidated with rammers in the way that concrete is laid down, enough water being added to bring moisture up to the surface when beaten with the rammers. The backing and revetment are to be carried up together and equally, the backing being filled in and consolidated directly after each course of revetment is laid and before a second course is put down.

6. The revetment is to be 2 feet in thickness (measured at right angles to the slope). It is to be built of stone of as regular shape as may be procurable.

- (a) all stones must be laid with their length perpendicular to the face;
- (b) as many stones as possible should be 2 feet in length or in other words through stones;
- (c) every fifth stone at least must be a through stone;
- (d) none of the face stones must be less than 18 inches in length;
- (e) every stone must be so bedded as to be firm and not liable to move when trodden on.

This

This will be the case if small stones are used as packing where necessary.

(1) There must be no open spaces any where of more than an inch in width - all spaces in the face work must be filled with small stone driven in with the blunt end of crowbars - not merely bits of stone placed so as to hide the cavity and capable of being picked or kicked out, but stones fairly filling the cavities must be used and must be driven so as to be with difficulty picked out with a crowbar.

(2) by properly ramming the backing up to the back of the stone and into all the irregularities of the rear face of the revetment a perfectly firm support will be afforded and the revetment will serve its intended purpose and will require no repairs for very many years.

(3) the old slope of the bund at the toe of the revetment is to be made up to its original form where temporarily removed.

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removed for laying the foundations and this is to be done as soon as the revetment has been built up to the required level. This foreshore is then to be pitched (covered) with stone which is to be rammed in. The irregular stone which may be picked for the revetment will do very well for this pitching which is intended to prevent the soil which covers the revetment foundations from being washed away.

(4) All earthwork required to make up the bund to section behind the revetment and backing must be rammed perfectly hard in their layer.

(5) When the revetment and its backing and the earthwork in rear have been completed to the section intended, a small side ridging of earth as shown should be placed over the revetment and backing to prevent any drainage from the road finding its way into the revetment or behind it. The surface of the road should be 3 or 4 inches higher at the side ridging than at the rear edge so that all rain water may flow to the rear.

7. When the flat slope of the interior comes high up the bund and when the bank is comparatively

paratively shallow the top of the foundations of the revetment may be higher than the level shown in the working section. There may be places also where the foundations may have to be placed lower. Whatever the circumstances the alignment of the revetment should be so made that the several parts may fit well together. Thus for every foot that the foundations may be placed lower they must be advanced 1 foot to the front and for every foot higher they must be retired one foot towards the front.

Camp at Pennagar
21st March 1876

Sgt John Mullins
Lt. Colonel R.R.
Chief Engineer for Irrigation.

To The District Engineer
North Arcot

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No 69.77

Memorandum

The following observations on certain works in the North Arcot District, which were inspected by the Chief Engineer for Irrigation in March last, are submitted for the information of Government.

Polur Tank. 2. Supply Channel - Head Works.

The flood embankment in connection with the right wing of the dam across the Cheyaur requires raising at and near the junction with the masonry. The revetment below the left wing has been built at too steep a slope, and some of it has fallen. At the foot of this revetment an apron about 9 feet wide should be laid to prevent

scour, which would under-
-mine the foundations. As a
rule revetments, along the
the face of which there is
a current, need such pro-
tection.

Head sluice - No shutters
were visible. They are probably
kept at a neighbouring village,
but it is doubtful whether
under that arrangement
they would be found in their
places when required, and
should there be any difficulty
on this point, it will be
better to suspend them in
their places at 2 or 3 feet
above the sill, so that on
the occurrence of a fresh
they may be readily ad-
-justed to the requirements
Channel. There is a good

deal of silt in the first 200
yards or so, and the channel
is very crooked.

1st drop.

