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Report on the Cauvery Project

1903

by

H. A. MOSS

REPORT

ON THE

CAUVERY PROJECT.

1903.

BY

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CAUVERY PROJECT—REPORT.

GEOGRAPHY OF CAUVERY RIVER AND DELTA.

Geography of Cauvery and its delta.—The district of Tanjore is about 3,650 square miles in extent and lies between 9°50′—11°25′ north latitude and 78°55′—79°55′ east longitude. It is bounded on the north by the Trichinopoly and South Arcot districts, on the west by the Trichinopoly and Madura districts and on the east and south by the Bay of Bengal and Palk Strait. The area enclosed forms roughly a four-sided figure, the extreme breadth being 70 miles and the length 115 miles. The coast line is 150 miles long.

In physical character the district naturally divides itself into two parts: (1) the northern portion comprising the delta of the Cauvery and its branches, and (2) the southern or higher tract which lies outside the influence of the river.

The delta consists of a gently sloping alluvial plain extending from a point 10 miles west of Trichinopoly to the sea. The non-deltaic portion is also chiefly formed of alluvial soil, but it is situated generally on a higher level.

The river Cauvery rises near Mercara in Coorg and drains a considerable area of the Western Ghauts where there is a very heavy rainfall in the south-west monsoon. This monsoon gives the greater part of the water to the river and occasions the highest floods.

Sources and amount of water-supply.—The portion of the catchment area fed by the south-west monsoon is 16,850 square miles and the maximum discharge from it is on an average about 157,000 cubic feet per second and may be expected usually in the months of July or August. 137,000

After leaving Mysore the Cauvery begins to come within the influence of the north-east monsoon, and before entering the delta receives a good supply from it towards the end of the year.

The portion of the catchment area subject to the north-east monsoon is 10,900 square miles and an average maximum discharge of 98,000 cubic feet per second may be expected from it in October.

The average total yearly discharge of the Cauvery at the head of the delta (upper anicut) is 450,000 millions of cubic feet, the drainage area here being 27,705 square miles. Of the total discharge 270,000 millions of cubic feet is supplied by the south-west monsoon and 180,000 millions by the north-east monsoon.

Description of the delta.—The head of the Cauvery delta is 10 miles west of Trichinopoly. Here the river bifurcates into two large branches, of which the northern takes the name of Coleroon while the southern retains that of Cauvery. For the sake of distinction the main river is sometimes known as the *Agunda (wide)* Cauvery.

The Coleroon is really the main channel of river and carries the bulk of the flood water to the sea. It flows in an easterly direction along the northern boundary of the Tanjore district and enters the sea at Devikotta.

The Cauvery or southern branch is utilized as the main channel for the supply of irrigation water to the fields of the delta. It divides and subdivides into innumerable branches which form a network of distributaries all over the delta. Some ultimately find their way into the sea while others are lost in the wide expanse of rice fields. The one which retains the name of Cauvery throughout enters the sea, reduced to an insignificant stream, at Cauveripatam about 8 miles north of Tranquebar.

The whole surface of the delta is a vast stretch of rice fields interspersed with topes or clumps of cocoanut and other fruit trees.

Anicut irrigation.—The alluvial soil of this part of the country is very fertile and, with sufficient water, yields abundant crops of rice. Irrigation from the Cauvery and its branches has been practised from very ancient times. There are many old native works existing and still in use for damming up water in the various river channels and turning it on to the neighbouring land. Many or most of the channels themselves too seem to be of artificial origin, and the character of the works remaining shows that, under some of the old native rulers, the irrigation system of the country must have received considerable attention.

Defects and deterioration of old irrigation.—From want of proper control over the water distribution and floods, however, the system in use must have been defective from the first. Then, for more than a century before the advent of British rule, the irrigation works had been entirely neglected owing to the disturbed state of the country, and when the East India Company took over the Tanjore district in 1801, the system of irrigation in the delta was rapidly deteriorating, the channels were silting up and the land being left uncultivated for want of water-supply.

First improvements.—Great efforts were made by the first district officers to remedy this condition of affairs. For many years these were mainly directed towards trying to remove the sand deposits in the Cauvery which formed the principal obstruction to the water-supply by providing a number of sluices and outlets at suitable places into the Coleroon which, for about 20 miles, flows parallel to, and at a short distance from the Cauvery. But it was not until 1836 when the upper anicut was built across the head of the Coleroon by Sir Arthur Cotton that this difficulty of water-supply was finally overcome. The supply, indeed, became during floods more than ample and threatened, through its very overabundance, to become a source of danger, causing serious erosions to the bed and banks of the Cauvery, till it was curtailed by a regulating dam built across the head of the Cauvery in 1845.

When the upper anicut was built another large dam (called the *lower* anicut) was also built across the Coleroon, 70 miles lower down, to remedy the loss to the irrigation channels of South Arcot (which take off here) occasioned by the diminished supply in the Coleroon owing to the construction of the upper anicut.

Since the upper anicut was built many other works have been carried out with the object of improving the irrigation of the delta. These consist chiefly of large regulators across the heads of the main channels and have been of great service in controlling floods and apportioning the water-supply. The minor distribution, however, has been left in the hands of the people and is still very defective.

Latest improvements.—The question of main distribution and flood control has of late received great attention. Several new regulators of a more modern and powerful type have been built and others are in the course of erection. The upper anicut has been cut down and rebuilt as an open dam with 55 vents, 40 feet wide, fitted with lifting gates which allow a much freer passage for flood water while enabling an extra 2 feet of depth to be turned into the Cauvery when the river is low. The lower anicut has also been converted into an open dam with 60 iron gates, each measuring 34 feet × 6 feet and it too is now capable of heading up 2 feet more of water when necessary. When all these works are completed the control over the water of the river and its branches will be very effective.

The drainage of the delta which at present is far from satisfactory is also receiving consideration.

Increased prosperity and increased assessment.—Owing to the steady and continuous improvement of the irrigation of the Cauvery delta in past years the land has risen in value and the returns from cultivation have greatly increased and at the last revenue settlement of the Tanjore district in 1893–94, it was found possible to raise the assessment on the lands supplied by the Cauvery by as much as 32 per cent. on the average. The fact however remains that both the drainage of and the supply to the delta are capable of much improvement; the former question is now being seriously taken up; the latter can only be dealt with satisfactorily by means of storage, the scheme for which is embodied in this report.

Tanjore rice crops.—There are 915,000 acres, or more than 75 per cent. of the total irrigable area of the Tanjore delta under rice cultivation. About 14 per cent. of this area produces two crops in the year.

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There are several kinds of rice cultivated, of which the three most commonly grown are—

(1) *Kar.*
(2) *Semba.*
(3) *Pisanam.*

(1) Of the *kar* crop there are 12 varieties with periods of growth of from 4 to 6 months.

(2) The *semba* is usually grown as a second crop to the *kar* on double crop lands. There are 17 varieties of this with periods of growth of from 4 to 5 months.

(3) *Pisanam* is commonly grown where only a single crop is raised and of this there are 6 varieties with periods ranging from 5 to 7 months.

The time for rice cultivation is not uniform throughout the delta, but differs in various localities, being influenced by the local conditions of river-supply and rainfall.

Conditions of irrigation water-supply.—As will be seen from the map the Cauvery enters the delta at the narrow western corner or neck and its waters are distributed over an ever-widening expanse of country on their way to the sea. The volume available in the channels is consequently much reduced as they proceed eastwards and the porous nature of the soil tends to still further diminish the supply by absorbing large quantities of water.

This is especially the case when the first freshes come in June after the country and its water courses have been dry for many weeks. As is only to be expected, therefore, the land towards the west receives a much earlier and more abundant supply than that towards the coast. The supply of the latter portion of the delta would indeed be very much deficient if it were not for the fact that the porous character of the soil already referred to, enables it to store up a considerable quantity of the river supply which afterwards drains out and is partly given back to the channels in the form of spring water for the benefit of the lower land. As we go east too the rainfall is heavier making up in a great measure for the diminished river supply.

System of rice cultivation.—Throughout the delta rice is invariably grown from transplanted seedlings. It is never sown in the fields on which it is grown. The seed is first sown thickly in seed-beds and after about 25 days the seedlings are transplanted into the liquid mud of the rice fields which have been prepared to receive them.

The seed beds are usually watered by the early freshes in the river, but in some parts water is obtained for them by baling from wells.

Any water in the river in excess of what is necessary for the seed-beds before the time of transplantation generally runs to waste as the ryots object to using it on their fields or wetting them until just before transplanting. They prefer the ground to remain dry and get thoroughly aërated. The lands which bear a double crop are practically confined to the western part of the delta where the water-supply is best. A north and south line through Kumbakónam may be taken as about the limit of the double crop land.

In this portion of the delta it is customary when two crops are grown to transplant the first crop (a short one) as soon as possible after the arrival of the early freshes in June so that it may be harvested in September before the break of the north-east monsoon. This is at once followed by a five months' crop for which seed-beds have already been prepared.

Where only a single crop is grown it is a long one taking usually six or seven months to mature. In the west of the delta it may be got in in July but more usually it is transplanted in August and harvested in January or later.

In the east where the proportion of double crop is very small the cultivation may begin in August, but it generally begins in September, the crop being harvested in March. The reason for the later date for cultivation in the east is the late arrival there of the early supply from the first river freshes.

The difference in time as we go east may be as much as two months.

Conditions of cultivation.—The rice cultivation of the delta depends on the Cauvery floods in the first place and secondly on local rain. The regular freshes begin about the middle of June and continue more or less uninterruptedly till about the middle of October when they begin to subside. This is just the time when the pisanam crops begin to mature. For about a month and-a-half after this they require water and have to depend on the north-east monsoon rain. This is an anxious period for the cultivators, and if there is a serious failure of the local rains the outturn is certain to be much below the average.

Another anxious time is the preceding interval between the two monsoons, *i.e.*, from 1st September to 15th October. The ideal of a good or successful season presumes a fair river supply and good local rain in this interval. If there is a low river, but two inches of rain in a fortnight, the irrigation does not suffer; while if there is four inches of rain the crops are independent of the river. The rainfall, however, is seldom of itself sufficient and without the probability of an adequate river supply in addition at this time the present large area of rice cultivation in Tanjore would be impossible.

During the north-east monsoon the rainfall in the eastern delta is usually more than necessary for irrigation and it often proves difficult to get rid of the surplus water. This portion of the country is also subject in this monsoon to the effects of cyclones and they cause the land to be at times deluged to an alarming extent.

Taking the delta as a whole it is observed that both the river supply and rainfall are precarious. The Cauvery being very heavily drawn on when low frequently runs short with the result of deficient crops and occasional complete failure in places. Consequently Tanjore irrigation is at present far from satisfactory though susceptible of considerable improvement.

The uncertainty of the water-supply is, to a great extent, due to the want of proper control over the water entering the delta and to imperfect distribution in the net work of channels. While much injury to crops is caused by defective drainage and though the average return from cultivation through a number of years is good, there is abundant evidence that the ryots frequently sustain loss through the produce of the land being reduced either by drought or floods.

Arrangements for improvement.—In 1896, with a view to still further improving the condition of the delta, Colonel A. W. Smart, R.E., was placed on special duty to prepare designs and estimates for works which would as far as practicable improve the supply and drainage of the delta and more thoroughly control the river floods. These estimates and designs are mostly completed and sanctioned. Some of the works have been constructed and others are now in progress.

When all are completed they will, it is hoped, dispose of the troubles resulting from floods and imperfect water distribution as well as to a certain extent improving the supply.

Project for protection by storage.—Attention was also given to the question of protecting the delta by storage, and it is mainly with a view to this protection that the present project has been schemed, though a considerable extension of irrigation is also contemplated as there is plenty of water available for both purposes.

History of the Cauvery project—Sir Author Cotton's proposal.—The idea of protecting the wet cultivation of the delta by storage of flood water is a very old one. The first proposal appears to have been made by Sir Arthor Cotton as long ago as 1834, but no attempt seems to have been made to ascertain the practicability of the scheme.

Major Lawford's proposal.—In 1856 Major Lawford submitted proposals for the construction of a reservoir on the Cauvery near Neringipet, but withdrew them after personally communicating with and inspecting some of the work of Mr. W. Frazer, a Civil Engineer then employed in examining the valley of the Bhaváni and its tributaries for suitable sites for the reservoirs. In doing so he gave it as his opinion that he did not now consider the valley of the Cauvery the best site for the construction of the first reservoir.

The reasons for this change of opinion do not seem to be on record, but in all probability it was because the site near Neringipet is not suited to the formation of a reservoir by the construction of a high earthern bank.

The byewash would have been practically an insuperable difficulty and the idea of a high masonry dam such as is now proposed with sluices capable of passing the full flood of such a river as the Cauvery was probably never thought of and would indeed have been hardly feasible in those days.

The Bhaváni river.—The Bhaváni is a small but important tributary of the Cauvery taking its rise in the Nilgiri Hills and joining the main river at the town of Bhaváni, 9 miles above Erode on the Madras Railway. Though the catchment area of this river is only 2,180 square miles, it is well supplied by the rainfall of both monsoons and its yearly discharge amounts to 70,000 millions of cubic feet or about one-sixth of the annual discharge of the Cauvery.

