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No. 435.

Read the following :—

No. 333-A.

MEMORANDUM

THE following notes of a tour of inspection in the Salem District are submitted for the information of Government.

2. The district possesses a large number of tanks, and not only have the tanks well formed and chained, but very considerable rivers have been bunded, and the result of the several series of reservoirs is therefore a matter of no little importance.

3. The drainage basin of this river above the terminal tank of Yeddapadi is about 416 square miles, 6 miles (by the Womaloor River series, river) above this is the Avany Perur Tank, and 5 miles higher up, the Chinnapenputty Tank. All these are on the main river. All were breached in 1852, and the terminal tank was successfully repaired; the Avany Perur Tank has been left as it was, the damage sustained being extremely serious; and the Chinnapenputty Tank was repaired, but breached again in September 1873. These three tanks were fine old works: they have some important defects, but at a very small cost, comparatively, they might have been made safe. As it is a great deal of money has been expended with some or no advantage, and a great deal more will have to be laid out; while judging from the comparatively few tanks and channels of this series that I have inspected, it will take a long time and much energy and judgment to get this group into proper order.

4. This tank is the terminal tank of the series, and with its drainage basin of 416 square miles, presents a marked contrast to some of the great tanks of this Presidency. In ordinary years its supply is very small, and the revenue is only about 4,000 Rupees. It has a very ordinary bund, which would inevitably give way again were the floods of 1872 to be repeated. At the north end is a surplus weir, 74 feet in length, the crest of which is somewhat above full tank level, and some of the surplus from this weir, as also some other water by means of a sluice are conveyed to the small Nachiamputty Tank to the westward. The main surplus weir is at the southern end of the tank, and is 885 feet in length. The bed of the river was rock and on this a great mass of stone was packed in somewhat irregular fashion, and thereafter to reduce leakage a face wall of brickwork was added. Much of this weir was washed away in 1872, and it was repaired according to the old section at a cost of about Rupees 3,900; this section is not an economical one, neither is it one that is likely to stand well in heavy floods. It is not worthwhile to undo what has been done, but should heavy repairs in the future be required it will be well to substitute a little good masonry for a great deal of loose though packed rubble. Where the rock is sound, a wall $4\frac{1}{2}$ or 5 feet wide at crest with a rear face batter of 1 in 6 would be much more effective than the present work, but the crest should be of massive well-dressed stone, and the rear face in ashla.

with plenty of broad stones, and the rest of the wall may then be in rubble: foundations would also have to be prepared by benching the rock. With very little trouble water-cushions could be formed by raising to a suitable level the narrow channels among the rocks.

About 4 feet of water have been discharging at the time the tank breached. A maximum discharge has been taken to be 31,500 cubic feet a second, and this would give a depth of 959 feet of weir, so that the bund should be 7 feet and the crest level F. T. L. The only alterations to the weirs which should be the construction of a proper north wing-wall at the large weir, and the crest of the small weir to the proper level with the addition of a raised crest.

The revetment is for the most part in very bad order; some raising* was carried out when the tank was repaired, but the lower part being greatly out of order

* About 18 inches.
nearly all of it will have to come down, and it should be repacked at a slope of about 1 to 1 with a flush face and a backing of gravel and small stone. The earthwork of the bund slope above the revetment level should be carried out to the edge of the revetment and some sods should be laid to cover the interstices and prevent any wash of the soil through. The top of the bund at the edge of the inner slope should be a few inches higher than at the rear, so that all drainage may run to the rear. The bund was repaired on an estimate of Rupees 5,240 sanctioned in 1873-74. It is to be regretted that the requirements of the tank were not then more carefully ascertained. There is some prickly-pear on the rear slope of the bund, and this should be cleared away.

5. This is not directly within the Womaloor main line of tanks, but it is connected with the Avany Peru Tank on that river. The bund is not in good order, but a moderate outlay will make it efficient. The revetment is of large stone; some of it is out of order, the result of drainage from the bund. At the southwest end there is an old waste weir 254 feet long, made of rough stone with a front wall, rather lower than the stone, to stop leakage; wings are required. At the east end there is a culvert under the bund, by which and a connecting channel water was obtained from the Avany Perur Tank. The vent is only twenty inches square, and the masonry is indifferent. The tank bund ends at a hill. Above the culvert channel there is another at the foot of the hill, by which it is said that surplus from the Avany Peru Tank was conveyed. There is a surplus weir 50 feet long on its bank, and corresponding thereto in the lower channel there is a weir 22 feet long in tolerably complete disorder, so there has been considerable discharge at some time. Where the upper channel joins the Avany Perur Tank or rather the Chinna Tank there is a culvert in the bund of the latter for the supply of the lower channel. The vent is $2\frac{3}{4} \times 2\frac{1}{2}$ feet. This masonry work is substantial.

The Kondiempetty Tank has two sluices, the Chinna Tank one sluice. The bund of the latter is much out of repair as regards earthworks. The revetment wants but little repair. In the connecting channel to the eastward there is a waste weir 40 feet long, which looks like a lot of rubble stone stacked for measurement.

6. This tank is on the main line of the Womalur River, and was so badly breached in 1872, that it is thought it will not be worthwhile to restore it. To

Avany Perur Tank.
render it efficient would require a very large outlay, and in the nature of things it is not an economical arrangement to bund the same catchment basin several times over and to have to provide for the discharge of its surplus at several points in succession.

The tank may be taken to commence at the west end at a surplus weir 220 feet long abutting at its west end on a mass of rock, and consisting of a rubble sloping apron with a face wall of brickwork. There is a breach 29 feet across at the east end; the sub-soil is rock, so the construction of a proper wing-wall and the repair of the weir would be an easy matter.

The level of the bund from this point up to the first sluice is very irregular; the revetment will do.

The first sluice is apparently in good order and water was running through it.

The next breach is at the west end of a surplus weir, and was due to there being no proper wing-wall. The breach is 65 feet across, and the remains of the weir measure 148 feet. There is rock at the bottom of the breach. Most of the apron of the weir is in good order, but some of the crest has been washed away. A ring bund has been thrown up round the breach.

The second sluice has a modern head-wall. The revetment at this part is all more or less displaced, and would need reconstruction. A little further to the eastward there is a breach 70 feet wide in the bund, and this has been temporarily closed by a ring bund. The soil of the bund at the west side contains a great deal of quartz gravel; at the east side it is more suitable for a bund.

A short distance from this is or was the surplus weir or anicut across the river. The western 200 feet are standing to nearly the full height; the rest of the crest wall has been washed away to various levels though nowhere to below tank bed level, which from silt is many feet above original ground level. The length of this damaged portion is 270 feet.

The scour below the crest wall has gone down to rock and decomposed rock at 12 to 15 feet below tank bed. The section was a body or crest wall with a rubble apron at a very steep slope, the surface being coated with concrete, which latter was very good. The general plan of the work is a great horse-shoe, but on the Revenue Survey map it is shown as a straight line. Were the weir to be restored, the arrangement of the different parts would be determined by the presence or absence of solid rock. Where such rock is present the overfall might be on to this, the drop of about 20 to 25 feet in all being divided into three by the construction of three parallel walls* to form water-cushions. Where there is only decomposed rock (a sort of gneiss laminated with a very high dip) it would be needful to break the fall into five or six steps with cut-stone aprons. The retaining walls would be founded on the decomposed rock, and the spaces between them would be filled in with small stone and gravel well consolidated to $2\frac{1}{2}$ feet below the surface level of each apron, then $1\frac{1}{2}$ feet of concrete would be laid down, and on this the cut-stone apron $1\frac{1}{2}$ feet thick of single stones would be placed.

* Besides the crest wall.

About 50 feet to the eastward of the weir there is an old wing-wall buried in the bund, and so probably at some former period there was a breach which led to the shortening of the weir, a proceeding of doubtful wisdom. Sufficient wings the weir never possessed, and their absence alone would have sufficed to occasion accidents whenever there was a flood, though the extensive damage sustained in 1872 appears to have been due to the undermining and washing away of the apron from the toe upwards.

A little further on there is a great and deep breach of 200 feet divided into three parts in the front part by two small bits of bund which were not completely washed away. The centre channel or part is about 15 feet below tank bed, which latter is some 15 feet below top of bund. Most of the stone of the revetment, which was thick, has been deposited in rear of the breach.

To the south-eastward there is a third sluice which was in use, water being conducted by a channel from the stream.

Just beyond this there is a rough-stone weir 123 feet in length with a face wall to stop leakage and a small breach at one end. It has no wings.

7. It has been already mentioned that it will not be worthwhile to restore this tank, the original construction of

Question of restoration.

which was a mistake, but this question

should be settled by the District Engineer in communication with the Collector with reference to the probable outlay required and the revenue involved. If this Avany Perur Tank be abandoned, the Kondiempetty Tank may probably be supplied by the west channel from the Chinnapenputty Tank, and be otherwise improved, a north and south bund being run also from some convenient point of the Avany Perur bund with possibly a supply channel from the weir. The rich soil of the bed of the Avany Perur Tank will no doubt be valuable for dry cultivation. If on the other hand the restoration of the tank be decided to be advisable it will be necessary—

1st.—To provide ample means of disposing of surplus. The catchment of the river above is 360 square miles. The difference between F.T.L. and M.W.L. would be about 3 feet, and the maximum discharge may be assumed to be 28,500 cubic feet a second. The total length of waste weir required will therefore be 1,630 feet, and the old weirs measured about 970 feet altogether, so that 660 feet additional will be required.

2ndly.—To raise the bund throughout to 6 feet above F. T. L.

3rd.—To reconstruct parts of the revetment.

4thly.—To close the breaches in a very careful and substantial manner.