At about $\frac{3}{4}$ of a mile from
the head there is a drop, the
wings of which have been
extended with rubble stone
in chunnam.

under tunnel

At about $1\frac{1}{8}$ miles there is an
under tunnel out of repair
and a palm-leaf aqueduct
has been put up alongside
for conveying tank water
to fields to the right of
the channel. The requisite
repairs should be carried
out before the next irrigation
season, and prompt attention
should be paid to such
matters generally. A short
distance below this a bowry
or square well was being
excavated immediately behind

the right bank - unless carefully
revetted it may be a source
of danger to the channel,
and it is a work which
should have had the District
Engineer's concurrence as
to the details of the arrange-
ments.

At $1\frac{1}{2}$ miles or a little lower 2^d drop.
down there is a second drop
round which water has
passed to the left the ground
being low. A stop bank is
required, and this should
be carried clear of the
singah to ground above M.W.L.
in the channel. Not far below
this the bund of a tank comes
up to right bank of channel.
The bund is in very bad
order and the escape stands
well up above the bund. The
repairs necessary should

3^d drop and
head sluice.

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be attended to.
At about 2 miles there is a
3^d drop in the channel and
a head sluice for the supply
of a tank lying a short dis-
tance below. Both works are
modern and are not well de-
signed to suit the circumstances.
The wing returns of the drop
are too short and the sluice
needs water wings in rear.

1st surplus
calingulah.

At about 3 miles, opposite
to the remains of a bridge
or regulator of some kind,
there is a small calingulah
with 7 upright stones of which
the crest would seem to be
high enough, without any
damming there above, to allow
of a full supply passing
down the channel. The over-
fall is 4 feet and the apron
needs early repair. The wings

are about 6 feet above crest.
The discharge is into the tank
which is supplied by the
head sluice at drop No 3.
It appeared doubtful whether
the dimensions of this surplus
work are adequate.

At the north end of the same 2^d surplus
tank and apparently dis- calingulak.
charging into it there is in
the channel bank a small
calingulak of about 9 feet
clear waterway and with a
sluice vent. Some indifferently
executed riv stone revetment
has been put up at the front
wing returns. Here also there
was formerly a bridge or
regulating work on the
channel. Another tank lies
below the channel to the
right, in continuation of
the tank above mentioned.

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About half a mile further down
there is a sluice the design of
which had no relation to the
conditions of the site. It will
be well to remove the upper
3 feet of the front and rear
walls and to slope the earth
work of the bank properly.
Hereabouts the channel bank
is revetted on the interior
slopes in an inconsecutive
sort of way, and the object
of the revetments is not
apparent. Some turfing has
also been done which for
want of rain has been hitherto
a failure. Bushes were not
cleared away before the turf-
ing was done, and this should
have been attended to.

Under tunnel. A little further down there is
an under tunnel which looks
to need repair, the design of

The east wing is inappropriate.
The channel is here double
banked.

A little lower down there is
a patch of new revetment
on the inside face of the left
bank. It would appear as if
the channel bank had here
been breached by accumu-
lation of water behind the
left bank, and if so a revet-
ment is needless, and an inlet
is what is wanted.

The channel then enters a
considerable cutting and
is crossed lower down by
a bridge of about 12 feet
span on the Polar and
Kachinteracoib road.

This supply channel evidently *Provision*
intercepts a great deal of *for inland*
drainage from the country *drainage*
lying above it, and the means

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of disposing of surplus are
clearly inadequate. What the
area of drainage intercepted
is does not appear from the
Atlas sheet, as many tanks
lying near the channel are
not marked thereon, and the
exact line of the channel can
not in their absence be laid
down, but it seems to be pro-
bable that this area is not
less than 15 or 16 square miles,
and if so about 2500 cubic
feet a second is the amount
of surplus to be got rid
of. Apparently the channel
should be capable of carry-
ing 4 feet of water ordinarily
and the crest of the surplus
weirs should be at that height
above the bed (after such
adjustment of its slope as
may be found desirable)

The maximum water level should not exceed 6 feet above the bed, as with that depth the velocity will be as great as the soil will stand, and the corresponding height of the banks should be 9 feet above bed. Consequently the depth of water to pass over the surplus weirs will be 2 feet, the discharge per foot $9\frac{1}{2}$ cubic feet in second, and the length required on the above supposition 263 feet, of which about 34 feet exist.