Mr. Frazer's schemes.—Mr. Frazer found several suitable sites on the Upper Bhaváni, but the best was at Pallavoor at the junction of the Bhaváni and Siruvani where the drainage area is 304 square miles. It was found that a reservoir of 13,500 millions cubic feet capacity could be formed here, but the dam would have to be 155 feet high. Apparently that was considered an insuperable objection and the project seems to have been dropped for a time.

Captain Smith's investigation.—It was taken up again under orders of Government issued in December 1869 and Captain C. J. Smith, R.E., undertook the further investigation of reservoir sites in the Bhaváni valley. This investigation, owing to Captain Smith's illness, was not completed, but had proceeded far enough to enable that officer to decide that the best site was somewhere between Satyamangalam and the junction of the Moyar with the Bhaváni.

Major Montgomerie's proposal.—Up to this time there seems to have been no intention of using the proposed reservoir or reservoirs for any purpose other than for the improvement and protection of irrigation in Tanjore, but in 1880, when Major P. Montgomerie took up the question again, he came to the conclusion that it would be possible to give water for local irrigation also. He drew up an elaborate report reviewing all that had been done previously and giving all the information then available.

Assuming the discharge of the Bhaváni to be 75,000 millions cubic feet annually he thought that two-thirds of this might be passed down the river and one-third used locally for new irrigation. He suggested that a reservoir, with a capacity of 27,000 millions cubic feet, should be formed by damming the river at a site 4 miles above Satyamangalam and that a channel should be dug from the reservoir to command 500 square miles of country down towards the Amarávati river (another tributary of the Cauvery), of which area he calculated on being able to irrigate 75,000 acres. The cost of the scheme was put at 40 lakhs and the revenue derivable from it at 11 lakhs. This estimate was based on insufficient data and the figures afterwards proved entirely incorrect. But the report drew attention to the necessities of the case and in 1883 Captain Romilly, R.E., was put in charge of the investigation.

Captain Romilly's investigation and proposals.—His report, with the Irrigation Chief Engineer's (Colonel Hasted, R.E.) review of it, is printed in G.O., No. 933 I., dated 15th October 1884.

The result of Captain Romilly's investigation was that there were two suitable sites for the construction of large reservoirs on the Bhaváni—one 4 miles above Satyamangalam and another 6 miles higher up.

He calculated that if a supply of 12,000 millions cubic feet were ensured from the Bhaváni in September and 8,000 millions cubic feet in October, 5½ feet depth might as a rule be maintained on the Cauvery dam at the upper anicut and the cultivation of the delta would thus be protected from short supply between the monsoons—that is if this supply could be sent down without loss.

He prepared rough estimates for reservoirs varying in size from 8,000 millions to 30,000 millions cubic feet capacity. He was of opinion, however, that the construction of any reservoir would be unprofitable if a financial return from any benefit to Tanjore irrigation was reckoned upon, but advocated rather the construction of his smallest reservoir (8,000 millions cubic feet capacity) at the *higher* site chiefly for local irrigation, calculating the return at 17 per cent. or more. He allowed in this case only 13,000 millions cubic feet for the protection of Tanjore, but he doubted if Tanjore irrigation could benefit at all from water stored for the purpose in a reservoir even of the largest size practicable in the Bhaváni valley owing to its great distance and to the great loss by absorption in transmission.

Colonel Hasted in reviewing his report differed from him as to the proper site and as to the feasibility of protecting Tanjore irrigation, and thought that a reservoir of 16,000 millions cubic feet capacity (as giving the cheapest storage per unit of capacity) ought to be constructed at the lower site. It would give the required 20,000 millions cubic feet in September and October as well as providing for 50,000 acres of local irrigation. He expressed no opinion as to the return to be expected.

Government in passing orders on the report agreed generally with Colonel Hasted's views, but did not require further investigation or say what was to be done. Nothing apparently was done, or at least nothing is on record till 1892 when Mr. J. C. Larminie, then in charge of Coimbatore division, took up the work.

Since then the subject of storage for Tanjore and Coimbatore irrigation has been constantly to the fore and the records have become very voluminous and confusing owing to the great variety of opinion among those concerned as to the best plan to follow and also to the way in which their opinions were modified as discussion on the subject proceeded.

Mr. Larminie's first proposal.—At first, after some preliminary investigation, Mr. Larminie was in favour of a reservoir at Captain Romilly's upper site and submitted an approximate estimate for one of 16,000 millions cubic feet capacity to ensure the required protection to Tanjore (20,000 millions cubic feet in September and October) and to irrigate 50,000 acres locally.

Then a discussion arose as to the proper site for the dam. The lower site was generally preferred and a great deal of money was spent in examining it and one or two other sites somewhat higher up by trial pits and trenches. Finally, in 1898, a site, seven and half miles west of Satyamangalam, was selected as affording the best rock foundation for the dam.

Mr. Hughes's first Bhavani project.—Meantime, in 1897, Mr. Hughes became Chief Engineer for Irrigation and he took the project into his own personal charge with the intention of completing it at an early date. He wished also to make it a productive work, and with this object gave up the idea of local irrigation in Coimbatore, as investigation showed that he could not make a combined project pay.

As will be seen from his preliminary report issued in November 1898, he proposed a reservoir of 27,000 millions cubic feet capacity formed by constructing a dam, partly of earth and partly of masonry, across the Bhaváni valley at the site fixed upon. Eighteen thousand millions cubic feet of the water stored was to be reserved for protection of Tanjore irrigation, and passed down during the interval between the monsoons in September and October.

To make the project pay he proposed to provide water for 100,000 acres of second crop in Tanjore, and to begin sending it down on May 15th to enable an early crop to be got in everywhere. He also proposed to provide for an extension of the wet cultivation in the district by 50,000 acres. This was to be supplied through the medium of the new supply channel of the Pattukkottai project then under preparation. He reckoned on the Cauvery floods being able to supply this new irrigation for about four months and consequently on its only being necessary to give two months' supply from the reservoir. The cost of the project he calculated to come to Rs. 1,69,00,000 and expected a yearly return of about Rs. 7,00,000 from second crop and irrigation extension.

Mr. Larminie's objections.—These proposals were criticised by Mr. Larminie who acted for Mr. Hughes when on leave. He objected to the site fixed for the dam and to the Bhaváni water being used solely for the benefit of Tanjore. He pointed out that since the construction of the new Cauvery-Vennar Regulators in 1887, the average annual remissions had only been 0·39 per cent. of the net revenue. In fact he thought that Tanjore was getting quite enough in the way of improvements to irrigation in the works of the "Cauvery completion estimates" and that the dry, poverty-stricken tracts of Coimbatore ought to receive first consideration under this scheme.

Committee of inquiry.—On this His Excellency Sir Arthur Havelock directed that Mr. deWinton (Chief Engineer), Mr. Larminie and Colonel Smart (then employed on the Cauvery completion estimates) should form themselves into a committee to go into the question and submit a report to Government.

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On his return from leave Mr. Hughes was also directed to join the committee and Mr. Larminie was placed on special duty for the further investigation of the project.

In their report, dated 10th January 1900, Mr. deWinton agrees with Mr. Hughes's proposals, but Colonel Smart dissents from the resolution that all idea of direct irrigation in Coimbatore should be given up. He also thought that before deciding finally on the site for the reservoir a full investigation of the capabilities of the Cauvery for storage purposes should be made.

Mr. Larminie's further objections.—Mr. Larminie had gone on leave before the committee had prepared their report, but before going he addressed a letter to the Chief Engineer for irrigation in which he drew attention to an objection that had hitherto been overlooked, viz., the injury that would be done to Tanjore irrigation by drawing upon the early freshes to fill a reservoir on the Bhaváni.

He pointed out that the recognised full supply for the delta in the south-west monsoon is 6 feet on the gauge at Cauvery dam (upper anicut). The upper anicut was built to provide that full supply in the Cauvery and the Tanjore cultivators have a right to expect it whenever it comes naturally and that it should not be interfered with by any arrangements for storage. Nothing should be held back except the surplus over the 6 feet discharge which now runs to waste over the upper anicut.

Mr. Hughes had proposed to make 4·8 feet on the gauge at Cauvery dam the standard, and to hold back all Bhaváni water for storage as long as the water-level exceeded that. As the river fell the water would be returned to keep it up to that level.

Mr. Larminie contended that such interference with the Tanjore irrigation supply would be most injurious and as he showed that such a large reservoir on the Bhaváni could not be filled by holding back Bhaváni water only, when the gauge at Cauvery dam reads over 6 feet, he condemned the project as it stood and advocated instead the construction of a large reservoir on the Cauvery which could be worked without interfering with the 6 feet standard gauge reading.

Effect of Bhaváni floods on supply.—Floods in the Bhaváni and Cauvery come in the same seasons and if the freshes from both rivers came simultaneously, this objection could not hold good. The abstraction of the Bhaváni flood water would not much affect the gauge reading as the quantity is so much less than that from the Cauvery. But, as Mr. Hughes himself observes, the chances are against a Bhaváni fresh coinciding in time with a Cauvery fresh (preliminary report). It may usually be expected to come a little before or after the maximum of the Cauvery fresh. The result for the purposes of irrigation is beneficial. In a natural way the total flood discharge is to a certain extent regulated. The maximum rate of discharge is reduced and the period of low fresh is lengthened. The Bhaváni freshes therefore, though comparatively small in quantity, play an important part in keeping up the supply to the Delta and cannot be held back except at rare intervals without materially altering the conditions of irrigation. It would be different if there were one or more large storage reservoirs on the Cauvery by which the Cauvery floods might to a certain extent be regulated. Almost all the Bhaváni flood water might then be taken for storage and in this way a large reservoir on the larger river would greatly add to the efficiency and value of one on the smaller. But until such a reservoir is constructed on the Cauvery there will always be a difficulty in retaining sufficient water to fill a reservoir of much size on the Bhaváni.

Colonel Smart's objections and proposal.—Colonel Smart then took up this question very vigorously. He agreed with Mr. Larminie's views as to the reduction of the full supply level, and also insisted that the allowance for early supply was far from sufficient considering the great extension of second crop contemplated. The water instead of finding its way to the seed beds and fields would be nearly all absorbed in the dry sandy beds of the delta canals. He, therefore, made out a proposal for the construction of a large reservoir on the Cauvery, and showed that such a reservoir would, besides ~~giving~~ more efficiently all the protection intended for Tanjore without reducing the full supply level, allow of a very large extension of wet cultivation.

The early supply he considered unnecessary and thought that the ryots ought rather to be encouraged to find their own water for early seedlings by baling from wells as is even now customary in some parts of the delta.

The Bhaváni project controversy.—A very animated controversy then arose between these two officers (Mr. Hughes and Colonel Smart) as to the merits and disadvantages of the two schemes. Mr. Hughes objected to the Cauvery reservoir chiefly on the grounds that it would trap a great deal *more* silt than one on the Bhaváni and would therefore not only become useless from want of capacity very much sooner, but would deprive the water of much of its fertilizing value.

Mr. Hughes's final Bhavani project.—Meantime Mr. Hughes completed his Bhaváni Project and issued his final report on it. He had by this time somewhat modified his views. He proposed now to begin the early supply on June 1st instead of on May 15th to supply water for 94,000 acres of second crop and to irrigate 90,000 acres of new wet cultivation. The cost of the scheme was now put down at Rs. 1,13,40,000, and the return, according to the Revenue information (G.O., No. 122 I., dated 5th February 1900), was expected to be Rs. 4,00,000 or $3\frac{1}{2}$ per cent.

The Inspector-General's decision.—The papers relating to the discussion between Mr. Hughes and Colonel Smart were laid before Mr. (now Sir Thomas) Higham, Inspector-General of Irrigation. He went into the whole question very carefully and thoroughly, and came to the conclusion (*vide* his note, dated 24th August 1901) that a reservoir on the Cauvery would be likely to prove more powerful and remunerative than one on the Bhaváni, provided the injury caused by its abstracting the fertilizing silt from the water was not an insuperable objection. The latter was a point on which he did not feel qualified to give a definite opinion. It would weigh against both schemes and he advised careful observations to test its value. He attached little or no importance to the loss of capacity due to the silting of the Cauvery reservoir.

Order for investigation of Cauvery project.—On this the Government of Madras sanctioned the further investigation of the Cauvery and Bhaváni scheme (G.O., No. 352 I., dated 19th March 1902) and the work was undertaken in April 1902. A project for a large reservoir on the Cauvery has been completed and is now submitted. Another for a reservoir on the Upper Bhaváni for the local irrigation of a portion of the Coimbatore district alone is under preparation. Observations on the quantities of silt carried by the Cauvery, Bhaváni and Amarávati and some of the channels and drains of the delta have been taken and chemical analyses of the silt and water obtained. A note on the results of these observations as far as they have gone is appended to this report.