8. This tank is the third and highest of those on the main line of the Womalur River. It breached in 1872 at the 140

Chinnapenputty Tank.

feet surplus weir or anicut on the original line of the river, and had not been repaired. There have been several accidents at this point, and the conditions of safety had not been at all adequately understood, for what may be called patchwork restorations had been effected, and it might have been predicted that the first heavy rainfall would assuredly have caused a breach. There were two accidents in 1872; one at the bund near the left wing

where a large breach occurred in May, which was carefully closed and stood, and then in October the bund at the right end of the weir, where there was no proper wing, was topped and carried away for a width of 58 feet. The weir was once much longer than now, but after successive accidents the easiest way of filling up the gap appears to have been resorted to, and now the original or a former left wing is in rear of the bund, and the right end of the weir wall was at one time evidently not the end of the structure. The crest of the weir is about 25 feet above the bottom of the breach, which is rock. The position is not a good one for a surplus weir, because the fall into the bed of the river is so great. The apron which, except for a few feet near the crest is of dry rubble packed at a slope of about 1 in 12, is in good order. The revetment to the end of the bund at its junction with the left end of the weir is 4 feet high, at the right end $2\frac{3}{4}$ feet, and of course this latter was entirely inadequate in height, and when the water rose above it the washing away of the bund was inevitable. This weir will now be done away with altogether, the bund being carried across in front of it, and the stone of its apron may be utilized in extending the large weir. The principal waste weir is to the south, and is 555 feet in length measured along the curve, and the dam stones about 3 feet high occupy 128 feet. There is a revetment in lieu of right wing. The left wing is of brickwork $4\frac{3}{4}$ feet above crest and out of repair. The apron is of packed stone on a slope. Additional length of weir can be given to any necessary extent in continuation of the left end. The catchment basin is about 290 square miles, and the maximum flood discharge may be taken as 24,533 cubic feet a second. The difference between F. T. L. and M. W. L. may conveniently be 3 feet, and the proper total length of weir will then be 1,400 feet. In fixing F. T. L., the requirements of the lands in the bed of, and under the Avany Perur tank may with advantage be considered, but this need not delay the restoration of the Chinnapenputty tank, as the waste weir of the latter can in the first instance have its crest at the old F.T.L., and the raising and improvements connected therewith may be subsequently carried out. The bund to be 4 feet above M.W.L. or 7 feet above crest of surplus weirs, which should all be on the same level* and

* Perhaps it will be best to place the 66 feet weir crest 1 foot higher as the surplus falls into the north channel.

have no dam stones. Near the west end of the bund there is another weir with a crest 66 feet long. It has rough stone

revetments only 2 feet high instead of wings. The crest and upper slope are of concrete; packed dry rubble forms the lower apron. The work is in fair order, but a little repacking of stone is required. The bund beyond this is in very bad order.

Altogether, then, this tank needs entire reformation, and its usefulness may be very much extended.

9. Two channels take off from this tank, one on each side of the river, and supply a series of tanks on each side.

South Channels and Tanks.

The left or south channel has at its head a weir with a clear length of crest of about 27 feet and a sluice in the body wall. If the ends of the bund at the wings be revetted to the full height the work will do for the present, though it is not a convenient way of regulating the supply

of a channel, but, should a part of the lands of the Avany Perur tank be irrigated by this channel, a proper head sluice will be required.

The channel is by no means in an efficient state. The land drainage it receives is not great, and can easily be disposed of. The area above the channel is about 7 square miles, and the flood discharge to be passed into the river may be taken to be 2,050 cubic feet a second, of which about two-thirds will have to be provided for down to and at the first tank, and the rest below. Two feet may be allowed to pass the surplus weir, the total length of which will be 216 feet. Stone is abundant, and all or nearly all the weirs are or will be on rock or hard ground, so that they will be inexpensive. The first existing weir is 40 feet in length, and is of dry stone; the next is 20 feet long, and similarly constructed. Between these there are several sluices in the channel bank, and most of them are more or less out of repair.

The Chencoothay tank is the first of the series on this side, and the channel runs into and out of it. It has no surplus weir, and about 90 feet additional waterway should be given to the 20 feet weir, or be placed between it and the tank and as near to the latter as a good site can be found. The channel bank should be $4\frac{1}{2}$ feet above ordinary full supply level, and the wings or revetments of the weirs should be raised to the same level. The bund of the Chencoothay tank is very irregular in level; it should be made $4\frac{1}{2}$ feet above F.T.L. There are two sluices, at both of which the bund is very low.

The channel from this tank has been cut through the rocky spur of a hill on which the bund abuts, and then runs at the foot of the hill, and in this part there is a dry stone weir 99 feet long, which, if put to rights and provided with wing revetments $4\frac{1}{2}$ feet above crest, and the latter placed at the proper or ordinary full supply level, will be sufficiently capacious.

The Arasancoothay is the second tank, and its bund is irregular and in bad order, overgrown with bushes, and near the north end there is a half breach. Thence the channel runs in cutting for some distance and then crosses a small valley by a single bank forming a petty tank, at the north end of which there is a small open breach which occurred in 1872. There is much prickly-pear. Passing close to, and on the east side of, the village of Tadapuram, it runs in cutting into the Injamary tank, and at the north end of this it will be well to provide a waste weir with 60 feet crest with perhaps a training bank to carry the surplus straight to the river clear of the cultivation.

The Injamary tank has a very strong bund partly revetted. It was not breached, and requires little to be done to it beyond some clearing.

In continuation of this tank is that of Nagasamudrum which was breached in 1872, and had not been repaired. The bund is covered with prickly-pear, and it should be cleared and put to rights, the top being made level with the Injamary bund and not less than $4\frac{1}{2}$ feet above F.T.L. The water-spread of the Avany Perur tank when full extended close up to these two tanks, and there appears to be no reason why the bed of the former and the cultivation under it on the left bank of the river should not be supplied from the channel and tanks connected with it. At present they are in a very neglected state. In repairing the channel bank

the soil needed should be obtained by widening the channel, and probably further widening will ultimately be required.

10. This channel is supplied by a weir 35 feet long (28 feet effective) with high and low level sluice vents. It is not in good order, and the left wing is much too low and overhangs.
- North Channel and Tanks.

The channel needs some distribution sluices. At some little distance down the surplus from the 66 feet weir of the Chinnapenputty tank falls in and has occasioned a breach in the leading bank to a rough stone weir without wings 73 feet long. If the banks be made $4\frac{1}{2}$ feet above the crest of the weir with wing revetments to the latter, probably accidents in the future will be prevented, that is, supposing the 66 feet tank weir to have its crest 1 foot above F.T.L. The crest of the 73 feet weir is about 3 feet above channel bed. There are numerous breaches in the channel below this point, and several of them had not been closed, and at different times there have evidently been a great many breaches; indeed the normal condition of this channel has been to be damaged. The state of the channel and of its surplus works fully account for this. There is a waste weir 145 feet long out of repair and without proper wings, and, had the channel banks been in proper order, probably this weir would have been carried away. Just at the upper end of the Vembany tank, the first of this series, there is a surplus weir 215 feet long which should have a face wall and masonry wings. It is not easy to say what drainage comes directly into the channel, but it is probably considerably greater than that indicated on the atlas sheet, and this is most likely due to spill from the stream to the west of Kondasamudrum. However the whole basin of the Vembany tank and channel above is 38 square miles, and taking the maximum flood discharge at 6,300 cubic feet a second, and the depth passing over the weirs at 2 feet, the total length required will be about 670 feet, and there are only 360 feet at present. As far as I can judge an additional 120 feet of weir should be allowed in the channel bank near Aratehpolliem, and the 215 feet weir of the tank should be extended to 405 feet, or if more convenient a weir 190 feet long may be placed at the west end of the tank. The channel banks should first be entirely cleared of prickly-pear and bushes, furlong-stones should be set up to serve as bench-marks, and levels should be taken throughout. The bank should be made $4\frac{1}{2}$ feet above ordinary full supply level, which would seem to be 3 feet above bed, but the fall of the channel is probably irregular, so that water surface level must be fixed on an even gradient. Near the tank of course F.T.L. must be taken into account and shown on the longitudinal section.

It is probable too that the capacity of the Vembany tank may be considerably increased at a moderate cost. It is a small tank compared with the drainage basin, and the cultivation under it may be easily extended. There are some tanks in this series lower down which were not visited. There will apparently be no difficulty in supplying the Kondiempetty tank and part of the lands which were under the Avany Perur tank by means of this channel.

The District Engineer should give careful personal attention to the requirements of this group of irrigation works which have been very much neglected

hitherto, but which should be capable of irrigating six to seven thousand acres. In submitting his proposals he should show clearly what is the ayacut area and assessment under the Chinnapenputty tank—

the 2 channels supplied therefrom, and the tanks which they supply;
Kondiempetty tank;
Chinna do;
Avany Perur do;
as also the average revenue for a series of years.

In the meanwhile the large surplus weir of the Chinnapenputty tank should be improved and extended to a length of 1,340 feet, and the bund should be repaired; also the crest of the 66 feet weir should be raised to 1 foot above that of the main weir, and all other emergent work to the two channels, including the increase of the discharging capacity of their surplus works, should be carried out, such of the estimates as may need the sanction of Government being prepared and submitted as soon as possible.

11. This is the small tank shown on the atlas sheet to the south of Oddaputty and west of Kondiempetty Tank. The drainage basin, as shown on the atlas sheet, is large, but the supply is very indifferent, the drainage from all the upper part of the basin being intercepted by the Chittoor Tank (not marked). It has a substantial revetment, which is getting out of order from the drainage from the bund getting behind it. This can be prevented by draining the top of the bund to the rear. At the north-east end the bund terminates on rock, which would make a very effective escape were it levelled and lowered. At present much water cannot get away. The tank has been breached at some former time, but when is not very certain. There is much prickly-pear and scrub jungle to be cleared away.

12. This is what is called a Jodi Tank, held on a tenure apparently somewhat similar to that called Dasabundum or Shrotriem in other districts. It is the lowest of a chain of three or four tanks forming a sub-section of the Womaloor group. It is in need of thorough repair. At the south end there is a rough stone escape 30 feet long, and at the north end there is a similar escape 50 feet long, of which 20 feet have been closed by a bund to stop leakage. Near this weir a good deal of the bund was carried away in 1872, and this is not surprising, looking to the state of the earth-works, the inefficiency and insufficiency of the weirs, and to the absence of wing walls or adequate wing revetments. The holders of the tank should be called upon to put it to rights, and the requirements of the tanks above it should be ascertained and attended to.

13. A Government tank, on the south side of the Taramungalum and Salem road, and not marked on the atlas sheet. The bund is for the most part strong, and it is substantially revetted. There was very little water in the tank. The bund was breached at the deep part in 1872, and a small half breach occurred in September 1873, at a point where the bund was somewhat low. Inspection was difficult, there being a great deal of prickly-pear and brushwood. There is no

surplus work, and one should be constructed towards the south end, where F. T. L. is but little above ground level; a wall with raised ends and a rubble apron will suffice, the junctions of the bund and wall being revetted. The top of the bund should be made to slope away from the revetment. There would seem to be no tank above this, but there is one not far below it. The revenue is said to be Rupees 500.