The additional weirs should be so placed as to discharge into the several tanks the supply of which has been intercepted, and the lengths should be fixed approximately with reference to

the areas draining into the channel in their neighbourhood. The sites for the several weirs may be selected, within the limits thus indicated, where the soil is most suitable, and the ground level as near to 4 feet above channel bed as may be.

An inlet in the left bank where the channel is double banked has already been intimated to be necessary by way of supplementing the under tunnel.

mile and four long stones. Miles and furlong stones are necessary, first for convenience, 2ndly as references for levels, 3rdly for the specification of work to be done. The levels of all masonry works also should be noted thereupon.

Surplus weir. This has been Tank
lengthened from 59 feet to
250 feet, additions having
been made at both ends
of the old work. The drops
are 3 feet on to 1st apron, 3
feet on to 2nd apron, and
2 feet on to the lowest apron,
which is of dry rubble. The
stone used for the latter
is much smaller than it
should have been, especially
as there is an abundance
of large stone close at
hand. It seems probable
that after a little while a
3rd masonry apron, and a
fourth drop will be necessary.
The soil in rear of the
lowest apron not being
apparently hard, and the
weir had just been whitewashed

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to obliterate the scribbling
of head boys and others, and
so what the work was really
like was not to be seen. The
wing pavement has no
backing and the soil being
cotton, its stability is not
likely to be satisfactory.
New sluice. The design
of the new sluice near the
south end of the bend is
faulty, and not well adapted
generally to the circumstances
of the site. When the plan
was submitted with the
estimate for the tank re-
pairs and improvements required
the modifications required
were noted thereon, but
it appears that the work
was carried out in antici-
pation of canals and
consequently the defects

were not remedied. It will
now be necessary to con-
struct a platform at or
above F.T.L. which may be
done either by throwing an
arch across between the
front wings so as to give
a platform 3 feet wide
as a maximum, or the
same object may be attained
by placing beam stones
across in lieu of an arch,
and this latter arrangement
the Range Officer considered
could be more readily car-
ried out.
The earth work of the bind
has been raised 4 feet and
the revetment 3 feet. The
old revetment is not in
very good order and the new
work has, it is understood,
no backing and is otherwise

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not up to a reasonably good
standard for such work, the
stones not having been well
packed and there being con-
siderable spaces which ought
to have been carefully filled in.
The gibbet stones of the sluice
near the north end of the
bund are much below F.T.L.,
and if the head of the sluice
be efficient a platform at
F.T.L. whence to regulate the
sluice should be provided.
At the north end of the bund
there is a calingulak, the
crest wall of which has been
raised nearly to the tops
of the upright stones. Its
length is 80 feet. There is a
sluice under the right end,
and a high level channel
in connection with the left
end.

A gauge at the low level
since is requisite, the zero
to correspond with the sluice
 sill. Gauge at
sluice.

3. The tank is said to ^{ma} ~~Bashampett~~
have been repaired 36 years
ago. The bund wants
clearing, a good deal
of raising in places, and
the soil should be taken
from the bed. The revetment
and a sluice also need
repair. There is no surplus
water; a pavement will meet
the requirements.

4. A short distance from Maddur
the bifurcation of the Vellore ^{luna or Gilem} Tank
and Arne roads there is
a rather large tank, the
greater part of which lies
to the east of the latter
road, but a portion of
the bund and a cabingulah

Sesamangalum
Tank

are to the west of the road.
The bund is in very bad
order and needs thorough
repair.
5. Supply channel from
Secar. Head sluice. The
shutters have rings at
the top, and want 2 or 3
holes at intervals of a foot
or so for the adjustment
of the shutters when the
river is in fresh, so that
the full supply level in
the channel may be allowed,
but not exceeded. What
this F.S.L. is to be should
be marked on the rear
wings (Circular No. 32). The
front wing revetments of
this sluice are in different
ganges should be placed
above and below the sluice.
The cyphon tunnel to carry