Proposals now submitted.—The Cauvery project as now submitted is for the construction of a reservoir near Neringipet to hold 46,000 millions cubic feet of water.

By two channels taking off from it directly it will irrigate 45,870 acres of rice cultivation in the Coimbatore and Salem districts. This local irrigation will be capable of considerable extension, should it be afterwards found, as is very probable, that sufficient water is available. But for the present it is fixed at the area stated.

In the delta there is an existing area of 915,000 acres of wet land to be protected and an extension of 216,460 acres now proposed. Of this new irrigation 60,000 acres will be directly under the new Kattar tank the construction of which is included in this project. It will be chiefly supplied by local floods in the Vennar but to be on the safe side its irrigation will be treated in the scheme of working as being supplied by the Cauvery Reservoir. It is proposed also to provide for an extension of 50,000 acres of second crop under the present irrigation of the delta and 110,000 acres of second crop under the new irrigation.

The reservoir is designed therefore—

(1) to protect 1,177,330 acres of wet irrigation (old and new) by ensuring a sufficient supply at all times, but especially in September and October;

(2) to provide a supply for 262,330 acres of new wet cultivation;

(3) to provide water for 160,000 acres of second crop.

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For the extension of irrigation in the Tanjore district some improvements to existing channels are required and new distributaries are also necessary. These works will be described in detail hereafter.

Working of the Cauvery Reservoir.—It is impossible now to state definitely what will be the best system of working for the reservoir. That can only be settled after it has been made and tried for some years, but it is pretty certain that whatever system is arrived at the aim will be to make the best use of the *water* and the question of depriving the lands of fertilizing silt will be treated as quite a secondary consideration. With the reservoir at Neringipet the silt which comes from the Bhaváni and Amaravati tributaries and which is considered, with good reason as may be seen from the comparative analyses, to be the most valuable part of the Cauvery silt will be untouched. Nor is it at all likely that all the silt in the water from the Cauvery itself will be left in the reservoir. In heavy floods the water in the reservoir must be surplused. The flood water will be but a short time in the reservoir and in issuing from it must contain a large proportion of the fine silt brought down. The effect of the reservoir as a regulator will be to prolong the duration of a flood while diminishing its maximum intensity. The ryots will therefore be able to take more water though it may be less silty and their loss in silt will be thus to a certain extent recouped.

In considering this question it must also be borne in mind that the fertilizing properties of Cauvery water do not lie in the silt alone. Much of the valuable matter is in solution and cannot be deposited as sediment. This will be seen from an inspection of the analyses—*vide* Appendix B.

Again it is hardly conceivable that any Government will continue to allow millions of cubic feet of water to run to waste in the Cauvery at the risk of immense loss and distress to the people, if they have the means at hand to prevent it merely on the grounds that the lands able to enjoy the full benefit of a flood will lose *some* of the silt in the small quantity of the flood water they are able to utilize. The owners of this very land, being the heaviest losers in event of subsequent short supply and loss of crop would be the loudest in their complaints. They would not thank Government for such finical thoughtfulness. Tanjore ryots are as much alive to their own interests as most people and there is probably not one of them who would hesitate for a moment to exchange his present precarious supply no matter how silty it may be, for a sufficient and certain supply of cleaner water. It is more than likely therefore that in the system ultimately adopted for the working of the reservoir every opportunity will be taken to hold back and utilize as much as possible of the surplus flood water. But in the system here worked out the water level of the reservoir is supposed to be lowered to R. L. 707, on intimation that a heavy flood is coming and not to be raised again till the water level at Cauvery dam (upper anicut) falls to 9 feet. The water containing most silt will thus be passed on.

Intimation of a flood will be received either from a gauging station far enough up the river or from the telegraphic returns of rainfall within the catchment area; or better still from both. A comparison of the registers of rainfall with the gauge readings at upper anicut shows that from the Mercara rainfall returns alone the arrival of high floods may be foretold with fair accuracy three days in advance. A gauging station up the river would probably give much better results. For present purposes it is supposed that intimation of a flood is received at the Cauvery dam 24 hours before it comes.

It is assumed that half of the water issued direct from the reservoir to Coimbatore and Salem finds its way back into the river. This is a reasonable assumption as the lands irrigated mostly border on and slope towards the river and a duty of only 30 acres to the cusec is allowed in their case.

An inch of rain in the delta is equivalent to three days irrigation and the reservoir sluices can and will be regulated accordingly to economise water. But in the following examples of the working of the reservoir this is not taken into account.

RULES FOR IMPOUNDING AND ISSUE OF WATER.

Impounding.

In June and before—
All water in excess of discharge at 5·0 feet, Cauvery dam (north gauge).

	FEET.
In July, August and September, and to October 15th—	
All as above in excess of	6·5
October 16th to end of year—	
All as above in excess of	5·0

Issues.

	FEET.
In July and August—	
Enough to maintain a minimum on Cauvery dam (north gauge) of ...	5·0
1st to 15th September—	
Enough to maintain a minimum on Cauvery dam (north gauge) of ...	5·4
16th September to 15th October—	
Enough to maintain a minimum on Cauvery dam (north gauge) of ...	5·7
16th October to 30th November—	
Enough to maintain a minimum on Cauvery dam (north gauge) of ...	4·2
After November if water is available—	
According to demand.	

These rules are such as experience shows will be likely to afford at all times a sufficient supply for the present and proposed irrigation if they can be adhered to.

The following diagrams and statements show the effect of a 40,000 million cubic feet reservoir (supposing it had existed) on the water-supply of the delta for the years 1890 to 1899, inclusive. The statements show month by month the gain or loss to the reservoir and the balance remaining in it. The diagrams show graphically the variation of the supply (in cubic feet per second) both as it now is and as it will be modified by the working of the reservoir.

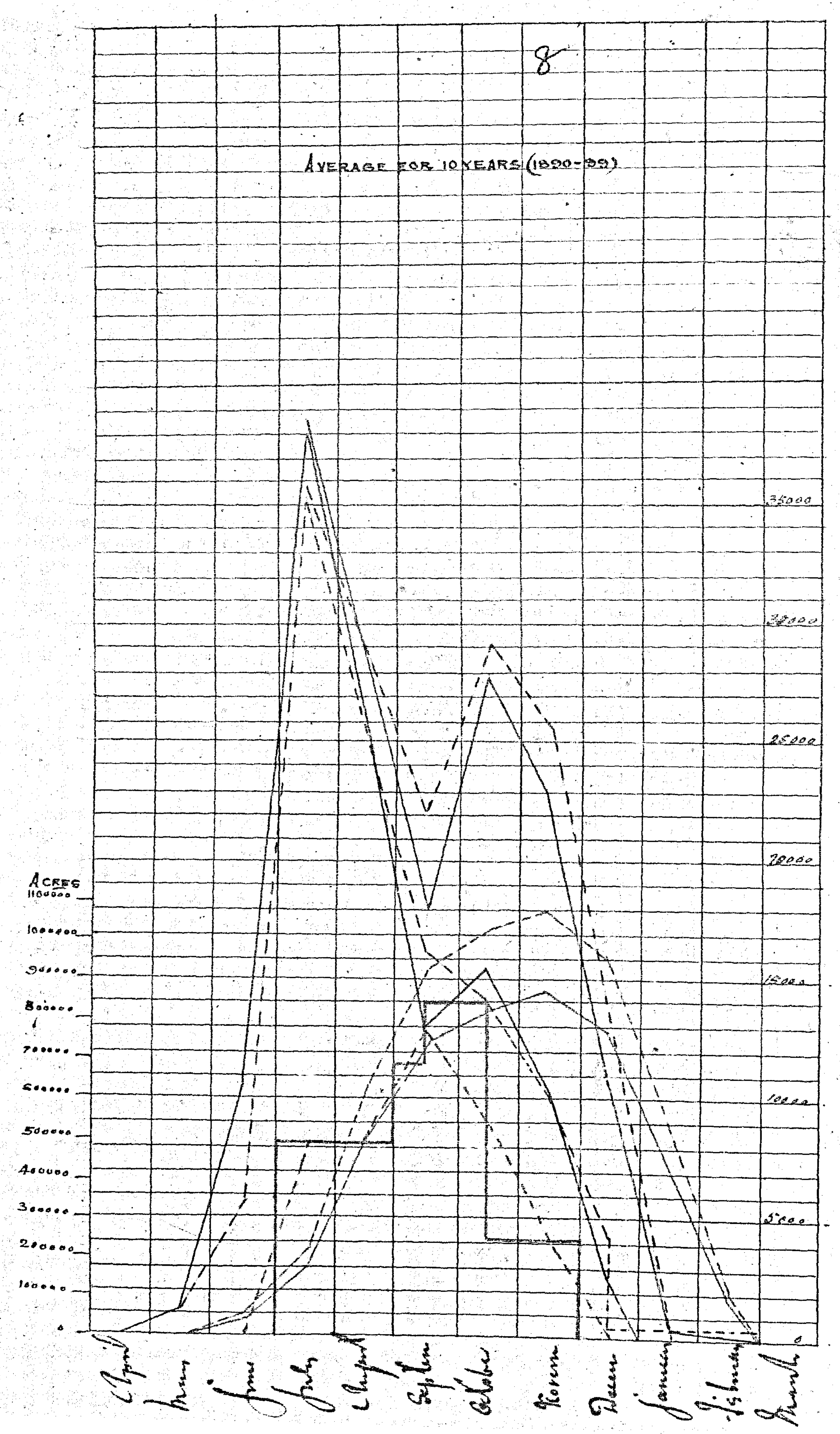
As the rainfall is an important factor in the success of Tanjore irrigation, the average monthly rainfall on the area requiring water has been reduced to cubic feet per second and plotted in the diagrams as an addition to the river-supply.

A curve has also been given (in vermilion) showing the theoretically required water-supply on a basis of 60 acres to the cubic feet per second for the existing area under irrigation and (by the dotted curve) for this area increased by 25 per cent. as it probably will be after the construction of the reservoir.

The green dotted curve shows the improved average minimum supply contemplated. The *full* green line shows the actual minimum supplies and the periods during which they are to be kept up by working the reservoir according to the foregoing rules.

All values are in cubic feet per second and shown by the red figures on the right hand side of the diagram. A scale is given on the left of the diagram showing the area under cultivation in acres on the vermilion curves.

8



Average Supply Diagram.

It will be best in remarking on the diagrams to deal first with that showing the average conditions for these ten years (1890 to 1899). The period under consideration is a good one for giving a fair idea of both the old and new conditions. It contains an average number of good and bad years. One of the latter (1899) is the worst on record.

The existing average river-supply is shown by the full line in lake, but the total water-supply to the land including rain is shown by the full line in blue. The dotted lines in the same colours show the supply as it will be modified by the reservoir.

These curves show very well how the supply in the south-west monsoon comes mainly from the river and how the deficiency of river-supply is made good in the north-east monsoon by the rainfall. The dip in the curves in September indicates the uncertain period between the monsoons. A comparison of the curves of existing and modified river supply (full and dotted lines in lake) shows how the deficient supply from the river will be eliminated.

Comparing the curves of actual supply with those of the theoretically required water-supply (which also show areas requiring water), it will be seen that the supply begins to fall off in October while the cultivation reaches its maximum in November. Then in December the blue lines cut the vermilion curves and afterwards remain below them, from which it would appear that towards the end of the year the average water-supply is much less than the requirements. This failure of supply, however, is only apparent. The water stored in the porous soil of the delta during the south-west monsoon floods and more recent north-east monsoon rains begins to show itself and make up for the loss in river-supply. The ground is also well saturated, the air is damper and cooler, evaporation is less, and consequently the crops require less water at this time. The effect of these conditions cannot be shown on the diagrams, but they must be borne in mind when reading them. The green curves showing the minimum supply it is proposed to maintain give a better idea of the actual requirements as found by experience. It will be seen that it is proposed suddenly to drop the minimum supply from 14,000 to 4,250 cubic feet per second in the middle of October and to maintain it at that to the end of November.

Working under the proposed rules it is found that on the average 30,722 millions of cubic feet of water will remain in the reservoir at the end of November, and if the discharge of 4,250 cubic feet per second is kept up to the end of December there will yet remain 23,520 millions of cubic feet.

It is evident that the average supply from the river is ample for a much larger area of irrigation than actually exists, and but for the precarious nature of the supply it would be larger.

The construction of even such a large reservoir as that now proposed will not greatly alter the distribution of the river-supply throughout the year. But it gives the necessary relief between the monsoons and at the end of the year when the natural supplies are little in excess of the requirements at the time and are apt to be very variable.

Besides steadying the supply at these uncertain periods, it leaves as a rule a good balance at the end of the year which may be carried forward and used to furnish the upper part of the delta with an early supply to increase the area of double crop there.

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Diagram and Statement for 1890.

This is a bad year. The water-supply in both the monsoons was small and there was a bad time between, the river-supply especially being then much below the average. The blue dotted curve shows how the conditions at this time would have been improved had the reservoir existed. There was a sufficient supply for storage. The reservoir would have been only once quite filled (in the south-west monsoon), but still it remained nearly full at the end of November. A comparison of the lake and green dotted lines shows that the contemplated minimum supply would have been well kept up during the year.