14. The above tank was the last of the Womaloor series inspected. There are scores of tanks in this group, and they all need to be examined and their requirements ascertained and attended to. Each chain should be taken up, commencing at the top and proceeding downwards.

14A. West of the Madras Railway near Salem there are two or three small chains of tanks which surplus across the line. One of these chains includes the following:—

1. Punnungadu Peddayary, the first of the sub-series.
2. Do. Chinnayary.
- 3 & 4. Karapur Tanks.
5. Mangopay.
6. Dalavaputty.
7. Timmalagiri.
8. Vedathamputty.
9. A small pond.
10. Sowthapuram—terminal of the sub-series, there are two small tanks also above No. 10 on a separate small chain.

The area of the entire catchment basin of this sub-group is about 13 square miles. The maximum discharge may be taken to be 3,100 cubic feet a second. The provision for passing this drainage across the Railway is a bridge of 2 spans of 12 feet each, 13½ feet from floor to under side of girder; the bridge is at 208.10, No. 41; it has a flooring, and it is possible that in an extreme flood it would suffice, but were the dimensions to be altered I should say that 4 or 5 spans of 12 feet or 3 of 18 feet would be proper; this assumes that a greater depth than 6 feet and velocity than 10 feet a second are not desirable. Many of the tanks of this sub-group were inspected.

The Punnungadu Peddayary.—There was a little water in the tank, the supply is derived from the hills to the eastward. The calingulah is 45 feet long, and the 11 upright stones occupy about 15 feet; they should be removed, they are above F. T. L. Bund strong and much of the revetment good. Where out of order this is due to indifferent soil and the absence of a backing.

The Pudu* or Chinnayary† was constructed at a latter date; the east end of its bund joins on to the bund of the other tank west of the middle, and the surplus of the latter falls into it. Its construction was a mistake; it can hold but very little water, and the bed is cultivated.

* New.
† Small.

The surplus from the small tank is diverted across the water-shed and goes into the Samudrum Tank of the Womalur group. Such was not the case before the small tank was formed. I am of opinion that the latter should not be maintained, but that it should be breached, the cultivation being carried on direct from the large tank. The small tank breached at a sluice in 1872. The stone of the surplus weir (50 feet) of the small tank can be used to improve the escape of the large tank. The concurrence of the Collector in this arrangement should be obtained.

Karapur Tank.—This obtains a supply from a stream passing to the eastward of the Punnangadu Tank. The bund is low and irregular. At the west end there is an escape 33 feet long, probably additional waterway will be required. To the eastward there is another small tank which was not seen.

Mangopay Tank.—In the present state of the bund the crest of the calingulah ($63\frac{1}{2}$ feet) is too high; the upright stones should be removed and the bund brought to a proper level above the crest. There are three sluices, of which the heads of the two western are out of repair. There is very little prickly-pear, and no breach occurred in 1872. The proper length of escape should be settled in the usual way.

Dalavaputty Tank.—This tank has at the west end a surplus weir 34 feet long which requires a masonry wall; at the east end there are two escapes of 18 and 28 feet, respectively. There are facilities for increasing the waterway at a very small expense. For the size of the tank the revenue, Rupees 300, is very small, but in ordinary years the supply with several tanks above is probably indifferent. The bund wants clearing and moderate repairs; it has a good revetment, and there are three sluices.

The Timmalagiri Tank adjoins the above and is supplied from it. It is a Jodi Tank; some parts of the bund are dangerously low especially at pathways; there is an escape 25 feet in length, the surplus of which passes close to the Dalavaputty Tank bund. The revenue is Rupees 300; the bund is covered with prickly-pear; revetment pretty good.

Vedathamputty Tank.—This receives the surplus of the upper tanks. Its escape at the west end is of rough stone and is 88 feet long; at the east end there is a channel from the tank with an open head. The bund is very low and was at places but little above the then level of the water. The revenue is only Rupees 100. All that can be said is that the quantity of water is so small that its breaching would not do any harm. Possibly it may be arranged to pass surplus over a considerable length of ground levelled to 6 inches above F.T.L. On the line of the surplus channel there is a small pond, which may be ignored and then the water falls into the *Sowthapuram Tank* which has an escape of dry stone and 66 feet long at the south end, and there is a sort of an escape over high rock at the north end, and there is room here for a weir 60 feet in length. It is a Jodi Tank yielding a revenue of Rupees 200, and it was badly breached in 1872. The repairs have not been well done either as regards earth-works or revetment. There are two sluices. To make this tank safe it will be necessary to make the total length of weirs 320 feet, and to bring the bund to a level of $4\frac{1}{2}$ feet above the weir crests. A small tank

at the lower end of a basin of 13 square miles with 10 or 11 tanks above it can never be a remunerative work, but if it be retained it must be made safe.

15. The Railway runs through this in the 209th mile, and there is communication by 2 vents of 6 feet span each. The surplus of this tank is discharged below the Railway.

Konraputty Tank.

16. This breached at the surplus weir, which is at the deep part, four or five years ago. The weir was undermined from the rear; the crest wall was strong and substantial. There is one sluice.

Kartivelpalaputty Tank.

17. Just above the village there are the remains of the bund of what was once a large tank, which was breached many years ago. It had apparently no escape weir. The bed is now highly

cultivated, and the restoration of the tank would not be remunerative; close to the breach the river has an anicut across it. The dam which is of rough stone is in very fair order, but the river has cut through the low ground beyond the left end, and a much higher wing with a flood bank will be needed if the anicut is to be maintained efficiently. This is one of the cases in which the circumstances of the cultivation need to be looked into. There seem to be very many of these small anicuts which were constructed in former times when the villagers had to look after and repair them, but which now that the duty of maintenance has devolved upon the Government may cost more than they are worth. Very little is known about them at present.

18. The construction of this tank was sanctioned in G. O., 23rd September 1868, No. 3,015, the estimated cost being Rupees 8,074 and the returns Rupees 827

Chinnakistapuram New Tank.

from 200 acres, which were expected to be irrigated.

In his letter printed in Proceedings of the Madras Government of the 26th January 1872, No. 259, the then Superintending Engineer, in asking for a transfer of funds to enable the work to be gone on with, reported that the slope of the revetment had been altered from the sanctioned arrangement of 1 to 1 to about $\frac{1}{4}$ to 1, that some of it had tumbled down, and that he proposed to reconstruct it at a slope of $\frac{3}{4}$ to 1. He was instructed to submit a section of the bund according to his proposed arrangement, and to report certain particulars regarding unauthorized deviations, &c.

In May 1873, being at Salem, I made inquiries regarding this and other projects with which no progress had been made for a long time, and on going over the papers connected with this tank it was considered—

1st,—That the original slope of 1 to 1 for the revetment was preferable to any of the subsequent proposals, and that the only modifications desirable were the addition of a backing, and the reduction of the height to maximum water level.

2ndly,—That as the sections taken showed that the earth-work had for the most part been thrown up at a slope of about 2 to 1 instead of $1\frac{1}{2}$ to 1 it was not advisable to alter it.

3rdly,—That certain proposed changes in the supply channel involving an increase in quantity of excavation from 3,350 cubic yards to 8,850 cubic yards were not necessary, and that the original arrangements should be adhered to. As regards the head sluice it was thought better to reduce the pier to a thickness of 2 feet, thus adding a foot to the width of waterway, and there would be no objection it may be noticed to substituting 1 vent of 6 feet for 2 of 2½ feet each, and this alteration would make the wings more adequate—a rear apron and revetments were considered necessary to this work.

4thly,—No place had been left in the bund for the surplus weir, and a site for this was to be selected where the ground was 2 feet below F.T.L.

All the details being thus settled the revised estimate and the report containing the information called for by Government were to have been got ready, but

* Rupees 11,330.

18 months have elapsed, and the estimate* has not yet been sent in though it has

just been completed by the Range Officer and sent to the District Engineer.

19. The project is altogether a very unsatisfactory one. The site affords no facilities for the construction of a good tank. Its capacity when full will be 641,000 cubic yards, or somewhat less practically, as the sluices will not drain it. The drainage basin is about 1½ square miles, and the supply from this source will be precarious and probably insufficient to fill the tank in ordinary seasons. The claims of existing irrigation on the considerable stream whence the supply channel takes off interfere with the latter being placed on a low level, and water will be obtainable from this source only when there are considerable freshes. Should the total supply obtained be equivalent to three times the contents of the tank, at most some 270 acres will be irrigated, and the revenue will not exceed Rupees 1,115 or a gross return of 9.9 per cent.

The work done is very far from satisfactory.

The earth-works have been thrown up very irregularly, and with but a remote connection with the intended section of the bund. The revetment so far as this has been constructed varies in style and batter at every few yards, and its thickness is very unequal. The sluices are not suitable works, though they appear to be substantial, and the stone work of the vents is badly fitted, and the plug holes badly cut.

No. 2 sluice has a rear cistern with walls over 9 feet high, all this masonry being utterly useless for any practical purpose. The surplus weir 60 feet long will be ample enough, but it has been ignored altogether, and no space was left for it, so that some expenditure will be incurred in removing a part of the bund to make room for it.

The supply channel was cut very unevenly, in some places a little too low, elsewhere not nearly down to bed level, and the spoil banks are too close to the cutting, and irregular. The head is badly placed and should have been a few yards higher up the river.

The project ought to have been rejected in the first instance; as it is, possibly there is not much room for choice between completing it or abandoning it, but

as more than half the total of the revised estimate has been expended it may be as well to go on. All the revetment which is substantial may be left as it is.

The surplus weir must be built before the opening in the bund at the stream is closed.

20. A rather large tank with a catchment basin of about 16 square miles, and a supply channel from the Vasistandudy or Vellaur. The description of the tank given in the irrigation register does not tally with the facts. The calingulah is 105 feet long, of which ½ is blocked by the upright stones. The proper length of escape, allowing 2½ feet to pass over as a maximum, would be 238 feet, and the bund should be 5 feet above F.T.L. The level of the bund is irregular and the tank is worth putting to rights, it being the finest in this part of the district. It is said to have silted up a good deal, and if the land available for irrigation will warrant it, the capacity might be increased by raising the F.T.L. and the bund in proportion. Part of the bund is broad, and is used as a village cart road. There are five sluices.