irrigation water under the
channel just below the head
since it is not in use, the
masonry work having
given way. The cistern
drop walls are a good
deal too low; their crests
should be at the proper
level of the small channel
bed, and the present level
of the upper one, this bed
would be cut down and
the soil would be washed
into the tunnel and pro-
bably choke it.
Aqueduct 1st mile. The
masonry shows several
small cracks and the
settlements to which they
are due should have been
prevented by careful con-
struction in the first instance,
for cracks even though at

no importance in themselves
often lead to deterioration,
especially if tree seeds lodge
in them.
Inlet right bank. This is
just below the aqueduct
and being formed of dry
stone pavement and paving
the latter at a level considerably
above F.S.L. in channel
is not likely to stand long.
Either the water will have
to be run down a paved
shoot which if formed
of carefully packed stones
might be stable; or it will
need to be dropped over a
crest wall on to a masonry
apron and then masonry wings
will be required.
The fashions aqueduct
which was built without per-
mission, and on a design which
created waterway has

been dismantled: if he wishes
to reconstruct it he should
be furnished with an appro-
priate design and estimate
of quantities.

The channel is rocky throughout.
There are a rough stone Tank
escape and a masonry calin-
gulah at the north end; the
former is not suitable to
the site, the overfall being
considerable.

There are some curious ends
of bund hereabouts, and
there have been two considerable
changes made in the alignment
of the bund at some former
period.

There is another calingulah
further south, which being
situated at a deep part of the
tank it is intended to close
and to substitute a large
weir at the north end. It appears

Cheyair
ancient
Irrigation.

to be worth consideration whether
it would not be better to close
the gap by which the water
from the escapes in the north
return bund passes, and
to construct a weir at the
high ground beyond, especially
if the soil there be found to
be hard, and room enough
can be obtained without much
excavation in excess of the
quantity of soil necessary
for filling the gap.
This did not
suffer much from the flood
of 1874 although the trial was
a severe one, for the water
rose to 9 feet above the crest
and the springing line of the
bridge arches is very much
below that level, indeed the
arches must have been entirely
submerged. The rough stone

apron has been a good deal disturbed, but very little of the stone has been lost. It was intended to build another retaining wall at the edge of a cut stone apron (long stones) which appears to have been an addition to the original work, but on further consideration it has been deemed unnecessary to incur the expense, as a little underpinning will make this apron quite sound, and it has stood very well for a good many years. In repacking the rough stone apron it will be better to place its surface a foot or so lower than before at the junction with the masonry apron, and a foot lower still at the outer end. The stones should be packed with their length nearly vertical

March 1876.

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or at right angles to the slope of the apron. The Main Channel. The spoil banks ^{were} originally very irregularly thrown up, and as a consequence they are at present incapable of being used as a bridle path, added to which the wash from them into the channel is considerable. Advantage should be taken of the present opportunity, afforded by the extensive clearances in progress, to bring them into section on the inner slope and top, and the drainage of the latter should be away from the channel. The channel apparently was not in the first instance cut to a full and regular width, or to the proper

depth, and a good deal in
the way of improvement of
this kind was being carried
out as repairs. It would
have been better to provide
for this under new works
by a separate estimate, be-
cause then some points of
importance would more
readily have come under
notice, and moreover the
repair funds of the District
are not adequate to the
carrying out of anything more
than very petty improvements
which are not worth separately
estimating for.
This channel receives the
drainage of a considerable
extent of upland, and more
or less silt is thus brought
into it. It is necessary that the
area draining into the channel
in the several sections of miles

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should be computed, and
due provision made for the dis-
charge of surplus. The arrange-
ments of such works will de-
pend upon the difference to be
allowed between ordinary F.S.L.
and M.W.L., which should not
exceed 2 feet. There were several
surplus weirs, but a Range
Officer understood to be Mr
Bryan, blocked them up, and
so has left the channel with-
out even the small and
probably very inadequate
safe guard which it once pos-
sessed. The walls of these weirs
should at once be cut down
to ordinary F.S.L.
Where the channel water rises
above ground level, and
where there is no right bank
it will, it is thought, be
generally desirable to prevent

submergence of lands where
cultivated or in occupation
by forming a small bank
about 1 foot above F.S.L.
with material obtained from
clearing drainage can then
be admitted at fixed points
only, and at such points
as may present favourable
conditions, care being taken
that the spaces reserved for
such admission are in
all cases of ample dimensions
so that there may be no considerable
depth or rush of water.
The Moakoor tank is the first
into which the main channel
runs, and thereafter it enters
and leaves a succession of
tanks.
The Chengados large tank lies
immediately above the channel,
and discharges into the latter