Actual Gauge Readings, Cauvery Dam (North Gauge) for the year 1890.

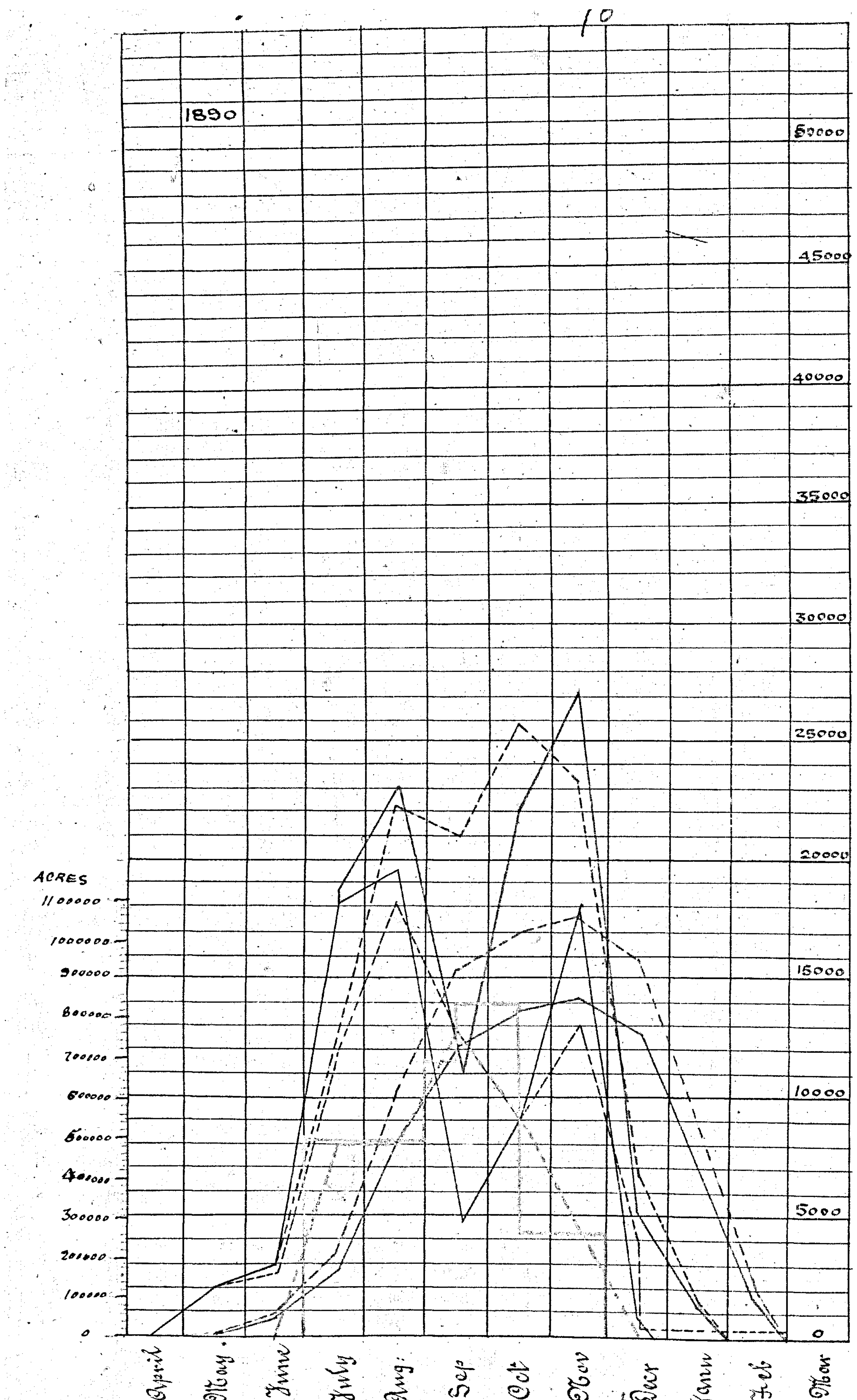
Date.	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.	13th.	14th.	15th.	16th.
May ..	3·1	4·0	3·8	3·5	3·3	3·3	3·7	4·0	4·2	4·2	3·7	3·3	3·0	2·8	2·7	2·6
June ..	3·8	3·1	3·2	3·4	3·2	3·1	3·8	3·7	2·3	2·2	2·2	2·3	2·3	2·2	2·1	2·3
July ..	4·5	4·2	4·0	4·2	5·7	5·9	5·5	5·5	5·3	4·8	4·2	3·8	3·6	4·3	4·6	4·7
August ..	7·1	6·5	6·3	6·3	6·1	5·9	5·8	5·7	6·7	7·5	8·1	8·1	7·7	7·2	6·8	6·4
September ..	5·0	4·9	4·6	4·3	4·4	4·7	5·9	5·3	4·9	4·5	4·3	4·2	4·2	4·0	3·9	3·9
October ..	3·5	3·6	3·7	4·3	5·7	5·7	5·6	5·7	5·5	5·1	5·0	4·7	4·3	4·1	4·1	4·1
November ..	6·7	6·0	7·3	8·6	9·0	9·0	8·3	8·5	7·7	8·4	7·0	6·4	5·8	5·5	5·3	5·2
December ..	2·9	2·9	2·8	2·8	2·7	2·7	2·7	3·0	3·2	3·2	3·8	3·7	3·3	3·2	3·1	3·1

Date.	17th.	18th.	19th.	20th.	21st.	22nd.	23rd.	24th.	25th.	26th.	27th.	28th.	29th.	30th.	31st.
May ..	2·6	2·6	2·7	2·4	2·4	2·9	2·9	2·9	3·1	4·3	4·7	3·9	4·3	4·4	3·8
June ..	2·3	2·4	2·6	2·4	3·1	3·6	4·2	5·2	5·4	5·1	4·9	4·6	4·9	4·8	..
July ..	4·9	5·3	5·5	5·1	4·8	4·8	6·6	8·5	9·1	8·8	8·9	8·9	8·4	7·9	7·3
August ..	6·1	5·9	5·9	5·8	7·5	5·4	5·2	5·2	5·2	5·1	5·3	5·4	5·6	5·5	5·5
September ..	3·8	4·0	3·9	3·9	4·0	3·9	3·9	3·9	3·8	3·6	3·5	3·5	3·2	3·3	..
October ..	4·3	4·0	3·8	3·8	3·7	3·6	3·4	3·3	3·1	3·2	3·5	3·8	8·9	7·7	7·8
November ..	5·0	4·7	4·5	4·3	4·1	3·9	3·8	3·6	3·5	3·3	3·3	3·2	3·1	3·0	..
December ..	3·0	3·0	2·9	2·8	2·7	2·7	2·6	2·5	2·5	2·5	2·4	2·1	1·6	1·6	1·5

Working of the Cauvery Reservoir for year 1890.

Period.	Issue required from reservoir in millions of cubic feet.	Loss by evaporation in millions of cubic feet.	Total loss to reservoir in millions of cubic feet.	Supply available for reservoir in millions of cubic feet.	Loss or gain to reservoir in millions of cubic feet.	Balance remaining in reservoir in millions of cubic feet.	Remarks.
1st to 31st May ..	..	..	..	..	..	..	
1st to 30th June ..	..	7	7	502	495	495	
1st to 31st July ..	390	91	481	36,030	35,549	36,044	
1st to 31st August ..	2,990	415	3,405	5,927	2,522	38,566	
1st to 15th September ..	7,743	190	7,933	..	7,933	30,633	
16th to 30th September.	15,861	148	16,009	..	16,009	14,624	
1st to 15th October	9,329	84	9,413	..	9,413	5,211	
16th to 31st October ..	2,048	55	2,103	15,248	13,145	18,356	
1st to 30th November ..	3,834	331	4,165	23,129	18,964	37,320	
1st to 31st December ..	10,801	364	11,165	..	11,165	26,165	

Clarendon figures show deductions.



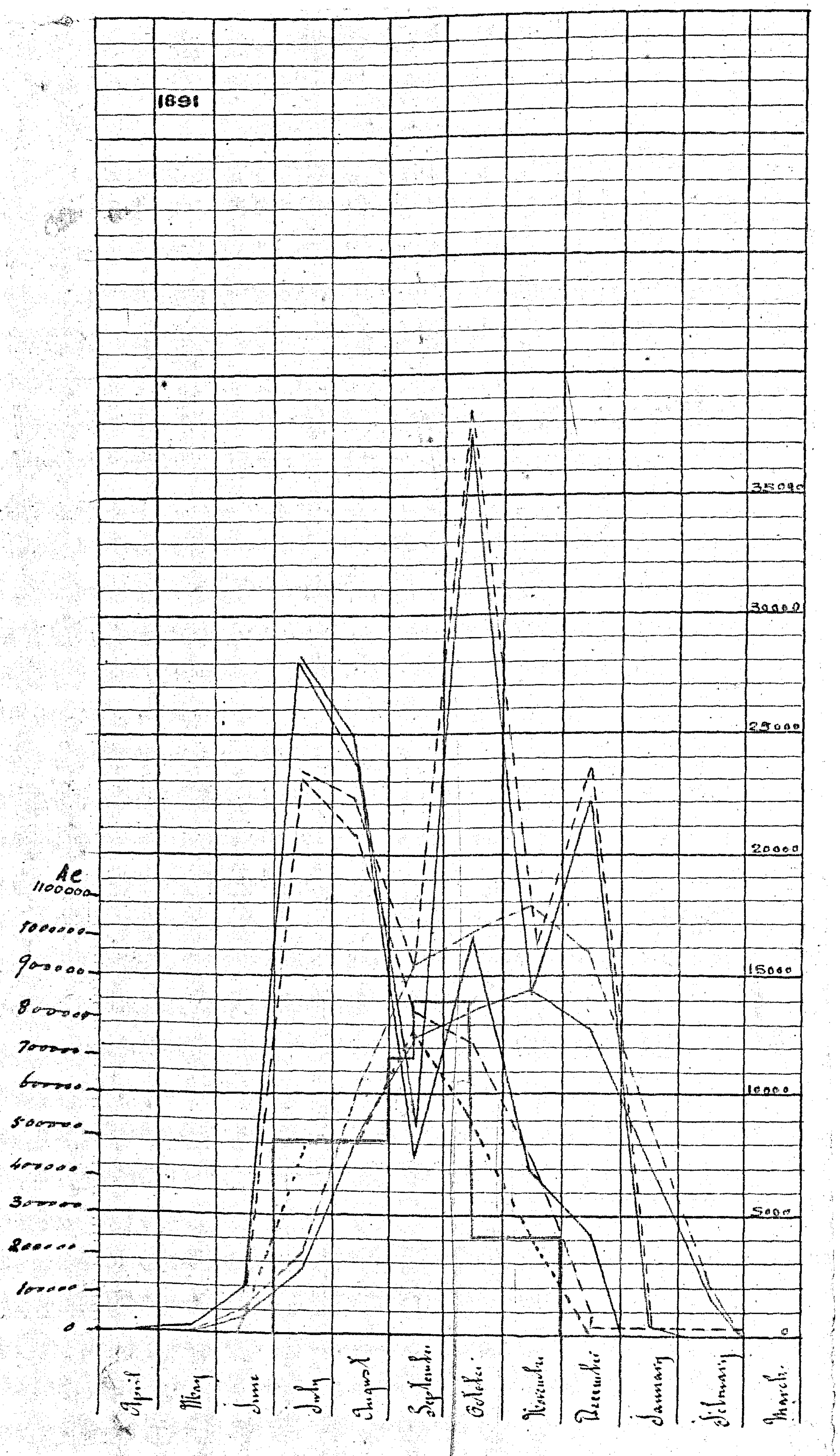


Diagram and Statement for 1891.

There was a pretty good supply in both monsoons, but the supply in the interval between was a good deal below the average, both the river-supply and rainfall being small then.

There was ample water for the reservoir and the proposed river-supply would have been well over the minimum all through.

The reservoir would have been quite filled in both monsoons and would have had 37,000 millions of cubic feet remaining in it at the end of November.