21. This is another of the ill-considered petty projects brought forward and sanctioned* some few years ago. Out

Valayamadavy Tank.
* G. O., No. 3,587, dated 5th Dec. 1863.

of the estimate of Rs. 8,670, Rs. 3,660 have been spent. The western end of

the bund has been partly thrown up on comparatively low ground in front of a rocky ridge instead of on high ground behind where the rocks would have been a most efficient breakwater and no revetment would have been required. The 1st sluice is completed, and will do, though the front wings have not much to do with the bund; it has apparently also no relation to the depth of water; a cut through rock will be needed to lead water from the sluice. The revetment, though built with a steeper batter than was desirable, will do very well, as it is substantial. Care to be taken to fill up the interstices both in the face and in rear with small stone so that the soil may not wash out.

Very little earth-work has been done, and for this little nowhere has the base of the bund been made of its proper width.

The 2nd sluice, to the east of the 2nd nullah, is of the same design as No. 1, but the level is different.

The design of the surplus weir is not good, as the first apron should have been on ground level. Only the crest wall and the front wing returns are of masonry, the rest of the wings is of stone in mud pointed. Special care must be taken to make a complete connection of wings and earth-work. Length of crest, 60 feet, which will suffice, the catchment basin being about 2 square miles.

The bund has not been closed across the two nullahs which are intended to supply it. Originally the gross revenue expected to be obtained by the construction of this tank was Rupees 3,000. As far as can be judged, the following is the best that can be expected. The Nadavulur tank, situated 3 miles to the S.E., and having a drainage basin of 5½ square miles of country almost identical, irrigates in good seasons 255 acres, so that 98 acres are the

proportion for 2 square miles. The land to be irrigated is for the most part cultivated, and the assessment is Rupees 1-6-6, while the proposed wet assessment is Rupees 5 an acre, so $98 \times 39.6 = 352$ Rupees will be the gross revenue, equivalent to 4.06 per cent. on the sanctioned estimate. The revised estimate, however, is Rupees 13,320, but as this provides for taking down and reconstructing the revetment, which is not necessary, probably the cost would not exceed 10,000 Rupees. The case stands then somewhat thus. The cost of up-keep would not be less than 152 Rupees a year on the average, leaving 200 Rupees net revenue or 2 per cent. on Rupees 10,000, and the loss on the tank if completed would be ... 300 Rupees yearly.

If the project be abandoned the loss will		
be 5 per cent. on Rupees 3,660 or ...	183	do.
Difference...	117	do.

There is nothing whatever in the tank site to make it worth while to go on with the project, and it appears to be useless to throw away more money merely because a good deal has been already spent, consequently the abandonment of the project is recommended. Possibly the stone, or some of it, may be made use of elsewhere or disposed of, and, if so, some small part of the outlay may be recovered.

22. The bund is in fair order, but it should be brought to a uniform level.

Nadavalur Tank.

It has ample means of disposing of surplus, the weirs altogether measuring 331 feet in length, and the maximum flood discharge being about 1,525 cubic feet a second, probably the depth passing over never exceeds 15 inches, and the bund should be made $4\frac{1}{2}$ feet above F.T.L. No. 1 weir at the north end is 150 feet long, of dry stone with a few upright stones which should be taken out, and the crest should be adjusted to F.T.L. with concrete, with which also the interstices of the stones for a width of 6 feet may be filled to obviate leakage. No. 2 weir is 35 feet long with wing revetments, and No. 3 weir is 26 feet long and of similar construction. All the wing revetments should be raised to $4\frac{1}{2}$ feet above the adjusted crests. The revetment here and there requires re-packing, and it may need some raising.

The sluices to the north of and that near the village are both manifestly out of repair. At the south end there is another escape 120 feet long, and at its north end a bank of stone about level with the top of the bund. As surplus discharged at this end goes into the village, it will be well to make the crest of this weir 6 inches higher than those at the north end. Then M.W.L. will be 18 inches above F.T.L., as fixed by the crests of the northern weirs.

The villagers are very anxious to have the supply of the tank improved, and showed a channel which passes above the small tank and runs close to Gungavally. This channel was supposed to have been formerly supplied by the Swethanuddy, but the evidence is apparently against this; it is useful as a catch-drain. The track into Gungavally crosses it by a revetted bund having an opening 18 or 20 inches square. The dimensions of the vent, having no relation to those of the channel, were probably determined by the size of the stones available.

The investigation of the Swethanuddy irrigation may indicate that the supply of Nadavalur tank from that river is practicable.

The small tank of this village is a very small reservoir, and is said to be much silted. Possibly it might be made more efficient by raising F.T.L. a foot or so. The surplus to 1 foot above F.T.L. might be passed into the large tank by a pavement.

Other tanks to the east of Nadavalur.

23. There are some very good tanks, 4 or 5 in a chain, in this part of the taluq, e.g. (taken from Atlas sheet),

Shettapadi tank catchment basin 7.70 square miles.

Tenkumary ,, ,, 11.25 ,,

also the Ponawassal and some 8 or 9 more, which should all be taken up and dealt with properly.

24. This appears to be a valuable little river for irrigation purposes, and it

Swethanuddy.

Goodamullay, and Kistnapuram Anicuts.

* Or 3 including Vellagur, lower down.

G. O., No. 3,587, dated 5th December 1863.

has several anicuts across it. Some time since, estimates for two* additional anicuts called the Goodamullay and Kistnapuram anicuts were sanctioned.

Some objections were raised to their construction by those cultivating under channels lower down and these were over-ruled,† but certain precautions were to

† G. O., No. 2,642, dated 11th August 1869.

be taken. Nothing having been subsequently settled, a visit to their sites was made for the purpose of determining how the details were to be arranged, and then it was found that the projects had been very incompletely prepared, no levels having been apparently taken to the lands to be irrigated, and no investigation made as to the best sites for the weirs, or as to whether one work would not accomplish all that was desired. At the Goodamullay site, a lot of rough stone has been collected, but nothing more has been done. There was formerly a rough stone dam here, remains of which, consisting of a quantity of rubblestone on the right bank, are visible. The bed of the river is very deep below ground surface, and the ground on the right bank is much broken. There is kunkur in the left bank and some trap rock cropping out in the bed on the right side. The old stone and the new collection appear not to have been kept sufficiently separate.

The site for the Kistnapuram weir is rather more than a mile above the village of Púdúr, but on a sketch map of the locality the distance is shown as about 2 miles. The bed of the river is many feet below ground level, and in it there is granitic rock, some of which is decomposed, and other sound, also some trap, &c. Much stone has been collected from a hill about $\frac{1}{4}$ of a mile distant, and the channel on the right bank was commenced, but subsequently stopped. There is lime kunkur at the mouth of the nullah a few yards higher upon the left bank.

With no levels as a guide, and with no information as to the circumstances of the river and country, it was impracticable to settle anything. Instructions were, therefore, given as to the preliminary work to be done. The first thing requisite is to know the level of the lands to be irrigated, and of the river whence the supply is to be taken. As of the circumstances and capabilities of the Swethanuddy very little is known, and as it is desirable to ascertain what the existing anicuts

Latitude 11.26 $\frac{3}{4}$
Longitude 78.32 $\frac{1}{2}$

Thence to Gungavully, a distance of 12 or 13 miles, the valley is narrow and possibly all, or nearly all, the irrigable land could be supplied from existing anicuts. Below Gungavully the country opens out, and all the water available may there be utilized without much difficulty. In the first instance, the survey and levels may be carried as far as Viraganúr, as all new works in the Salem District are likely to be above that village, but particulars of existing irrigation from channels having their heads between Viraganúr and the junction with the Vellaur, whether in the Salem or South Arcot Districts, should be ascertained, as this area will have to be taken into account in deciding what extension of irrigation above will be feasible. Permanent bench marks should be set up near Tummuputty and Viraganúr, and should be connected by independent lines of levels, of which there will be one down the bed of the river and one on either side. The levels should be reduced to mean sea datum by connection with the Railway levels in South Arcot and Salem. Levels for a mile or two, as circumstances may indicate to be desirable, of all affluents, with a few cross sections, should be taken.

southern stream is called the Valakombiyaur and the northern the Perryaur. This village (Tummumpetty) extends for a considerable distance along the right bank of the river; the subsoil is kunkur and trap rock. There is some very good garden cultivation on the left bank from wells cut in the kunkur on the edge of the river.

Existing Anicuts—Konariputty Anicut.

stone about 6 or 7 feet high and carefully packed. The bed of the river is rock,

This anicut supplies the Chendariputty channel on the right bank. The bund of the channel is about $4\frac{1}{2}$ feet wide, and is cut in kunkur and rock. There is an excellent site for a head and sand sluice just where the channel enters high ground; but before any improvements are carried out, it will be necessary to see what additional lands can be irrigated on either the left or right bank of the river from this anicut, which is, as far as the bed level of the river is concerned, well situated,

Ayacut area	...	...	...	...	...	Acres	136
„ assessment	...	...	...	...	...	Rupees	1,724
Cultivation.	Acres.						
1867-68	355	...	...	Rupees	3,221		
1872-73	...	...	...	„	3,300		
1873-74	365	...	...	„	3,200		

M.W.L. at 2 feet and the maximum

Basin 5 square miles C = 675 for hill country. flood discharge at 1,976 C R a second, the tank would be quite safe with 208 feet of surplus weir; the present weirs are—

										FEET.
No. 1	...	...	...	...	...	...	...	...	...	157
2	...	...	...	...	...	...	...	...	...	65
3	...	...	...	...	...	...	...	...	...	48
4	...	...	...	...	...	...	...	...	...	32
										302

* It should be seen also that the approach to No. 1 escape is free and open.

27. This is situated a little way below Konariputty. It is formed of stone packed on kunkur and trap rock. The

Condampully or Kondiyampully Anicut. channel from it is on the left bank; it has no right wing, and there is high ground close by. If this anicut be retained, it will need a face or crest wall and wing.