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just below a bridge. The water
passes down the channel into
the Chengados Stationary tank,
which latter at the lower end
has a weir which has been
lengthened from 30 to 70 feet.
It should be ascertained what
the drainage area is, and whether
the means of disposing of
surplus are adequate, if not
a weir just below the bridge
should be given if the discharge
of surplus at that point will
do no harm to cultivated
lands below. Or it may be
desirable to discharge the
surplus of the large tank
at the back rather than at
the west end.
The Loviloor tank has been
much enlarged. It has a small
weir at the north end, and at
the south end there is a com.

paratively new sluice of indif-
ferent design

8. The designs of most
of the masonry works of
this part of the country
are bad, and they are made
worse by the way the earth
works are joined to them.
There is much need of each
section of the ground and
banks on which such works
have to be built or with
which they are to be connected,
and the water levels should
always be duly considered.

9. The main channel ends
about $2\frac{1}{2}$ to 3 miles west of
the Great and Wandiwash
road. The right branch falls
into the Poraday tank, over
the bund of which that road
passes, and the left branch
runs nearly on the watershed

Designs of
masonry works
of this part of
the country.

Bifurcation
of main Chan-
nel.

Poraday
Tank.

16
between the Cheyair and the
beyond to the Tetty tank. An
estimate had been
framed for raising the F.F.
about 2 feet and the bund
4 feet. In 1864 the small
escape under the north
tunnel at the south end of
the bund was much crippled
by raising a body wall 3
feet high on a line with the
face wall of the tunnel. Had
this wall been placed 3 or 4
feet distant on the tank side,
it would have left the discharging
power of the escape with a
given depth of water passing
over unimpaired; and if this
escape be retained the wall
should be so removed. The
evidence is not very clear as
to what was the former full
level of this tank, and it is said
that the upright stones at the

tunnel escape have been buried
in the creek wall. However this
may be it is probable that the
former M. W. I. did not exceed
the present P. I. I. and that
the alteration of the escape
so as practically to raise
the M. W. I. considerably should
not have been carried out
without at the same time alter-
ing the level of the bend to
correspond. Moreover alterations
having for their object a
material increase of the
capacity of a tank are not
works properly chargeable
to ordinary repairs, but
when considered desirable
they should be brought for-
ward for sanction as new
works, and should be sup-
ported by proper information.
The intended arrangements
of the work under execution

in anticipation of the sanction
of the estimate, with a view
to the safety of the tank
which had been seriously
endangered during the floods
of 1874 owing to the inadequacy
of the escapes, which inadequacy
had been enhanced by the altera-
tions above referred to, being
under the circumstances more
costly than was needful, certain
modifications were considered
desirable and instructions
were given to the District
Engineer at once in order that
the work might be carried
out accordingly. The estimate
which had been submitted
was returned shortly afterwards
for revision.
The floor of the north tunnel
escape and the corners of
the abutments on the lower

Ms B d/21st
March 1876.
Vide appendix
on an
appendix

floor

side require an additional apron (rough stone) about 12 feet wide should be added the surface being placed 1 foot below that of the floor.

There is a road tunnel a little further south which acts as an escape and also as a head sluice to a high level channel. Its floor is about 1.77 feet below present F.T.L. The means of disposing of surplus require to be very largely increased, and the additional escape may it is considered take the form of a road dam and it should be of sufficient length to restrict M.W.L. to 2 feet above F.T.L. The District Engineer was informed that an estimate for further raising the F.T.L. may be prepared and submitted for sanction on its

merits, but that the work to be done at present should be confined to that necessary to make the tank safe with its present F.T.L.