ACTUAL Gauge Readings, Cauvery Dam (North Gauge), for the year 1891. *

Date.	1st.	2nd	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.	13th.	14th.	15th.	16th.
May ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
June ..	1·8	2·4	2·5	2·4	2·3	3·1	4·6	4·8	4·3	3·9	3·7	3·4	3·2	2·8	2·7	2·5
July	2·7	2·6	2·5	2·3	3·4	4·7	7·0	7·4	7·2	7·7	7·5	7·2	7·1	7·1	6·5	6·0
August ..	9·3	8·5	7·7	7·0	6·5	6·5	6·7	8·3	8·4	8·1	7·5	7·4	7·7	7·2	6·7	6·3
September ..	5·9	5·5	5·1	5·0	5·7	6·2	6·0	5·7	5·4	5·2	5·0	4·9	4·9	4·7	4·9	4·8
October ..	3 6	5·7	5·0	4·7	5·8	4·8	5·7	5·1	5·7	5·8	5·5	4·9	6·9	6·5	5·4	5·7
November ..	5·7	5·4	5·5	6·7	5·7	5·5	5·3	4·8	4·7	4·5	4·6	5·5	5·0	5·2	5·1	4·6
December ..	2·7	2·6	2·5	2·4	2·3	2·3	2·2	2·3	2 3	2·2	2·2	2·2	2·2	2·1	2·0	2·2

Date.	17th.	18th.	19th.	20th.	21st.	22nd.	23rd.	24th.	25th.	26th.	27th.	28th.	29th.	30th.	31st.
May ..	..	..	..	..	..	..	..	..	1·9	2·5	2·5	2·0	2·0	1·9	1·8
June	2·5	2·4	2·3	2·3	3·8	3·9	4·2	4·1	3·8	3·5	3·4	3·0	3·0	2·9	..
July ..	5·6	5·2	5·0	4·8	5·3	5·0	6·2	8·7	9·5	10·2	10·0	9·6	9·3	9·4	9·5
August ..	6·1	6·0	5·8	5·7	5·6	5·5	5·2	5·1	5·3	5·2	5·1	5·7	5·6	5·5	5·4
September..	4·7	4·6	4·4	4·2	4·0	3·9	3·9	3 8	3·7	3·5	3·5	3·6	3·6	3·6	..
October ..	6·5	6·3	8·0	7·2	7·1	7·7	7·0	6·4	6·0	5·9	5·6	5·4	6·8	6·9	5·9
November..	4·4	4·4	4·3	4·1	3·9	3·8	3·7	3·5	3·4	3·3	3·2	3·0	2·9	2·5	..
December ..	3·5	3·2	2·9	2·7	2·7	2·6	2·6	3·8	3·7	3·8	3·4	3·2	3·5	3·2	3·1

WORKING of the Cauvery Reservoir for year 1891.

Period.	Issue required from reservoir.	Loss by evaporation.	Total loss to reservoir.	supply available for reservoir.	Loss or gain to reservoir.	Balance remaining in reservoir.	Remarks.
1st to 31st May ..	..	..	..	..	..	..	
1st to 30th June ..	..	..	..	..	..	..	
1st to 31st July ..	1,060	96	1,156	26,156	25,000	25,000	
1st to 31st August ..	1,495	302	1,797	15,539	13,742	38,742	
1st to 15th September.	3,321	195	3,516	..	**3,516**	35,226	
16th to 30th September.	14,311	166	14,477	..	**14,477**	20,749	
1st to 15th October ..	5,066	124	5,190	..	**5,190**	15,539	
16th to 31st October ..	845	143	988	25,429	24,441	40,000	
1st to 30th November..	2,851	154	3,005	..	**3,005**	36,995	
1st to 31st December ..	10,720	372	11,092	..	**11,092**	25,903	

Clarendon figures show deductions.

Diagram and statement for 1892.

This was not a very good year owing to the failure of the north-east monsoon. Still the supply was fairly well maintained till November when it was much below the average. From the statement showing the working of the reservoir, it will be seen that it would have been filled once in the south-west monsoon and have had a small supply in the north-east monsoon.

At the end of November there would have been nearly 25,000 millions cubic feet left in the reservoir. If a supply of 4·2 on Cauvery dam (north gauge) had been continued to the end of December there would have been 11,737 millions cubic feet of water left. Owing however to the failure of the north-east monsoon, it is probable that had the reservoir existed it would have been more heavily drawn on towards the end of the year and the balance would not have been so much.

ACTUAL Gauge Readings, Cauvery Dam (North Gauge) for the year 1892.

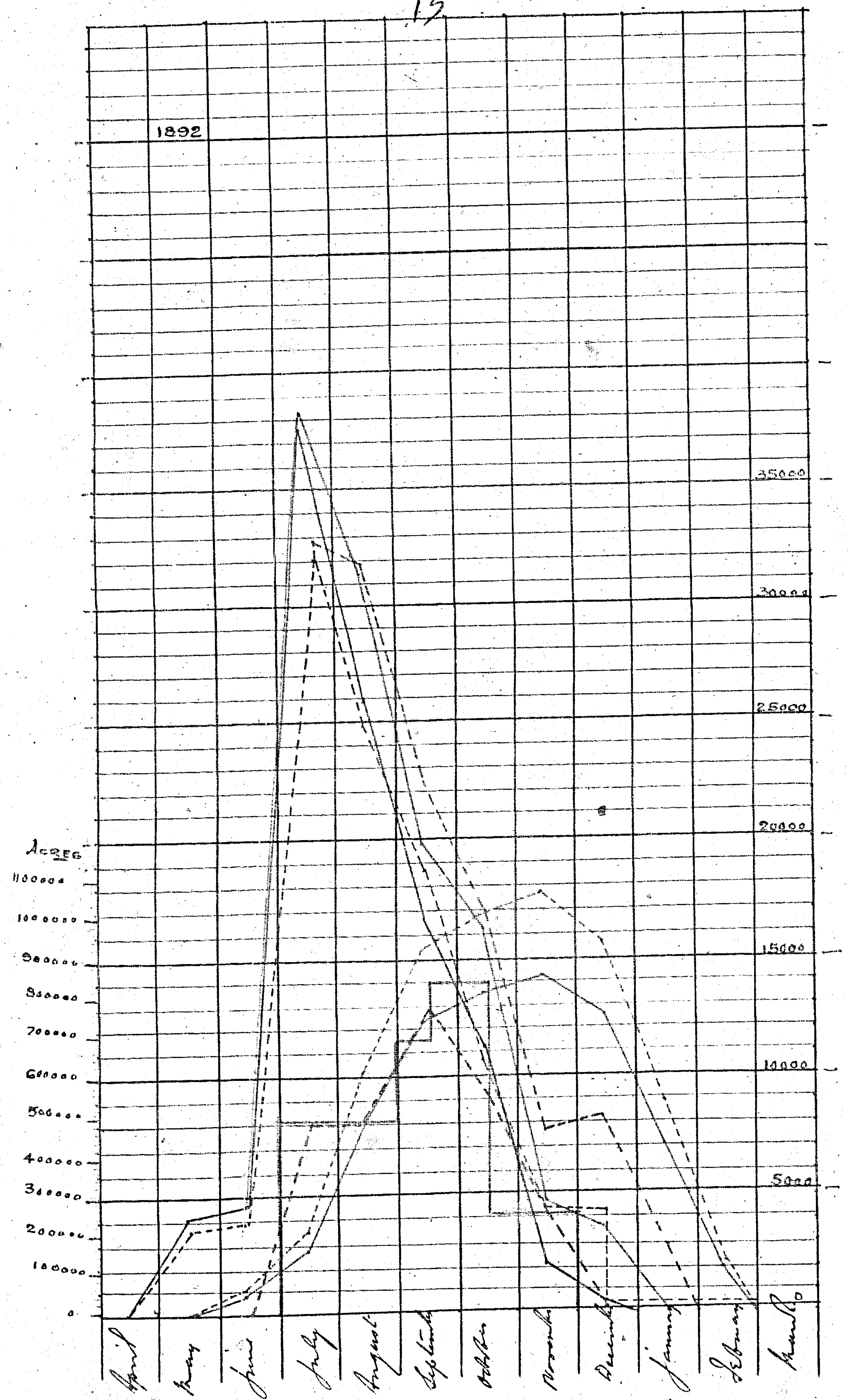
Date.	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.	13th.	14th.	15th.	16th.
May ..	2·1	2·7	2·6	3·1	3·2	3·3	3·6	3·1	3·0	2·7	2·4	3·0	3·9	4·2	4·4	4·9
June ..	3·2	3·0	3·1	3·0	2·8	3·0	4·4	4·7	4·7	4·4	3·9	3·8	3·7	4·1	4·7	5·7
July ..	6·7	5·7	5·9	5·4	4·7	4·6	3·7	3·4	3·2	4·2	5·2	7·9	8·8	8·9	8·9	8·6
August ..	8·1	7·8	7·5	7·6	7·6	7·4	7·2	7·3	7·3	7·2	7·2	7·0	6·7	6·5	7·1	6·4
September ..	7·8	7·3	6·9	6·5	6·4	6·8	6·7	7·0	6·7	6·5	6·4	6·2	6·1	6·0	6·1	5·9
October ..	5·2	5·0	5·2	5·1	5·3	5·5	5·5	5·2	5·5	5·1	4·9	4·6	5·2	5·3	5·0	5·8
November ..	4·8	4·5	4·4	4·1	4·0	3·9	3·8	3·9	3·8	3·7	3·9	3·7	3·0	3·4	3·1	3·0
December ..	2·1	2·2	2·0	1·9	1·8	2·0	1·8	1·7	1·7	2·0	2·0	1·8	1·7	1·6	1·6	1·6

Date.	17th.	18th.	19th.	20th.	21st.	22nd.	23rd.	24th.	25th.	26th.	27th.	28th.	29th.	30th.	31st.
May ..	4·7	4·9	4·2	5·5	4·8	5·9	5·3	4·9	4·3	3·8	3·4	3·3	4·2	3·7	3·3
June ..	5·4	4·9	4·5	4·4	4·1	3·9	3·7	3·6	3·5	3·5	3·4	3·7	3·8	6·4	..
July ..	8·3	7·8	7·0	6·2	5·9	5·9	10·9	12·0	10·3	10·6	10·2	9·9	9·8	9·3	8·5
August ..	6·2	6·3	6·3	6·1	6·0	6·2	6·4	6·6	6·6	6·7	6·8	6·4	6·5	6·4	7·0
September ..	5·7	5·5	5·4	5·1	5·0	5·0	5·1	5·2	5·3	5·1	4·9	4·9	4·9	4·8	..
October ..	6·1	6·1	5·8	5·9	5·6	6·2	6·3	5·6	5·8	5·3	5·0	5·0	5·0	4·7	4·5
November ..	3·0	2·9	2·9	2·8	2·7	2·7	2·7	2·6	2·6	2·7	2·4	2·5	2·1	2·2	..
December ..	2·0	1·9	2·0	1·9	1·9	1·9	1·9	1·9	1·9	1·9	1·8	1·8	1·7	1·7	1·7

WORKING of the Cauvery Reservoir for the year 1892.

Period.	Issue required from reservoir.	Loss by evaporation.	Total loss to reservoir.	Supply available for reservoir.	Loss or gain to reservoir.	Balance remaining in reservoir.	Remarks.
1st to 31st May ..	..	..	..	1,285	1,274	1,274	
1st to 30th June ..	..	43	43	2,194	2,151	3,425	
1st to 31st July ..	3,403	219	3,622	36,374	32,752	36,177	
1st to 31st August ..	2,015	433	2,448	6,271	3,823	40,000	
1st to 15th September ..	975	215	1,190	1,190		40,000	
16th to 30th September ..	6,430	171	6,601	..	6,601	33,399	
1st to 15th October ..	6,565	174	6,739	..	6,739	26,660	
16th to 31st October ..	1,040	187	1,227	7,632	6,405	33,065	
1st to 30th November ..	7,891	345	8,236	..	8,236	24,829	
1st to 31st December ..	1,2818	274	13,092	..	13,092	11,737	

Figures in Clarendon show deductions.