28. The Perrany or great anicut appears to have been a small dam of rough stone; very little of it remains, or rather was visible. It supplies a channel on the right bank, and apparently was of use only when the river was very low. The villagers asked for its restoration, but as the Chittany is just below it is quite clear that both cannot be kept up, and the best arrangements will be determined as soon as a survey and levels are forthcoming.

29. This channel is on the right bank and was supplied from the Perrany; it has no head sluice and is said to have been badly breached. Probably the arrangements will need radical improvement.

30. On the left bank a few yards above the Perrany is the head of the Nadavalur Channel. It is somewhat doubtful whether it ever was efficient, but at any rate it has fallen into disrepair, and has not carried any water for very many years. A little way below the head a large hill stream crosses the line, and the channel was properly taken under this by a tunnel under a weir, but the arrangements were not made sufficiently complete. The weir over the tunnel is 80 feet between the wings, and the basin of the stream being 12 square miles, probably the maximum discharge is between 3,000 and 3,500 cubic feet a second, and the water may rise to a height of 5 to 5½ above the crest, consequently to prevent the work being turned it would have been necessary to make the wings 8 feet above the crest, and the flood bank on the left bank of the channel up to its head of the same height. However the bed of the stream is shallow and it overflows the ground, and it is probable that the water would never rise so high, but would find its way into the river in a southerly direction. As the head of the channel is in kunkur, it will probably suffice if the flood bank be made 6 feet or thereabouts above the crest of the weir, leaving the discharge in excess of 4 feet over it to find its way into the river, but the exact details can easily be settled when the ground levels for 150 to 250 feet above the head of the channel are known. Then a portion of the discharge may be taken direct into the river over ground which will act as a supplementary surplus weir.

Levels along this channel to the Nadavalur Tank will be needed; probably such were taken some years ago, as the surplus weir and sub-tunnel is a work of comparatively modern times, but if they are not to be found they must be taken again.

31. This anicut is built across the left and deep channel of the river, and abuts at its right end on an island about quarter of a mile long, the upper end of which is connected with the right bank of the river by a mass of lime kunkur over which water flows when there is much in the river. This upper end of the island is but little below the remains of the Perrany. The anicut is a mass of rubble stone and does not look very safe, but it appears to have stood very well. By adjusting the level of its crest, building a crest or face wall and otherwise improving it so as to remove danger of its being turned, this weir may be made capable

of superseding the Perrany altogether and of supplying the Periaivoikal and Nadavalur Channels even if their heads be left where they now are. It may be requisite also to build a low wall on the kunkur across the channel of the river at the upper end of the island. The Gunjavully Channel from the Chinna Any is on the left bank of the river, and is a very small affair. Judging from the atlas sheet and the general features of the country it might be enlarged with advantage and be made to supply the chain of five tanks, of which that at the village of Ponavassel is the second.

32. There are two or three more anicuts lower down the river which were not inspected. A general statement of all the existing irrigation showing ayacut area and assessment and also the average cultivation and revenue under each anicut including the tanks supplied will be of great use, and with a little care and thought this small river, the water-supply of which is believed to be remarkably reliable, may be turned to very good account.

33. This tank, which is not marked on the map, is 3 or 4 miles north-west of Mullikerry. Its catchment basin would seem to be large, 9½ square miles. The bund had had a lot of earth added to it recently in a rough way. A sluice said to have been built 4 or 5 years ago was designed without any reference to the position it was to occupy, and a good deal of money was wasted by making the tunnel many feet longer than was necessary. This is a glaring instance of a very common mistake. It would seem to be such a natural and obvious thing to draw on paper a section of the bund where a sluice is to be built, that it is astonishing how such a work is ever sanctioned without this necessary information being exhibited. There is a surplus weir at the south-west end of the bund. The requirements of the tank as regards the disposal of surplus should be ascertained.

34. This tank was very extensively breached in 1874, and an estimate for its repair was submitted, but the information furnished did not admit of its being settled how the surplus in future should be disposed of. The weir has been lengthened 150 feet at the west end, and was to have been extended 105 feet at the east end where the ground is favourable, but as owing to the approach being blinded by a spur of comparatively high ground in front, the extension would not be effective, it has been determined to carry it at the west end up to the recently constructed sluice, and to make the bund level such that it will be safe even with a repetition of the flood which did so much damage last year. The design of the new sluice is not appropriate. The head wall stands out some distance from the bund which latter must now be taken out to it; first money was spent in putting the wall away from the bund, and now more must be spent in correcting the mistake. The front wing return of the surplus weir should be connected with the head wall of the sluice, and the rear return can similarly be connected with the other end of the sluice. Some of the bricks are very bad, others brought from the Railway kilns are very good, but their cost is Rupees 8 a thousand without

carriage. Such bricks as the common ones ought not to be used in the Irrigation Department at all. Probably excellent bricks might be made for from 4½ to 5 Rupees a thousand.

The rear cistern of the Devatamadugu sluice has settled and broken off from the tunnel, and there is a leak on the east side of the latter which should be attended to. In carrying out the repairs splayed wings like those of a road tunnel may be given, and the retaining wall connecting them may be curved and used as a distribution weir. The bund of the tank near the village is low, and it is said that the water went over all this part without however doing any damage of consequence. There were two deep breaches and one partial one. The emergent repairs have been nearly completed. The bund should be 3 feet above M.W.L. as determined for the length of weir now to be given. There will I think be no objection to a couple of hundred yards or so of the bund near the village being left permanently low, say at 3 feet above F.T.L. Once in 50 years or so water would find an outlet without damage of any consequence, and this supplemental escape would remove all risk of a breach even in very extraordinary floods. There is a roadway along the bund and this should be carried down to and up from the low part by ramps of 1 in 25 or so. The arrangements for the traffic at the east end were particularly bad and ought to have received more attention. Carts had to go up and down the steep rear slope of the bund and get through a very narrow opening between palmyras, a difficult matter with necessarily no command whatever over the bullocks which with laden carts were overpowered directly the top of the bund was quitted.

35. This breached a short way beyond the 120 feet weir at the east end.

Kannamandur Tank.

The weir is to be extended 80 feet, and the best position will be from the present end and nearly at right angles to the direction of the old work. One sluice was carried away at a breach, two sluices are still in use, and it appeared to be doubtful whether a third were necessary. The bund is irregular and should be levelled; the backing of the revetment should be more carefully packed.

36. This tank is about 10 miles from Tripatore to the north-east. It was

Yagalairy Tank.

extensively breached. It has a large drainage basin, and though the surplus works are extensive, they were altogether inadequate. The revenue is from 700 to 850 Rupees, and it will not be easy to provide for the future safety of the tank for a sum proportionate to this small revenue. The catchment basin is 38½ square miles, and the maximum flood discharge is probably between 5,700 and 6,400 cubic feet a second, say 6,000 cubic feet. The circumstances of the tank prevent an effective length of escape of more than 330 feet altogether being provided, and the depth passing over will consequently be 37 inches, and the bund must be 41 inches above M.W.L. or 6½ feet above F.T.L.

There does not appear to be much land available for the extension of cultivation under this tank, neither can the F.T.L. be raised to any considerable extent conveniently.

At the first open breach there is rock at parts of the bottom. The old bund shows some sand layers but sloping towards the tank. The work done at the

east end is altogether wrong and useless. The closing must be carried out by forming the bund at once over the whole area of its base and then to full section foot by foot. Instead of this a lot of loose soil has been thrown down without any reference to section. Moreover for every part of the new bund a proper seat must be prepared and the connection between the new and the old work must be made as laid down in Circular No. 48. It is not creditable that the most absolute requirements of work of this kind should have been neglected. Very little had been done, but that little if allowed to remain would be quite sufficient to cause another breach and the waste of all the money here expended. All water and soft mud to be taken out of the bottom of the breach. A revetment should be constructed at the rear slope to about 10 feet above the deep bed. Just beyond this there was another breach of less depth which has been closed, but apparently without sufficient consolidation of the new earth-work. There is then only a short length of artificial bund which abuts on a low rocky hill. At the west end of this hill where another bund commences a breach occurred some few years ago. At the next breach a concrete and rubble masonry wall was built, but this was too slight and the lime used was a very indifferent cementing material. A wall founded on concrete should be built across the breach between the rocks on either side, the proper position being about 62 feet behind the former wall. The concrete to be 6 feet wide, base of wall 5 feet, top 3 feet, average height 8 feet. The front slope of bund to be revetted carefully, and the rear slope to 10 feet above deep bed of breach. There is some rotten kunkur at the sides of the breach. The rate for revetment is 14 Annas, and the work done could hardly have cost more than 4 or 5 Annas, as stone is abundant close at hand. The face stones should enter 2 feet from the face, and 10 or 12 Annas a cubic yard should suffice for first-rate work. The tank bed is silted to a depth of 6 to 8 feet. Near the Yailagherry hill there is another escape 33 feet long. It can be lengthened 30 feet at the east end but not more. The surplus from this escape crosses the channel from the high level sluice, which has a wall and apron so as to allow of the water flowing over it; the apron is in need of repair. At the east end of the bund near the road the short weir can be lengthened only 15 feet. The greatest effective length that can be given to the principal weir is 98 feet. The south-east pavement can be lengthened from 27 to about 80 feet. All the crests should be exactly on the same (F. T.) level. In the flood which breached the tank about 4 feet went over one end and 5 to 5½ feet over the lowest part of the 147 feet escape, of which in high floods only 98 feet can be taken into account. With the additional (15+53+30) 98 feet of escape and all escapes on one level, the tank may be made secure, but when the estimate has been prepared it will have to be considered whether the tank, which will always be somewhat expensive to maintain is worth the outlay which may be found to be required for its restoration.

37. This tank lies above the Tripatore tank. The bund is irregular. The surplus weir is a long work of the ordinary sloping apron section in good order;

Madapully Tank.

the end of the bund abutting on the weir should have a pointed revetment which should be of the full height of the bund when brought to a proper level. A channel had recently been cut, apparently by the villagers, turning the left end of the

surplus weir. It should be ascertained why this was done and on whose authority. The supply of this tank is derived from a stream taking its rise in the Yailagherry hill.

38. This tank is a little to the south of Tripatore. There are 105 feet of surplus weir, but the left end has been turned. There is rock, and a wing wall should be constructed. The bund is very irregular and is much too low near the weir. The revetment was badly packed and is in a loose state. The tank can be made quite efficient, if its palpable requirements be attended to.