In reconstructing the revetment a good backing should be provided, and the slope should be 1 to 1, as then the quantity of earth work required will be much reduced and this is of importance seeing that coal has to be brought from a distance, the ground in rear of the bund being cultivated, and the tank water caldron falling low enough to allow of earth being obtained from the bed.

Letry Channel II. This channel runs through several tanks and it seems probable that its share of the supply is less than it should be, for while the Poorasay

Tank which is under the other
branch always gets an abundance
of water, the tanks under the
Tetry branch are not well
supplied. With gauges at the
heads of the branches and
information as to their dis-
charging capacity with given
depths of water, the requisite
detailed instructions for the
management of the regulation
may easily be drawn up.
Peerapantam Tank. A new sluice
was built in 1874 - an old pattern
which is unsuitable to the
circumstances was adopted.
Kurmapullam Tank. This
has been recently repaired
and is in fair order. The
villagers complain of scarcity
of water and appear to interfere
with the supply to tanks lower
down by bunding the regulating
weir at the offtake of the

channel from the
Kurumbur Tank. This was
it is said repaired in 1870-71.
The earth work is in fair order,
but the revetment is in a mess
owing to its having no backing.
Melmar Tank. The supply
channel for this has a head
sluice which has been built
in a surplus weir of the Tetry
channel and has entirely
closed it. This was done in 1874.
The design of the sluice is bad,
the work indifferent, and ap-
parently the chumam was
not good. The proceedings were
altogether improper and sanction
to the estimate must have been
given on inadequate information.
Rear water wings and a lower
floor $2\frac{1}{2}$ feet below the sluice
floor are necessary. Just above
this sluice there is a set against
the bank which can be remedied
by cutting away a little decayed

rock and by revetting.
Tetry tank. This is the upper
 tank. The bund is in fair order,
 revetment middling. The wings
 of the regulating weir at the
 north end of the tank, and there
 is no other escape, are several
 feet lower than the bund. The
 water passes thence into the
Tetry tank east of the road
 and the channel turns at
 right angles after passing the
 road the bank being revetted.
 Probably a pavement is
 necessary over the bed of the
 channel from the road tunnel
 to the end of the revetment
 as the action of the water
 must sometimes be rather
 violent.

12. There is a rough sketch Sketch map
 map showing the tanks con. and information
 needed with the Cheyair ancient required.
 channels and those in the rough.

x of that name

a-1867
 b-1863
 c-1872

viewhood which have not as
 yet been applied. Therefore
 this map is imperfect as it is,
 is of considerable value
 but what is much wanted
 is a connected set of levels
 of the whole system of
 irrigation, and then a com-
 plete knowledge of the circum-
 stances and requirements
 of the several parts of the
 system. As a foundation for
 the investigations accurate
 general levels are necessary
 and arrangements have been
 made for obtaining these. For-
 merly levels were neither checked
 connected nor properly recorded
 and the frequent changes
 in the Department from
 large divisions to districts,
 then to smaller divisions and
 then again to districts have

rendered it very difficult
to find out what has be-
come of these technical
records which at some
time or another must have
existed. The levels of all the tanks,
F.T.I. and level of lowest
source sill, which are now
supplied or which it may
be proposed to supply of
the several sections of the
main and branch channels
are necessary as an essential
preliminary to the proper
management of the works, and to
the determination of the way in which
further investigations for the
improvement or efficiency of
particular parts of the works
should be carried out. As soon
as the general levels have been
determined, these levels of bench marks
they are amount system should be

proceeded with and at the same
time such surveys as will allow
of a fairly accurate sketch
map being drawn up should
be made, unless the Revenue
Survey should be able to afford
the information required. Ap-
plications from villages to
be supplied from the ancient
are frequent and are made
by villagers of the Chingleput
as well as the North Arcot District,
so that it is probable that a material
extension of the usefulness of
the ancient will yet be found
feasible. The accounts of
past expenditure and of
revenue resulting therefrom
have yet to be compiled,
and as yet there has been no
return prepared. Throwing
any light upon the subject
the results shown will be
of value not only as exhibiting
the value of these works, but

as a guide to a decision as to whether the Cheyair can be further trusted to account as a source of irrigation for lands in South Arcot. On the one hand, and by the construction of another ancient below the junction of the stream, near Mambanthur, as has been strongly urged.