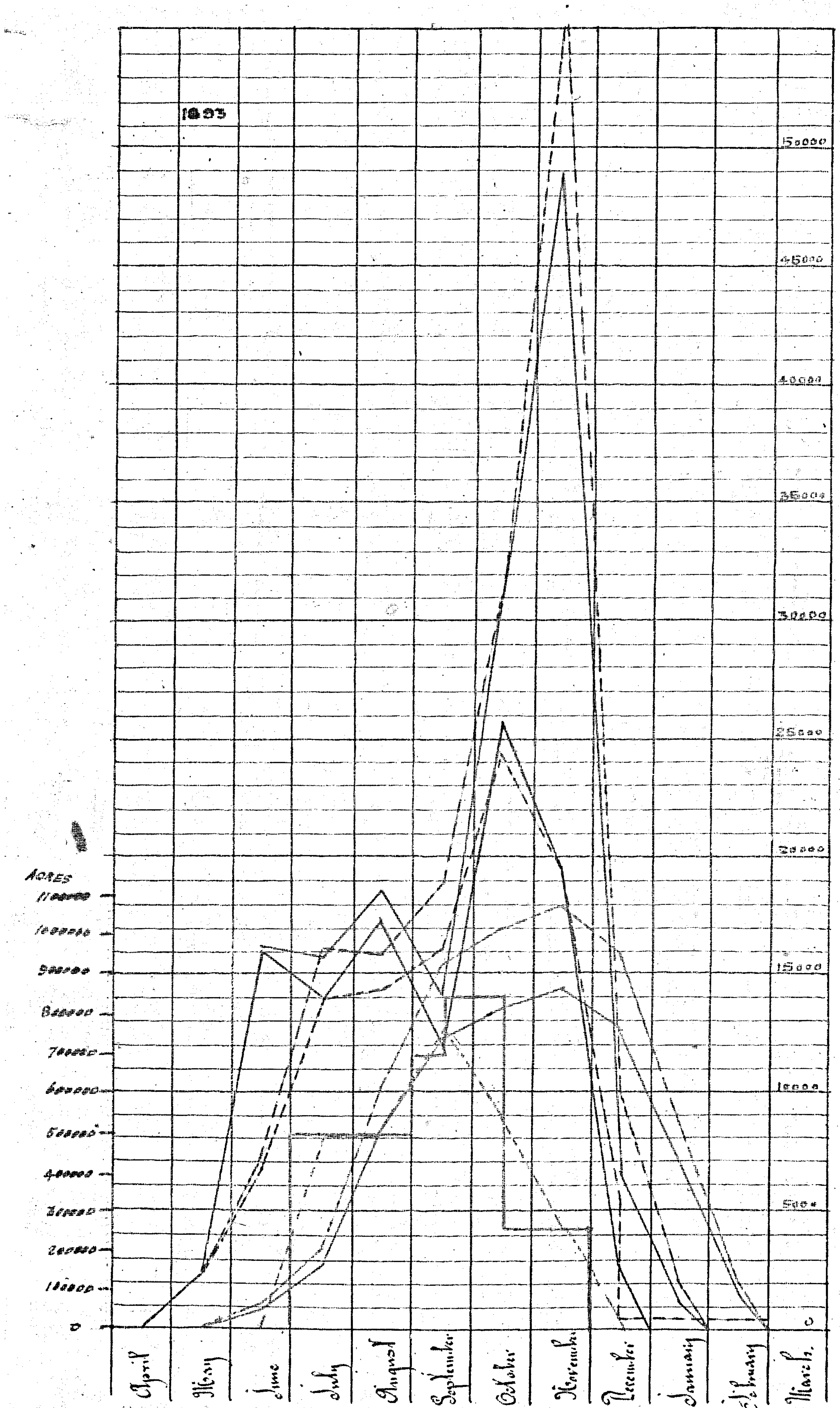


Diagram and statement for 1893.

In this year the south-west monsoon supply was small, but still sufficient. The north-east monsoon rainfall and floods were excessive.

On the whole the supply to the delta was good, and if the reservoir had been available it would have been little drawn on. The statement shows that the contents would not have fallen at any time below 30,000 millions cubic feet and at the end of November it would have been left quite full. Still it would have been useful in the interval between the monsoons when the natural supply was a little below the average.

ACTUAL Gauge readings, Cauvery Dam (North Gauge), for the year 1893.

Date.	1st.	2nd	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.	13th.	14th.	15th.	16th.
May ..	3·0	3·3	3·3	2·8	2·6	2·8	2·7	2·8	2·7	2·6	2·5	2·7	3·3	3·4	3·8	3·5
June ..	3·2	3·4	3·4	3·4	3·6	4·4	4·9	5·0	6·0	6·1	6·1	5·5	5·0	5·6	5·4	5·1
July ..	6·4	6·2	6·2	6·1	5·8	5·6	5·3	5·1	5·2	5·1	5·3	5·5	6·2	6·2	6·1	6·2
August ..	5·9	5·7	5·7	5·9	6·4	7·6	7·5	8·0	7·7	7·4	7·1	6·7	7·0	6·6	6·0	6·0
September ..	5·3	5·5	6·1	5·9	5·7	5·5	5·4	7·4	7·1	6·7	6·2	6·0	5·8	6·1	6·3	6·3
October ..	4·5	5·3	5·3	5·8	5·6	5·6	6·4	7·6	7·2	7·5	8·4	8·6	9·9	8·5	8·3	7·2
November ..	5·7	5·4	5·0	4·8	4·6	4·5	4·7	4·2	4·2	4·4	7·2	5·9	5·6	6·5	8·2	9·1
December ..	5·6	5·5	5·1	5·0	4·8	4·7	4·6	4·4	4·3	4·2	4·2	4·0	4·0	3·9	3·8	3·7

Date.	17th.	18th.	19th.	20th.	21st.	22nd.	23rd.	24th.	25th.	26th.	27th.	28th.	29th.	30th.	31st.
May ..	3·7	3·8	3·3	4·4	4·3	4·2	4·6	4·3	3·8	3·5	3·4	3·4	3·5	3·3	3·2
June ..	4·9	6·3	6·7	8·0	7·9	7·8	7·1	6·5	6·6	6·6	6·5	6·3	6·4	6·6	..
July ..	6·2	6·1	5·9	5·7	5·5	5·5	5·3	5·2	5·3	5·1	5·3	5·7	5·5	6·2	6·1
August ..	5·6	5·4	5·2	5·0	4·9	4·7	4·7	4·6	4·5	4·5	4·6	5·0	5·8	6·1	6·0
September ..	6·5	6·2	5·9	5·6	5·4	5·1	4·9	4·7	4·5	4·3	4·2	4·0	4·4	4·4	..
October ..	6·5	6·2	6·3	6·1	5·9	5·8	5·8	7·0	7·1	6·7	7·0	7·6	7·1	6·5	6·0
November ..	7·6	8·1	7·0	6·4	6·3	5·9	6·5	7·5	6·8	6·4	6·2	5·9	6·8	5·8	..
December ..	3·7	3·6	3·5	3·4	3·3	3·3	3·2	3·2	3·0	3·0	3·0	2·9	2·9	2·8	2·8

WORKING of the Cauvery Reservoir for year 1893.

Period	Issue required from reservoir.	Loss by evaporation.	Total loss to reservoir.	Supply available for reservoir.	Loss or gain to reservoir.	Balance remaining in reservoir.	Remarks.
1st to 31st May ..	..	..	..	..	..	..	
1st to 30th June ..	715	129	844	33,451	32,607	32,607	
1st to 31st July ..	2,015	372	2,387	..	2,387	30,220	
1st to 31st August ..	3,921	406	4,327	11,720	7,393	37,613	
1st to 15th September ..	975	202	1,177	3,083	1,906	39,519	
16th to 30th September.	7,686	196	7,882	..	7,882	31,637	
1st to 15th October ..	2,529	186	2,715	11,078	8,363	40,000	
16th to 31st October ..	1,040	224	1,264	1,264	..	40,000	
1st to 30th November ..	2,173	434	2,607	2,607	..	40,000	
1st to 31st December ..	306	282	588	..	5,888	34,112	

Blocktype figures show deductions.

Diagram and statement for 1894.

This was a bad year owing to the failure of both monsoons. It will be seen from the diagram, however, that the proposed minimum river supply would have been well maintained. The statement shows that the reservoir would have contained 21,000 millions cubic feet at the end of November, but it is possible that as in 1892 it would, had it existed, have been more heavily drawn on at the end of the year and the balance would have been less. It is in such a year that the value of the reservoir as a protective work is best seen.

ACTUAL Gauge Readings, Cauvery Dam (North Gauge), for the year 1894.

Date.	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.	13th.	14th.	15th.	16th.
May ..	2·5	2·4	3·2	3·1	3·0	2·7	2·5	2·8	2·7	2·8	3·5	[illegible]	3·6	3·6	3·6	3·6
June ..	3·4	3·5	3·5	3·4	4·0	4·5	3·6	3·6	3·3	3·4	3·1	3·4	3·1	3·0	3·5	4·1
July ..	4·3	4·2	4·6	3·8	3·7	[illegible]	3·6	3·5	3·5	3·5	3·8	4·0	4·2	4·8	5·3	5·8
August ..	6·0	5·8	5·6	5·3	5·2	[illegible]	5·0	5·6	6·0	5·9	6·0	6·7	6·8	6·6	6·4	6·2
September ..	5·5	5·4	5·5	5·5	5·4	5·3	5·3	5·1	4·9	4·9	4·8	5·0	5·0	5·1	5·0	4·8
October ..	3·7	3·5	3·4	3·3	3·2	3·1	3·0	3·0	2·9	3·0	3·0	3·0	2·9	3·4	3·5	4·5
November ..	4·3	6·0	6·8	6·2	5·7	5·6	4·9	4·7	5·9	5·8	5·5	5·2	4·8	4·6	4·4	4·3
December ..	3·3	3·5	3·4	3·8	4·0	[illegible]	3·4	3·3	3·2	3·2	3·0	2·9	2·9	2·9	2·8	2·8

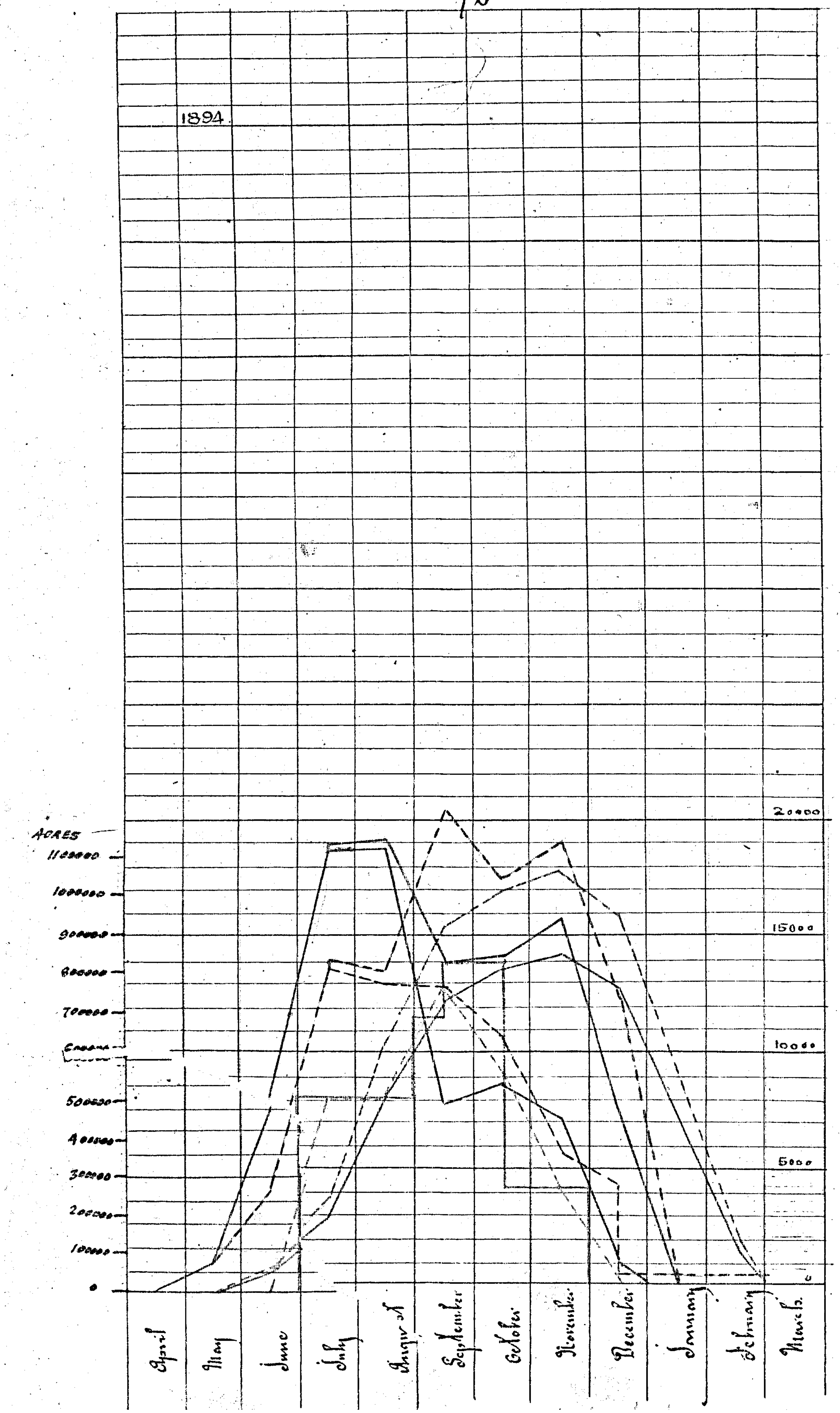
Date.	17th.	18th.	19th.	20th.	21st.	22nd.	23rd.	24th.	25th.	26th.	27th.	28th.	29th.	30th.	31st.
May ..	3·1	3·2	2·8	3·3	2·9	2·8	[illegible]	3·0	3·0	3·0	3·0	3·1	3·1	3·2	3·0
June ..	4·1	4·4	5·3	5·5	6·0	6·6	6·8	6·7	6·5	6·1	5·3	5·3	4·8	4·5	..
July ..	5·5	5·9	[illegible]	[illegible]	[illegible]	9·9	10·2	9·5	9·1	8·2	7·3	6·7	6·5	6·1	6·2
August ..	6·2	6·1	6·2	6·5	6·8	6·5	6·9	7·5	7·2	6·7	6·4	6·0	6·9	6·0	5·6
September..	4·8	4·7	4·7	4·9	5·3	5·2	4·8	4·6	4·4	4·2	3·9	4·0	3·8	3·7	..
October ..	5·0	6·1	6·3	6·7	7·0	6·6	6·3	6·2	6·2	6·1	5·8	5·3	4·9	4·8	4·4
November	4·1	3·9	3·8	3·7	3·9	3·6	3·7	3·5	[illegible]	3·2	3·2	3·1	3·1	3·2	..
December ..	2·7	2·6	2·5	2·4	2·4	2·3	2·3	2·1	2·1	1·9	1·8	1·6	1·5	1·5	1·5

WORKING of the Cauvery Reservoir for year 1894.