39. The surplus from the Tripatore tank does not cross the railway, but a large part of the catchment basin of this tank lies to the west of the railway and on the streams there are many small tanks, but few of which are shown on the atlas sheet, and these should be put to rights in the interest both of the railway and of the large tank. There is also a small tank,* the *Malakashary*, the surplus of which crosses the railway to the south of the feeders of the Tripatore tank. Its bund is irregular and not in good order. At the south-west end there is a pavement 10 yards long for the discharge of surplus, and there is room to lengthen this 5 yards at the west and 10 yards at the east end, so that its capacity may probably be made sufficient. Two small tanks above are said to surplus into it. The railway openings are a 9 feet and a very small culvert.

Proceeding northwards into the basin of the Tripatore tank, there are the following openings under the railway:—

Pachykalvoy.

3 feet culvert about 4 feet high.
36 feet in 3 arches of 12 feet, 8 feet to springing, has a floor.
9 feet culvert for apparently spill from the Pachykalvoy; the ground above this is swampy.

The tanks in this section of the basin are Reade Saibs and three others between it and the railway.

The next valley is that of the Podayankote or Pillayankote (Mittah) tank, the bund of which is at a short distance west of and parallel to the railway. At the south-east end there were two very small breaches at irrigation cuts; there is a large breach in the middle, and the bund is generally irregular in level and in bad order. It has no regular escape, and a pavement 15 yards long should be provided at the south end where the ground is hard. Top of bund should be 4 feet above F.T.L. or pavement level. The tank irrigates 10 acres and pays a revenue of 100 Rupees. The Moothanary, a small tank above, requires to be put to rights.

The opening under the railway for this drainage is a 9 feet culvert which will suffice.

The next valley is that of the Hanuman stream. Above the railway the ground is swampy and flood waters cover a considerable area. There are two railway bridges. That to the south 3 spans of 12 feet and 5½ feet to under side of girders; the other 5 of 12 feet and 7½ feet to girders.

Moothoor Tank.—This has been resumed by Government, the Mittahdar who formerly held it having failed to repair it. In addition to local drainage it has a supply channel from the Hanuman stream, and the bank of this near the tank was extensively breached. Near this there is a pavement of 10 or 12 yards by way of escape, which stood very well though it has no wing revetments. Some earth-works were in progress, and were not being satisfactorily done, rate 1¼ Annas which is too much for good work, and far too much for such work as was being done. There is a sluice at each end of the tank; that near north end is too short, and the bund over it does not occupy the best position available. There is a pavement 18 feet long at north end, and this should be 40 feet and be 6 inches above F.T.L., as the surplus goes over the fields. The principal escape should be at the south end, and should be 60 feet long and at F.T.L. The drainage basin is about 2½ square miles. It will be necessary to see whether the supply from the Hanuman stream cannot be brought under regulation, and flood waters excluded. If owing to the spill of the river a sluice cannot be placed near the head without liability of being turned, it will be requisite to provide an additional pavement in the right bank of the channel to discharge surplus and prevent breaching. The opening under the railway, which is at a short distance from the tank, looks like a 20 feet span, which may do though it is none too much.

Kuttary.—This is a Mittah tank. The bund is very irregular and was topped by the water in many places. There is a considerable breach in the centre, and this was ring-banded and gave way again. There is a very small escape at the east end; the ground is favorable at the other end for the discharge of surplus were the bund placed in good order and at a proper level.

40. This is the terminal tank of the series or group in the basin of that affluent of the Pooniar which runs a mile or so to the eastward of Kistnagherry. Its supply is good in ordinary seasons. The catchment basin above it

Gow Saib's Tank.
Latitude 12°29½.
Longitude 78°16½.

is 45 square miles in area, but of this only a very small area indeed drains directly into this lowest tank. The largest of the tanks above is the Badatalab. In seasons of large rainfall a very large quantity of water reaches the terminal tank, and for this no special provision has yet been made. A breach occurred in 1874, and this has been carefully and substantially closed, but the tank with its waste weir of 146 feet in length, all of which is not fully effective, and with low wing revetments, is decidedly unsafe. Taking 500 as the co-efficient, the maximum flood discharge will be 6,325 cubic feet a second and, looking to the present height of the bund, probably without much difficulty it may be all brought to 6 or 6½ feet above surplus weir crest level, and if so 4 feet may be fixed as the maximum height to which the water may be allowed to rise above full tank level. The length of weir required will then be 235 feet, and this must all be given at the west end. The east end of the bund will have to be carried across the road, which is lower than the proposed maximum water level, and occasionally, as must now be the case, part of the road to the northwards will be liable to submergence. The present weir is of well-packed rough stone, and its extension may be of the same description, only a face wall in masonry should be given to stop leakage and prevent undermining, and the

crest should be of a uniform level throughout and 2 or 3 inches higher than any of the rough stone apron in rear. The wing revetments carefully pointed should be carried up to the level of the top of the bund. The revenue of this tank is Rupees 1,139. It can never be profitable to have a comparatively small tank with such a great drainage basin, but the best must be made of the circumstances.

41. This is a very good tank with a substantial bund very fairly revetted throughout on the inner slope and partially on the outside. It is on a lateral

Groome Saib's Tank.

valley of the Gow Saib basin. Its catchment basin is not very clearly defined, but it appears to be about 5 square miles. The maximum flood discharge will be then about 1,460 cubic feet a second and, judging from an inspection only, it is probable that 3 feet could be allowed to be the rise above F.T.L. There is no regular escape weir, but surplus is discharged by a cut at the south end of the bund. Considerable facilities are present for the construction of a weir at this end, and this will abut on a hill of gneiss which is now being quarried. The weir may be of the form common to this part of the country, namely, a sloping apron of packed rubble with a well-fitted crest pointed and finished off with a levelling course of concrete. The length of the crest, supposing the above assumptions to be correct, should be 85 feet. The surplus passes down a shallow nullah, the bed of which is rock, and the discharge is into that tank of the series lying immediately above Gow Saib's tank. There is a great deal of prickly-pear on the bund which should be cleared away, and some trifling repairs are required.

42. This is the most important tank in the same basin. Mr. Paynter, a former Range Officer, estimated the catchment basin at 20 square miles, but from the

Badatalao.

atlas sheet it would seem to be about 28 square miles. The bund is in fair order, but not sufficiently regular as to level. If it be levelled and brought everywhere to 6½ feet above the crest of the escape, which latter is 245 feet in length and should be brought to an uniform level, and if also the wing revetment be carried up to top of bund and pointed it will be perfectly safe, for the maximum flood discharge may be taken as 4,610 cubic feet a second, and less than 39 inches going over will dispose of all the surplus. The present capacity of the tank is 4·815 millions of cubic yards, and the ayacut area is 557 acres, but it is stated that for the seven years prior to 1872, the average area cultivated was only 268 acres. When full the tank is considered to be capable of cultivating the whole ayacut with one crop and ¼ of that area with a second crop, so that it may be deduced that the total area cultivable with 4·815 millions of cubic yards is about 640 acres, taking the shorter time the second crop is on the ground into account, hence in round numbers 7,500 cubic yards have to be stored for one acre, a reasonable conclusion.

It has been proposed to enlarge this tank to hold 16½ millions of cubic yards, and to supply it from the Kurumbapilly river by means of an anicut and channel. The catchment basin of that river is 650 square miles, and the freshes are reported to be good. The estimates of the revised project amount to Rupees 96,000, but adding, as is now required, provision for establishments, tools and plant, capitalization of land assessment, interest during construction, and until the

lands to be watered are taken up, the total will become about Rupees 1,60,000. The gross returns anticipated by the Revenue Officers, who have examined into this part of the question in detail, are Rupees 11,000. Consequently to give a net return of 5 per cent. the up-keep of the works must not cost more than 3,000 Rupees annually, and it is not likely that an anicut, a channel about 11 miles long cross-ing a great deal of drainage, and a large tank could be maintained for this sum; some expense also would have to be incurred for conservancy establishments. The project, therefore, is not one which is likely to be carried out. It will, however, when more pressing work shall have been disposed of, be examined in detail with a view to the orders of Government upon it being taken. The Public Works establishment of Salem have much more than enough to do in attending to the vast numbers of irrigation works which want greatly enlarged means of disposing of surplus water, and which now breach whenever there is a heavy rainfall, so that were the Badatalao project much more promising than it is there would be but little chance of its being carried out for some years to come. In the meantime the tank, as it is, should be made secure and be efficiently maintained. Bushes and prickly-pear should be entirely cleared away from the bund; all the tanks of this group should at the same time be attended to.

43. This was breached in 1873, and has lately been repaired in a very credit-able manner, the bund being level, in good section, and neatly turfed. The

Kothapully Tank.

prickly-pear which has been removed should be buried, as it is beginning to grow again even where laid on bare rock. The outlay on repairs was Rupees 339, the revenue being stated to be 250 Rupees. The tank is not marked on the atlas sheet; so probably it is of comparatively modern construction. It is close to the village marked Vuttyganrapully, the name of which is stated, however, to be Kothapully. This tank is the lowest of a group of 18; the basin above it is about 30 square miles in area. The waste

Latitude 12°20½.
Longitude 78°14½.

weirs two in number are at the south-west end next the village, and they are 80 and 120 feet long respectively, the former abutting on solid rock at the left end. The maximum flood discharge may be taken as 4,825 cubic feet a second, and with the present weirs the depth passing over would be between 44 and 45 inches, and this would be more than the tank could safely stand, especially with the wing revet-ments as low as they now are; 76 feet of additional weir should be given, which will make the maximum depth passing over 3 feet.

44. This project was partly investigated by Mr. Wilson some years ago, and he unfortunately began to design and estimate for a tank before he had settled the most important particular, namely, the discharge of surplus at some point away

Proposed reservoir on the Pooniar.
Latitude 12°2½.
Longitude 78°15.

whether it was practicable to provide for the discharge of surplus at some point away from the main bund. On the left of the river there is certainly no saddle; it would be practicable to carry the surplus along the face of the hill, which apart from the boulders on the surface is of solid rock, but this would involve a good deal of rock cutting. On the right bank between the abutment hill and the hill imme- diately behind it there is a comparatively low part, but it will be necessary to

ascertain its actual level. The project is not a promising one. The catchment basin is very large requiring very extensive surplus works, and the country below is much intersected by water-courses which would make the distribution works costly. Mr. H. S. Thomas thought it worth investigation, and it is possible rather than probable that when the existing irrigation works have been put to rights something may be made of it.