13. Instructions were issued some years ago for a careful examination and analysis of the water supply of the Cheyair, as deducible from the registers kept at the ancient, to be made. These instructions, owing to frequent changes in the charge of the District, appear for a time to have been lost sight of, and the present District Engineer has had much to occupy his time and attention since he took charge some 3 years ago, but he has promised shortly to make an opportunity for doing this necessary work not only for the Cheyair but for the Palas.

Dusi Masudur Tank.

32/22
14. - The way in which the repairs to the low level sluice, with improved arrangements at the head, are being carried out will do very well. As a rule it is desirable to have wider tunnels for the sluices of large deep tanks, but as the flooring and the side walls, where lined with stone, were in good order, it was not necessary in this case to make any alteration. As the outlet from the tunnel into the rear cistern is low, a ventilator 8 or 9 inches in diameter may with advantage be placed a short distance above the cistern wall, the mouth being placed 2 or 3 inches above the rear slope of the bund.

Special care should be taken to rake out the joints of all brick work which is to be plastered. The failure or falling off of plaster, which is so common, is due to the neglect of this essential preliminary and this raking out of the joints should be

be done a few days after the brick work is built, and then it can be easily and effectually performed.

With regard to the proposed rearrangement of the surplus works (calingulaks) of this tank it appears that the conditions are as follow.

1st It is said that the South weir crest is 5.80 feet below proper full tank level; a level however which has not at least in recent years been attained. That similarly the crest of the Northern weir is about 2.75 feet below F.T.L; that the water in 1872 rose to 7 feet above the crest of the South weir or to 1.20 feet above F.T.L.

2nd The full length of the South weir is 234 feet
 " — effective — do — do — 133 —
 " — full length of the North weir — 119 —
 " — effective — do — do — 89 —

There being no information as to the tail water levels in the flood of 1872, any accurate calculation of the actual discharge then

then is impracticable, but from a rough calculation which has been made it appears that this discharge was

Between stones South weir Cub. feet a second - 4134
 above — do — do — " — 1034
 Between stones North do — " — " — 1646
 above — do — do — " — 286
 Total Cub feet a second — 7100

The area of the catchment basin is said to be 85 square miles, and the above discharge is therefore equivalent to 2.46 inches from the whole area.

3rd On the other hand Rypes' formula with a co-efficient of

400 gives a discharge of — 7732 Cub. feet
 450 — " — do — of — 8698 —

equivalent to 2.87 and 3.23 inches respectively from the whole area. It does not appear that the larger of these quantities

is left than should be deemed possible and in order to err, if at all, on the safe side, the maximum quantity coming into the

the tank may be assumed to be 9,000 cubic feet a second.

4th A tank of this size must act to a material extent as a flood moderator, and it is very probable that some of the difference between the discharge as calculated from the depth on the weirs and by the formula is due to this circumstance. On the Atlas sheet the area of the tank appears to be about $5\frac{3}{4}$ square miles or 17.811 millions of square yards, so for every yard of depth this area would absorb 17.811 millions of cubic yards, and this quantity in a day represents 1855 cubic feet a second. - It follows then that without much risk of error, 2000 cubic feet a second may be assumed to be absorbed in raising the tank above the F.T.L. level one yard.

5th According to these data then 9000 - 2000 = 7000 Cub. feet a second would be the maximum quantity to be disposed of if M.W.L. were

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were to be fixed at 1 yard above F.T.L. - It has been already mentioned that the water rose to $7.0 - 5.80 = 1.20$ feet above F.T.L. in the flood of 1872, and therefore a maximum water level so fixed would be 1.80 feet higher than the maximum level of that year.