Period.	Issue required from reservoir.	Loss by evaporation.	Total loss to reservoir.	Supply available for reservoir.	Loss or gain to reservoir.	Balance remaining in reservoir.	Remarks.
1st to 31st May ..	..	..	..	..	..	..	
1st to 30th June ..	390	39	429	9,639	9,210	9,210	
1st to 31st July ..	6,620	178	6,798	36,415	29,617	38,827	
1st to 31st August ..	2,015	411	2,426	3,599	1,173	40,000	
1st to 15th September ..	3,192	203	3,395	..	**3,395**	36,605	
16th to 30th September.	11,502	177	11,679	..	**11,679**	24,926	
1st to 15th October ..	18,417	112	18,529	..	**18,529**	6,397	
16th to 31st October ..	1,040	110	1,150	13,651	12,501	18,898	
1st to 30th November ..	4,392	295	4,687	7,068	2,381	21,279	
1st to 31st December ..	10,667	248	10,915	..	**10,915**	10,364	

Clarendon figures show deductions.

beat



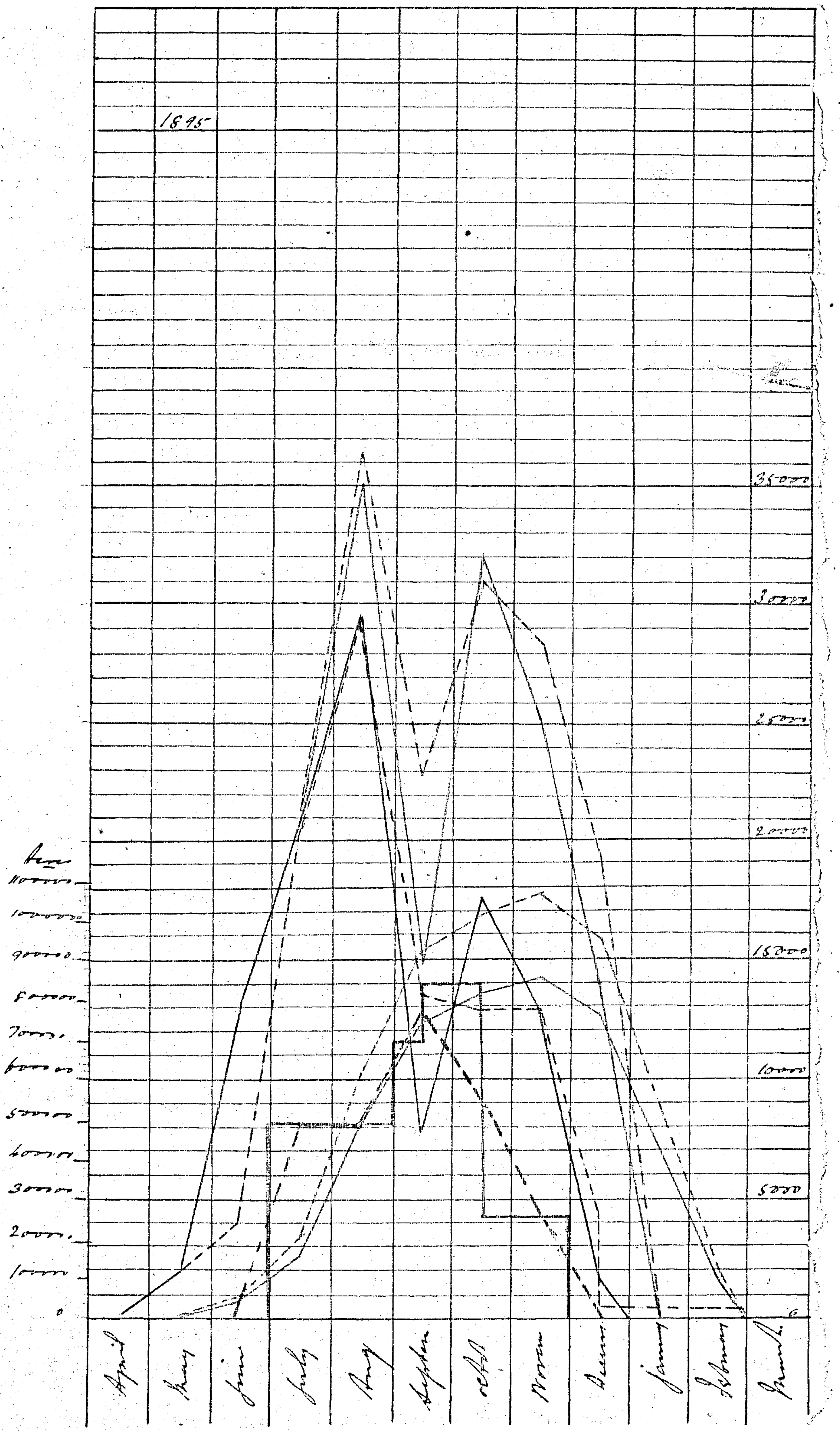


Diagram and statement for 1895.

This year can be considered a good one on the whole. The rain and river supply in both monsoons was good. In the interval between the river-supply was deficient; but this was largely made up for by the rain which was above the average.

Had the reservoir been available it would not have been very much drawn upon though it would have been of some value between the monsoons. The balance left in it at the end of November would have been 36,380 millions cubic feet.

ACTUAL Guage Readings, Cauvery Dam (North Guage), for the year 1895.

Date.	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th
May ..	3·9	3·9	3·7	3·3	3·1	3·9	4·0	4·3	4·2	4·1	4·0	3·8	3·4	3·2	3·5	3·9
June ..	1·9	2·1	2·3	2·8	2·9	2·4	2·3	2·2	1·8	1·7	1·6	2·1	1·9	1·7	1·7	2·1
July ..	6·2	6·5	7·6	9·1	8·8	7·9	7·3	6·6	6·0	5·8	5·5	5·2	5·3	5·2	5·5	5·9
August ..	7·2	7·7	9·2	9·4	9·1	8·1	7·2	6·6	6·2	7·2	8·7	9·7	8·9	8·1	7·3	6·9
September ..	6·6	5·3	5·1	4·9	4·8	4·7	4·7	4·6	4·5	4·4	4·2	4·2	4·1	4·1	4·1	4·2
October ..	6·4	6·9	7.5	6·3	5·9	5·5	5·2	5·4	7·8	7·7	6·7	6·1	6·1	5·7	5·4	5·4
November ..	7·6	6·7	7·0	7·9	8·0	8·8	7·5	7·2	6·3	5·9	5·5	5·1	4·8	4·6	4·3	4·2
December ..	3·3	3·3	3·1	3·1	3·0	3·0	3·0	2·9	2·9	2·9	2·9	2·8	2·8	2·8	2·8	2·8

Date.	17th	18th	19th	20th	21st	22nd	23rd	24th	25th	26th	27th	28th	29th	30th	31st
May ..	4·1	3·8	3·4	3·1	2·9	2·9	2·8	2·7	2·6	2·5	2·4	2·0	1·9	1·8	1·7
June ..	2·0	1·9	1·8	1·6	7·1	9·0	9·6	9·1	8·3	7·5	7·1	6·7	6·9	6·5	..
July ..	6·0	6·5	6·2	6·0	5·8	5·7	5·9	6·7	6·5	6·3	6·0	6·1	5·8	5·5	6·2
August ..	7·0	6·6	6·5	6·5	6·4	6·0	5·0	6·3	6·0	5·8	5·7	5·5	5·5	5·7	5·7
September ..	4·3	4·3	4·1	3·9	3·8	4·0	4·0	4·0	4·7	5·3	5·0	6·5	6·3	7·0	..
October ..	5·5	5·3	5·6	5·6	5·5	5·8	5·6	5·9	6·4	6·3	6·0	5·5	5·7	6·7	6·4
November ..	4·1	3·9	3·8	3·7	3·6	3·5	3·5	3·4	3·5	3·5	3·4	3·3	3·3	2·2	..
December ..	2·7	2·7	2·6	2·6	2·4	2·3	2·3	2·2	2·2	2·1	2·0	2·0	2·4	3·0	6·8

WORKING of the Cauvery Reservoir for the year 1895.

Period.	Issue required from reservoir.	Loss by evaporation.	Total loss to reservoir.	Supply available for reservoir.	Loss or gain to reservoir.	Balance remaining in reservoir.	Remarks.
1st to 31st May ..	..	..	..	..	..	..	
1st to 30th June ..	520	98	618	40,618	40,000	40,000	
1st to 31st July ..	1,059	422	1,481	..	**1,481**	38,519	
1st to 31st August ..	2,015	432	2,447	2,903	456	38,975	
1st to 15th September.	7,342	191	7,533	..	**7,533**	31,442	
16th to 30th September.	9,761	153	9,914	..	**9,914**	21,528	
1st to 15th October ..	1,950	153	2,133	7,959	5,826	27,354	
16th to 31st October ..	1,040	189	1,229	10,925	9,696	37,050	
1st to 30th November.	261	409	670	..	**670**	36,380	
1st to 31st December..	9,173	272	9,445	..	**9,445**	26,935	

Clarendon figures show deductions.

5

Seal

Diagram and statement for 1896.

This was a very good year.

The supply in both monsoons was well above the average and also in the interval between.

As a protective work the reservoir would not have been required in such a year, but it would have been useful of course for the proposed irrigation in Coimbatore and Salem.

As will be seen from the statement it would have been left almost full at the end of the year.

ACTUAL gauge Readings, Cauvery Dam (North Gauge), for the year 1896.

Date.	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.	13th.	14th.	15th.	16th.
May ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
June ..	2·7	2·5	2·7	2·3	2·8	3·0	2·9	2·8	4·6	2·5	2·7	2·0	1·7	2·0	1·9	2·1
July ..	9·2	9·8	9·7	9·2	8·7	8·2	7·9	7·4	7·1	6·7	6·4	6·0	5·7	5·6	5·5	8·5
August ..	13·3	13·5	12·5	11·7	11·1	10·6	10·4	9·7	9·7	8·9	8·2	7·8	8·1	5·6	8·2	7·7
September.	6·4	6·3	6·3	6·4	6·1	6·0	5·7	6·5	6·6	6·3	6·0	5·8	5·7	5·5	5·3	5·2
October ..	6·3	7·0	7·1	7·5	7·3	7·3	6·4	6·1	5·7	5·4	5·4	5·4	5·2	5·1	5·1	4·9
November ..	3·9	3·8	3·6	3·6	3·6	3·6	3·5	3·4	3·2	3·1	3·0	2·9	2·8	2·9	2·8	2·7
December ..	4·9	5·0	4·9	4·7	4·3	4·1	4·1	6·0	7·0	6·1	6·8	5·4	5·0	4·7	4·4	4·2