45. This is between 2 and 3 miles from Burghur. The villagers asked for its restoration and the remains of the tank were inspected. It was breached it is said between one and three hundred years ago. I should judge from the sluice near the north-east end and from other appearances that it was never really finished. The bund is large and very irregular. the line of the river there is a large breach down to rock, and south-west of this for a considerable distance nearly all the bund has been washed away by the river setting against it. The soil of the bund is indifferent, very much of it being extremely sandy. There were no proper escapes, but there is a small gap on rocky ground at the north end, and two or three openings, where the bund would seem not to have been completed, to the south of the river. A good deal of what would be the bed is under wet cultivation, and most of the remainder under dry cultivation. There would be no great difficulty in forming a tank, as any extent of escape weir could be provided south of the river, and for a small weir at the east end there is a suitable site. Stone is abundant. Paddle facing would be required to make the bund water-tight, and special precautions would be necessary at and near the breach to prevent undermining at the toe of the revetment. Mr. Blacker prepared an estimate for restoring the tank, but his project would have to be recast to suit the circumstances. There is no need of taking any present action in connection with this tank which can wait until more important work has been done. The river is said to have a good supply of water; it rises in the hill country on the borders of Mysore.

46. This is a Dasavundum tank, and is situated near and within the northern margin of the Tripatore large tank basin. It is a good tank, but water had been retained to a level considerably above F.T.L. by placing a bund on the small escape pavement at the southern end. The surplus passes by an artificial channel through the high ground, and this arrangement was made in order to prevent the water running over the cultivation. There is a supply channel from a considerable stream to the north which falls into the Palar a couple of miles above Vaniembady. At the head of the channel, which is unregulated, there is a rough stone anicut which appears to be fairly efficient. The channel banks are not in good order. Where the channel crosses the Kistnagherry and Vaniembady road the state of the bed shows that the small tunnel is of insufficient capacity, and that sometimes the quantity of water flowing down is large. To make the tank safe its surplus weir should not be less than 45 feet in length, and the bund must be brought to a level of 4½ feet above the crest. Bunding on the crest of the escape must not be permitted. The upper part of the surplus channel to the point where there is a sudden fall must be widened so as to give a free outfall, the widening should be on the right bank.

47. This has a supply channel from the stream which supplies the Natrum-pully tank. It is a Mittah tank. The Kaylandaputty Tank. bund is irregular and not in good order.

Near south end it is revetted, and between the revetted part and the escape pavement, 70 feet long, the bund is very weak. Very little water has ever been discharged at the escape, and probably most of the surplus finds its way out by overflowing the channel bank which is low and weak. The tank bund should be 4 feet above the crest of the escape, and the channel bank 1½ feet above the same level. There is room for lengthening the escape 30 feet. 300 yards or so to the eastward the railway runs, and the opening for this drainage appeared from a distance to be a culvert of 6 or 9 feet, which must be insufficient for complete

stagnation; for the drainage basin,* exclusive of the supply from the river, must occasionally cause a large quantity of water to be discharged.

48. The freshes of October 1874 were of unusual height, and the result has been, as the Government are aware, the Palar river at and near Vaniembady, 18th Jan. destruction of a large amount of property in houses and valuable cocoanut plantations or garden lands in Vaniembady, Rahimanpett, and the detached township of Periapett. Moreover, as regards the latter place particularly, the destruction will certainly be continued when the next freshes occur, unless immediate measures be taken to avert the danger. Many of the houses destroyed and of those now threatened with destruction were or are fine substantial structures worth a good deal of money. It is not therefore a matter of a cluster of mud huts which might be re-built at a small expense in some safer locality and to provide for which a very small sum would suffice.

49. The atlas sheet No 78 will enable the following description to be the more readily understood, and there is no larger scale survey at present available the better to exemplify the lamentable effects of the flood, but as one will be needed to enable effective works to be decided upon, the District Engineer has been authorized at once to engage a Surveyor and lascars and to lay down upon the Revenue

Scale 16 inches to the mile. Survey maps the present state of the river.

Nearly two miles above the fort of Vaniembady a channel taking off on the left bank of the main stream will be seen; probably the enlargement of this has been going on for years, but at any rate it is now the largest and deepest branch of the river. Between this and the right branch there is a large island, towards the eastern end of which there is a village marked Rymanpettah which is really Periapett, Rahimanpettah being on the other island. West of Periapett a sharp bend of the river to the northward is shown, and there must have always been a tendency to cut away towards the south and east. Now the river channel has gone beyond a good alignment, and in so doing has swept away a large part of Periapett and a great extent of cocoanut gardens, and occupies a channel entirely clear and to the right of its former bed for much of its course, the bend northwards being now below the town, and this is succeeded by an abrupt bend to the east. The head of the channel passing to the south of this upper island is greatly silted up, and much of the head of the island has been washed away. Large quantities of water

passed down the branch between the two islands and did a good deal of mischief; below the lower end of the upper island the united waters eroded the right bank greatly in several places, at one of which the scarp has been brought close to some houses, and is at no great distance from the Sub-Magistrate's Cutcherry. On the right lower channel to the south-east of Vaniembady there was a 3 arch bridge on the road leading from the Railway station to the town; this was completely destroyed in the flood of May 1874. Good floorings and a lower apron would have saved it, as undermining from scour was evidently the cause of its fall. With the exception of a few unusually high places, both islands appear to have been submerged by the flood, and it is not to be wondered at that the inhabitants felt their position to be eminent. Various, for with the one bridge gone there were no means of escape left. The evidence of the sad effects of the flood upon property is still very patent, the beds of the rivers being strewn with cocoanut trees in all directions, and the half-washed away houses of Periapett on the river brink, with those dismantled close by to save the roof timber, &c., present a scene of great desolation.

50. The most pressing work to be done is the prevention of further erosion on the south or right bank of the river at Periapett. This can, it is thought, be effectually done, if taken in hand at once.

1st, by laying down at such a distance from the foot of the scarp as will admit of a new slope of 2 to 1 being given to the bank, a line of durbah or nanel grass rollers made in the Tanjore* way, placed in a regular curve, bedded as low as possible in the sand,

* See description given in memorandum on use of nanel.

and pegged down with long stakes driven 4 or 5 feet into the bed. This line of rollers will form the toe of the slope, the top of which should be so far away from the top edge of the scarped bank as to allow of a regularly and flatly curved alignment. The slope and filling in should then be formed of the best soil available in the neighbourhood, and it must contain a good deal of clay; the filling in to be carried up from the bottom and over the whole width from scarp to face in 4 inch layers, watered and well rammed with heavy rammers; the slope is to be revetted with nanel revetment formed of rolls pegged† down with the long ends placed in the mass of the earth and between each two layers.

† Small thin pegs 8 or 9 inches long.

Afterwards the facing is to be watered and kept quite moist until it is clothed with a well-established crop of growing nanel. As a further security it will be desirable, if practicable, to place two more lines of durbah rollers outside, the first roller forming the toe of the slope and similarly staked down, or an apron of rough stone 3 yards wide and 2 feet deep would be an effective substitute, if sufficient nanel for the rollers cannot be obtained.

The new bank should extend from the upper end of the small cocoanut tope immediately above this pettah to a point some yards below the last house near the river.

2ndly, a plantation of nanel should be at once formed commencing at a bush on the edge of the right bank at about one-third of a mile above the pettah, starting with a width of say 3 yards and gradually increasing the width with a regular and even curve for the outer edge; until opposite the pettah this width will probably be 25 yards at least. This plantation to be carried on in front of and beyond the new bank until it reaches a point at which the set of the river has passed to the northwards. There is a shallow stream in the river, and if the nanel be now planted it will probably thrive.

3rdly, for the protection of the nanel plantation and the diminution of the current along the right bank, a set of cocoanut horse groynes (vaganies) should be constructed. Their direction* should be not less obtuse than

* Pointing down stream;

135 degrees, with the axis of the current which here may be deemed to be parallel with the line of the bank, and their length should be such as to extend to two-thirds of the width of the nanel plantation; if placed at 75 yards intervals they will probably be fully effective. It is doubtful whether bamboo thorn tatties will be available for fastening upon them, and this is the best material, as the current is by them materially checked, yet not so much so as to cause scour.

The Superintending Engineer, Tanjore, should be applied to for the services of three or four men well acquainted with the work to assist. Cocoanut leaf keets and brushwood will be the best substitutes for bamboo thorns.

51. It is believed that these simple and comparatively inexpensive works, which the District Engineer has been authorized to proceed with, will prevent any further damage from ordinary high freshes, but for the permanent safety of the towns, works of much greater magnitude will be needed, and the details of these cannot be settled until the survey and levels with cross sections of the several branches at about quarter of a mile intervals have been completed. It will be necessary to establish regulating dams, with flood banks in connection therewith, for dividing flood waters approximately in proportion to the present capacity of the several channels into which the river is divided, and for preventing the Periapett branch from becoming year by year larger, and the silting up of the other branches still greater than it now is. As far as the future safety of Vaniembady and its townships is concerned, this may, with suitable arrangements, be much more assured than was the case formerly, seeing that the total capacity of the river waterway has been greatly increased; and if each branch does its full share of the duty of carrying flood waters these will be likely to do much less harm. What is wanted is then—

1st, a proper distribution by means of regulating dams, with embankments to prevent these being turned.

2nd, the laying down of a proper alignment for each branch, and the working up to this by means of nanel plantations.

3rd, the protection of the river banks throughout by nanel, peykar-rambu, &c.

4th, probably some permanent groynes.

5th, such embankments as may be found to be requisite to prevent spill from one branch to another in the neighbourhood of the townships or elsewhere.

The discharge of the Vepumpet and Natrumpully streams, both of which fall into the Palar right branch below the head of the upper island, will need to be specially taken into account, the freshes in these streams being frequent and sometimes heavy.

52. The inhabitants of Periapett wish this branch of the river to be forced back into its old course, but this is manifestly economically impracticable, seeing that the old channel was one from which the river had naturally a tendency to depart; the limit of reformation here will be the retraction of the channel to the line which is the best for purposes of easy discharge without undue tendency to erosion.