6th The full length of the two escapes would, with the upright stones removed, be effective, and would be $353 \text{ feet} - \frac{7000}{353} = 19.83$ Cubic feet a second per foot of weir, which with a clear over-fall would correspond to a head of 39 inches. There would be a clear over-fall at the South weir with a crest at any level at or above 1.80 below F.T.L. There would not be a clear over-fall at the North weir with the crest at F.T.L. Assuming the full discharge to require 4 feet of water on the aprons (first); it remains to be seen what area of sluice vent would reduce the M.W.L. from $3\frac{1}{4}$ to 3 feet above F.T.L.

F.T.L., and it is thought that if circumstances will allow, it will be better to put the sluices at the North rather than at the South weir.

The South weir with 3 feet going over will discharge $234 \times 17.458 = 4085$ Cub. feet

The North weir under similar conditions will discharge (119 feet) 1886

leaving 1029 Cub. feet a second to be disposed of by sluice vents. The head available is $3 - 1.25 = 1.75$ feet and may be taken as $6\frac{2}{3}$. The area of opening required will then be 154 sq. feet. Also the height of the crest wall being 2.75 feet, if vents 4 feet wide be provided each vent will measure 11 square feet, and 14 will be the number of vents. In this position open vents with self acting shutters working on a horizontal axle would be unobjectionable for the leakage would be utilized; and if the shutters be designed

The tail water
1.25 feet above
crest.

* to open at
12 inches above
F.T.L.

Robertson
27 April 1873

to open with the water at 1 foot above F.T.L., there will be plenty of margin to ensure opening before the M.W.L. is reached.

If the level of the tail water should approximate to 3 feet rather than 4 feet above apron, the discharge over the North weir will be 2053 cubic feet, and through the sluices 1287 or together 3340 cubic feet against 2915 as before calculated.

The conditions prescribed for the vent shutters will be nearly satisfied if the lower half be made 13.3 and the upper half 19.7 inches.

Wm. Lindley St. Colonel
Chief Engineer for Ordnance

To
The Secty. to Govt. 1873

FORMER CASES.

No. of 187

Issue Case.

I. E. Form No. 31.

I. W. 1876. Department
The Chief Engineer for Irrigation.

RECEIPT No. 1477

Dated 27th April 1876.

Received 15 June

Issue No. 697
Dated 27th April 1876.

LATER CASES.

No. of 187

Subject:— Irrigation works
in North Arcot District.
Submitted notes on —
inspected by him in
March last.

Sent to Government with No.

18

W. of

Printed with G. O. No.

dated

ENCLOSURES. 1

REMINDERS ISSUED.

No. 1, dated	187
" 2, "	"
" 3, "	"
" 4, "	"
" 5, "	"

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KEEP-WITH.

E. I. Form No. 22.

Public Works Department.
PROCEEDINGS of the MADRAS GOVERNMENT.

UNDER date the 13 June 76

READ the following:—

Note by Chief Eng. for Imp. (H.E. No. 424th April 1876)

[Handwritten signature]

[Handwritten initials]

This Memo shows that the
works have not been satis-
factorily carried out -
The criticism, which is
valuable, leaves an
unfavorable opinion of
the skill of the
Officers -

The foregoing
Memorandum will
be communicated
to the District Engineer
North Arcot for
information and guidance.
The observations
of the Chief Engineer
for Irrigation show
that the past manage-
ment of some of
the irrigation works
admits of improve-
ment, and that there
is a good deal to be
done.

done for the safety
and efficiency of the
works especially in
the very important
matter of providing
adequate means of
disposing of drainage.

3. The improvement
and extension of the
irrigation under
the Cheyair aicut
will it is hoped
make steady pro-
gress when the levels
needed to obtain
proper data on
which to work have
been taken. The
accounts of past
expenditure and
of the revenue
derived from these
works are necessary

203/4

286 31
to a correct appre-
-hension of their value,
and as a guide to
the determination of
other proposed schemes
for further utilizing
the Cheyair as a
source of irrigation.

by 30/5

D. E. H. Hurst
R. E. H. Hurst
C. E. H. Hurst

Desd 29/6/16