53. The bund wants levelling and the natural escape should have a pavement with a wing revetment at the end of the bund. The ground is favorable for the disposal of surplus. A little way up the basin surplus is sometimes discharged into the Vepumpett stream. This point is bunded and apparently breaches occasionally; it acts as a safety valve. Altogether it appears to be a serviceable tank; there is one sluice.

54. This tank has a short bund and irrigates 18 acres. It is not worth the outlay that would be required for the construction of a permanent escape at the east end, for the outfall channel has cut down to 4 or 5 feet below bed level, and a masonry weir would be required. At the west end there is rock, and surplus might be discharged there, but the water would pass over and injure the cultivation. The tank is very small, and not likely, therefore, to be dangerous. There is a breach in the guiding bank alongside the outfall channel, due apparently to an irrigation cut. The bund is substantial, and there is one sluice which should be examined, as there is no tunnel or masonry work to be seen in the hole in the bank in rear and there is evidently something wrong at this part of the sluice. The supply of this tank comes principally from the high ground to the west of the Trunk Road.

55. This is a Mittah tank. It discharges surplus over a length of 60 feet at the left end of the bund; the arrangements are bad and a pavement is required. Some extension is practicable at the left end. There is a considerable breach to the eastward, but very hard soil prevented its being cut down below 1 yard below F.T.L. The bund is in bad order and wants levelling; the water overflowed it in two or three places. There is only one sluice and that is at the east end. Water can be got rid of at the east end, but here the soil is soft, and so the surplus work at this end should be somewhat higher than that at the west end. There are three petty tanks, all Mittah, above the Vepumpett tank. No large amount of stored water was poured into the Vepumpett stream; no doubt the discharge of the latter was great, but it was mostly due on this section of the basin to direct drainage from heavy rainfall.

56. This tank received extensive damage, the whole of the modern bund at the south end having been washed away, but fortunately it was founded on rock, Kothakuthay Tank.

and this not only prevented a deep breach, but formed a rough surplus weir over which the flood waters were discharged. The drainage basin is said to be 14 square miles. An escape weir of ample length should be provided, and this will not be difficult. There are two tanks and a pond above. The bund terminates at the other end at a rocky hill. There are only 29 acres of wet cultivation under this considerable tank, and so the cost of making it safe will be out of proportion to the revenue. There are two sluices of one of which the tunnel at junction of rear cistern has been destroyed, and the head is reported by the villagers to be out of order. The second sluice is stated to be in need of repair.

57. All the above tanks commencing with the Chettyappanur new tank (paragraph 53) are in the valley of the Tanks affecting the railway near Vaniembady. Vepumpett stream, across which the bridge on the trunk road and that on the railway a short distance below were destroyed in May 1874. None of the tanks were so breached as to discharge more than a portion of their contents, and it is tolerably clear that had there been no tanks the flood in this stream would have been remarkably high, though possibly the enhancement of the discharge due to the partial breaching of the tanks may have just sufficed to occasion the difference between a severe strain on the bridges and their destruction. The water way of the new railway bridge has been fixed at 120 feet instead of 75 feet linear, and this will be ample, but it is none the less necessary and desirable that all the considerable tanks in the valley should be made perfectly safe.

58. In riding through this valley the remains of many small tanks were noticed and all of these had been breached owing to the absence of any means of disposing of surplus. It appears that most Petty tanks on minor streams of the Vepumpett valley.

of these were private tanks, and it would seem that the experience of the past has not shown the people the folly of so constructing tanks, for a new one was being formed under precisely similar circumstances. The Deputy Tahsildar at Vaniembady was informed of this, and he promised to make inquiries. No new tanks should be allowed to be constructed or old ones to be restored without adequate escapes, and these escapes should be first built and the earth-works thrown up afterwards. Individually they may be very small, but the breaching of half a dozen of them may do great damage to the tanks, road, and railway below.

59. Most of the tanks of the Salem District have unusually strong bunds, with for the most part excellent revetments, stone being abundant and of a Tanks of Salem District.

description well suited for this work. Most of them have escapes without upright stones. Nevertheless but very few of them are safe, and accidents whenever the rain-fall is heavy are numerous. If their requirements, which are in most cases readily ascertainable from an inspection, coupled with an examination of the atlas sheet on which the drainage basins are usually clearly indicated, be attended to, such a thing as a breach in a tank will be most rare. Fortunately, as a rule, it will

not cost much to make the tanks perfectly safe, while their maintenance thereafter should absorb but a moderate per-centage of the revenue, seeing that revetted tanks are liable to but very little wear and tear. I have seen no other district in which works of this class are so easily capable of being put thoroughly to rights with so little difficulty. The lengthening of escapes to correspond with the areas of the catchment basins; the construction in some cases of a low wall to form a crest, stop leakage, and fix more accurately the full tank level, or where there is little or no leakage a levelling course of concrete on the line of the crest, and the addition of adequate wings, which generally may be well packed revetments of well-shaped stone, backed with a foot or so of gravel concrete (like the surface of a road) well rammed, and pointed with mortar, with the top of the bund made level at a height of 2 to 4 feet above M.W.L., and ordinary repairs to sluices are all that is required generally, though in some cases revetments will to some extent need re-construction. In all cases the drainage of the top of the bund should be thrown to the rear, and water should be prevented from entering at the back of the top of revetments by covering the upper course of stones with a little soil, which may, where necessary, be formed like the side ridging of a road embankment.

60. From what I learnt casually, as well as from what was seen during the tour in the district, there is much reason for believing that the irrigation from the minor rivers or streams of the district requires thorough overhauling. There would seem to be numerous anicuts having under them individually a very small area of irrigation and revenue, and the cost of maintenance is frequently out of all proportion to the revenue, owing first to the way in which the anicuts were originally built, and secondly to the fact that the cost of keeping an anicut in repair is, other things being equal, in proportion to the area the drainage of which passes over it. Consequently a dozen anicuts on the same river, where two or three would suffice, cause a great waste of money upon maintenance, and it is very desirable that the number of dams should be reduced as much as possible, and that those which it may be found necessary to retain should be made efficient by such alterations and improvements as will reduce the cost of up-keep to a minimum. At present it would seem that very little is known about these works, and a complete examination of each stream will be necessary. The District Engineer and Range Officers must determine that whatever is done in the future shall be what is right to be done and not merely a restoration of damaged work with a perpetuation of the faults of construction which over and over again may have in the past led to similar damage. The right mode of restoration may not always be found out at once, but at any rate dams should not be allowed to be turned any more owing to the absence of wing walls or revetments of sufficient height and strength, or to the want of a few yards of flood bank, while if one form of apron has proved to be unstable some other arrangement should be substituted.

61. The remarks contained in this memorandum will show that there is a vast amount of most useful work to be done in the district, work which will, if well done, be assuredly remunerative and advantageous alike to the people and to the Government. The rate of pro-

gress will depend upon the strength of the Executive staff, but there is no reason why what it may be possible to accomplish should not be well done, and every irrigation work which may be inspected should have its circumstances and requirements fully gone into, and be dealt with thoughtfully and in accordance with those circumstances. All or nearly all the works were constructed by former generations, who knew not how to provide fully for their requirements, though they did what seemed to them sufficient in a very substantial manner. There should be no difficulty in preserving what is good and serviceable in these works, and in adding to or altering them in the light of the greater experience and knowledge of the present day.

FORT ST. GEORGE.,
31st March 1875.

(Signed) JOHN MULLINS, Lieut.-Colonel, R.E.,
Chief Engineer for Irrigation.

No. 436.

ORDER THEREON, 25th May 1875, No. 1,431.

IRRIGATION, No. 52.

THE notes of inspection of the Chief Engineer for Irrigation will be communicated to the District Engineer,

Salem, for information and guidance, and that officer will take care that the requirements of the Irrigation works generally of the district are dealt with in the manner indicated as necessary in the foregoing memorandum. It will take several years to make all the tanks and other works safe and efficient, but each year as many as possible should be taken up and put into thoroughly good order. In the first instance those tanks which affect the safety of the Railway should be attended to, and in all cases of chains of tanks each series should be dealt with consecutively from the highest tank downwards, and the repair and improvement of each such group should, as far as possible, be completed in one season.

2. The completion of the Chinnakistapuram tank (paragraph 18) and the abandonment of the Valayamadevy tank (paragraph 21) are approved. It is evident that these tank projects were in the first instance not properly investigated, and that, had their circumstances been fully reported upon originally, they would not have been sanctioned. As the completion of the Valayamadevy tank would result in a greater annual loss than will be sustained by its abandonment, no further expenditure upon it will be incurred. The District Engineer will attend to the suggestion made at the end of the paragraph relating to this tank. The careless and slovenly way in which the work at the Chinnakistapuram tank has been executed is noticed with dissatisfaction.

3. The Government concur with the Chief Engineer for Irrigation in considering that, looking to the large amount of work to be done to render the numerous tanks of the district safe, it is not desirable to proceed further at present with the investigation of the proposed reservoir on the Pooniar (paragraph 44), or with the revision of the estimate for the restoration of the Malapady ruined tank (paragraph 45).

4. Orders have already been passed on the subject of the protective works required near Vaniembady and Periapett (paragraphs 48 to 52), and the estimates for

No. 740, dated 17th March 1875.

*Proceedings of the Madras Government, Public Works Department,
25th May 1875.*

those undertaken on emergency are awaited and should be submitted with explanation of the delay which has occurred in their preparation.

(True Extract.)

John A. S. S. S.

Major, R.E.,

Offg. Joint Secretary to Government.

To the Chief Engineer for Irrigation.

- „ District Engineer, Salem.
- „ Revenue Department.
- „ Collector of Salem.
- „ Controller of Public Works Accounts.

Exd. E. C. Shunker.

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Govt of 1875 Madras

PUBLIC WORKS.

To

THE CHIEF ENGINEER FOR IRRIGATION

&c. &c.

Dated May 25th

Issued

Recd. June 3rd

Recd.

G. O., 25th May 1875, No. 1,431.

MAY

Nos. 435-436

N^o 1188

Comm. to the
Board of Revenue

4th June/75. *Ali*

Salem District. - Passing order on
notes of the Chief Engineer for Irriga
of a tour of inspection in the

14. To the Board of Rev. Ser. 10 June