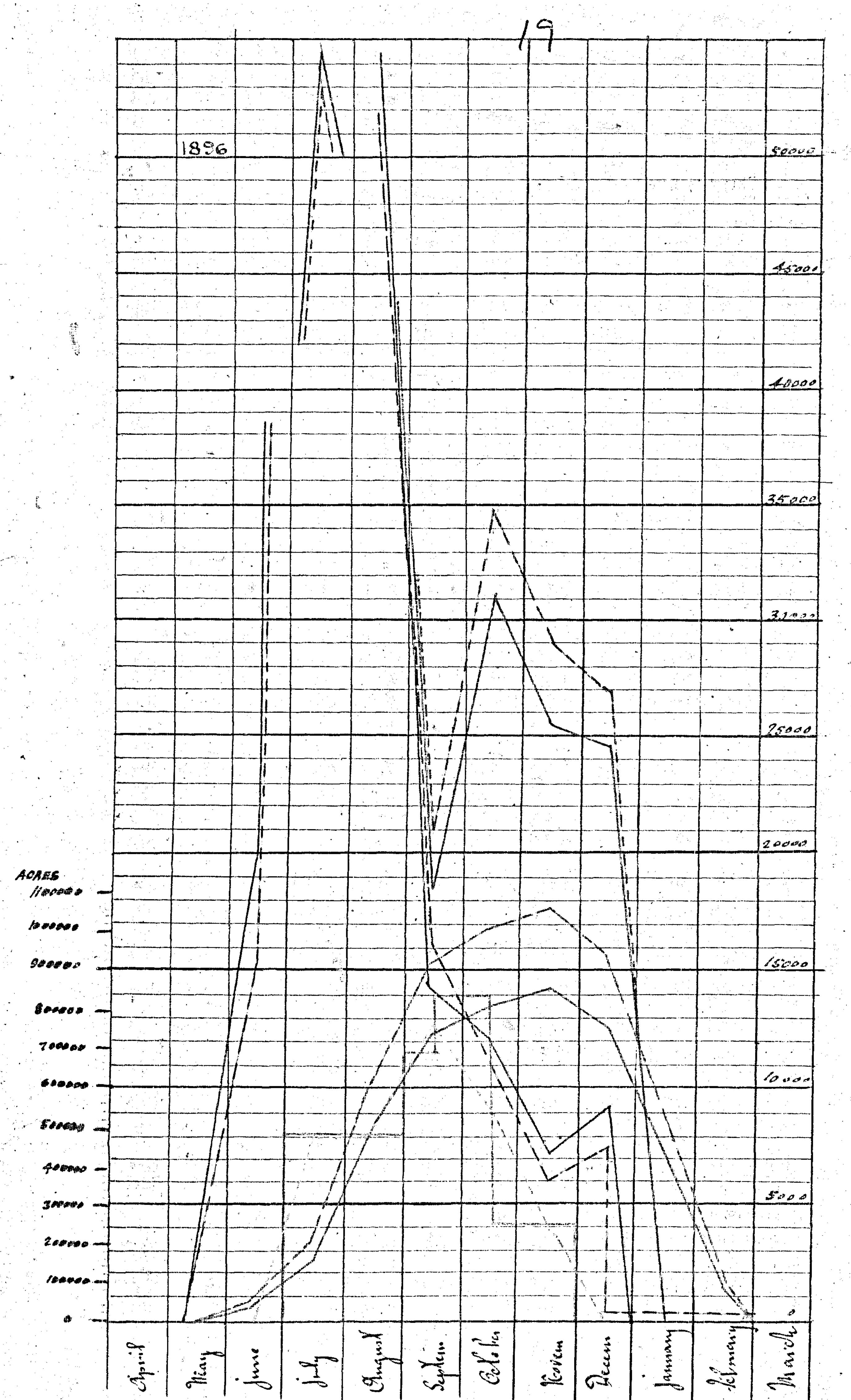
Date.	17th.	18th.	19th.	20th.	21st.	22nd.	23rd.	24th.	25th	26th.	27th.	28th.	29th.	30th	31st.
May ..	..	..	..	..	..	..	..	..	..	..	..	3·7	3·4	2·9	2·7
June ..	4·0	3·3	3·3	3·8	4·1	7·4	9·7	10·[illegible]	10·7	10·2	10·5	9·4	8·6	9·2	..
July .	10·1	10·2	9·9	9·0	7·9	7·4	6·7	6·3	5·9	5·9	8·1	10·2	12·3	12·0	13·8
August ..	9·1	9·3	9·0	9·1	8·6	7·0	7·3	6·9	6·5	6·3	6·5	6·3	6·2	6·5	6·5
September..	5·1	5·0	5·0	5·0	5·0	5·2	5·1	4·9	5·4	5·1	5·6	5·7	6·7	6·6	..
October ..	4·7	4·5	4·4	4·3	4·2	4·5	4·5	4·6	4·4	4·0	4·4	4·5	4·2	4·3	4·2
November..	5·1	5·0	5·3	5·1	6·0	5·3	5·6	5·7	5·9	6·4	6·4	5·9	5·5	5·2	..
December..	4·1	4·2	5·1	6·3	6·4	6·3	6·5	4·9	4·8	4·1	4·3	4·0	3·9	3·8	3·7

WORKING of the Cauvery Reservoir for the year 1896.

Period.	Issue required from reservoir.	Loss by evaporation.	Total loss to reservoir.	Supply available for reservoir.	Loss or gain to reservoir.	Balance remaining in reservoir.	Remarks.
1st to 31st May ..	..	..	..	..	..	..	
1st to 30th June ..	455	74	529	25,529	25,000	25,000	
1st to 31st July ..	2,615	310	2,925	2,925	..	25,000	
1st to 31st August ..	5,339	392	5,731	20,257	14,526	39,526	
1st to 15th September.	1,047	198	1,245	..	1,245	38,281	
16th to 30th September.	5,398	186	5,584		5,584	32,697	
1st to 15th October	2,868	192	3,060	6,783	3,723	36,420	
16th to 31st October..	1,040	208	1,248	..	1,248	35,172	
1st to 30th November.	5,516	324	5,840	6,979	1,139	36,311	
1st to 31st December.	3,488	423	3,911	6,523	2,612	38,923	

Clarendon figures show deductions.

19



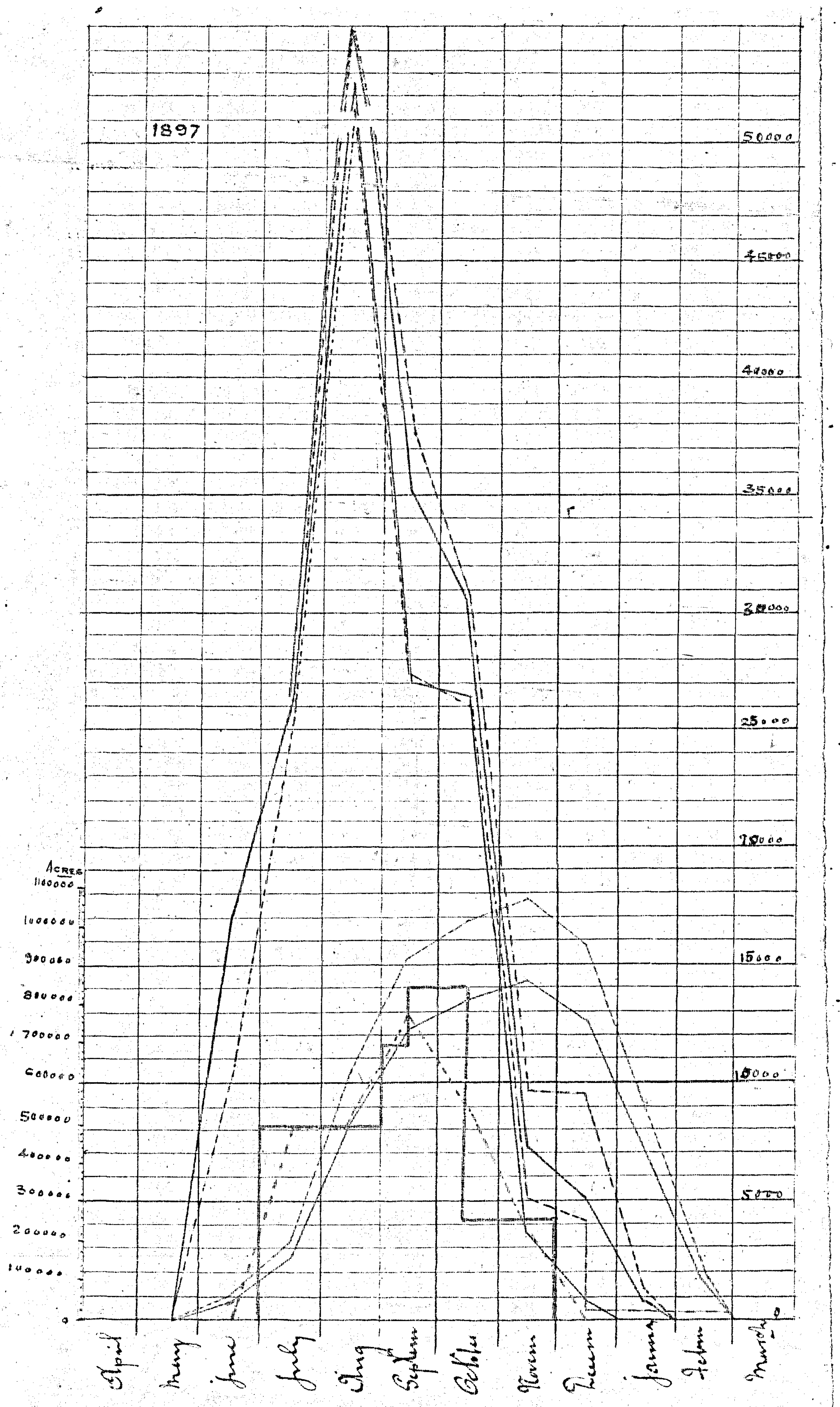
21

Diagram and statement for 1897.

There was an excessive supply during the south-west monsoon and a failure of the north-east monsoon rains.

The reservoir would have proved of great value at the end of the year.

The balance shown at the end of November by the statement is 33,575 millions cubic feet, but, in such a year, this might have been heavily drawn on in the next month or two.



Actual gauge Readings, Cauvery dam (North Gauge), for the year 1897.

Date.	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.	13th.	14th.	15th.	16th.
May ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
June ..	1·9	2·9	3·0	3·4	3·3	2·9	2·9	2·8	3·0	3·6	3·7	3·5	3·3	3·3	3·1	3·6
July ..	5·7	5·3	4·9	4·5	4·3	4·0	3·8	3·7	3·8	4·2	7·4	9·6	10·6	10·4	10·6	10·0
August ..	9·0	8·9	8·9	8·3	7·7	7·2	6·7	6·5	9·0	12·0	12·2	12·2	12·3	12·3	11·5	10·6
September ..	8·3	8·3	7·6	7·0	6·5	6·5	6·7	6·8	6·3	6·1	6·2	6·3	5·9	5·8	5·7	5·3
October ..	9·8	1·05	9·3	8·3	7·5	7·5	6·5	6·6	6·3	6·9	5·7	5·5	6·2	8·3	7·7	8·3
November ..	4·4	5·1	4·8	4·7	5·2	5·1	4·9	4·5	4·3	4·1	4·0	3·9	4·3	3·7	4·0	4·8
December ..	3·4	3·9	3·3	3·6	3·3	3·2	3·2	2·9	2·8	2·8	2·8	2·8	2·6	2·6	2·7	2·6

Date.	17th.	18th.	19th.	20th.	21st.	22nd.	23rd.	24th.	25th.	26th.	27th.	28th.	29th.	30th.	31st.
May ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
June ..	3·6	3·7	4·3	5·9	9·0	9·9	10·0	9·9	9·0	8·5	7·6	7·2	6·7	6·1	..
July ..	8·6	7·8	7·1	6·4	5·9	6·7	6·3	6·6	6·4	6·1	6·0	6·2	6·5	6·3	7·2
August ..	9·6	8·9	8·5	8·6	7·8	7·3	7·0	6·6	6·5	6·4	6·4	6·8	6·8	8·2	7·8
September ..	5·3	5·1	4·8	5·0	5·7	8·3	8·1	8·4	5·4	8·3	7·0	6·8	8·3	10·1	..
October ..	7·6	5·5	8·0	7·1	6·3	5·8	5·5	5·2	5·1	4·9	4·8	4·7	4·7	4·5	4·3
November ..	4·0	3·8	3·6	3·4	3·3	3·2	3·0	2·9	2·9	2·9	2·9	3·0	3·1	3·4	..
December ..	2·5	2·3	2·5	2·3	2·2	2·2	2·2	2·3	2·3	2·2	2·2	2·2	2·2	2·1	2·1

Working of the Cauvery Reservoir for the year 1897.

Period.	Issue required from reservoir.	Loss by evaporation.	Total loss to reservoir.	Supply available for reservoir.	Loss or gain to reservoir.	Balance remaining in reservoir.	Remarks.
1st to 31st May	..	..	..	..	..	..	
1st to 30th June ..	585	75	660	31,117	30,457	30,457	
1st to 31st July ..	4,707	887	6,094	12,627	7,533	37,990	
1st to 31st August ..	4,115	434	4,549	6,559	2,010	40,000	
1st to 15th September	343	210	553	..	553	39,447	
16th to 30th September	3,050	205	2,255	3,808	553	40,000	
1st to 15th October ..	1,520	210	1,730	1,730	..	40,000	
16th to 31st October ..	250	224	474	..	474	39,526	
1st to 30th November ..	5,555	396	5,951	..	5,951	33,575	
1st to 31st December ..	10,990	344	11,334	..	11,334	22,241	

Clarendon figures show deductions.

Diagram and statement for 1898.

This is a very good year.

The diagram shows a small supply in the south-west monsoon, but as usual in such cases there is an excessive supply in the other monsoon.

The supply in the interval was above the average.

As a protective work the reservoir would not have been needed. It would have remained full at the end of November.

a

ACTUAL Gauge Reading, Cavery Dam (North Gauge), for the year 1898.

Date.	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th	12th.	13th.	14th.	15th.	16th.
May ..	3·1	2·9	3·2	2·7	2·7	3·0	2·9	3·6	4·2	3·7	3·3	3·0	2·8	2·7	2·8	2·6
June ..	2·7	2·6	2·6	2·5	2·5	2·4	2·4	2·5	2·4	2·4	2·5	2·3	2·2	1·8	1·9	2·9
July ..	4·4	4·2	3·9	3·5	3·4	3·2	3·3	4·5	5·9	6·0	6·0	5·8	5·5	5·3	4·9	4·7
August ..	9·5	8·3	7·6	7·0	6·5	6·3	6·2	6·1	6·1	7·3	6·8	6·5	6·2	5·9	5·7	5·4
September ..	4·9	4·3	4·2	4·7	4·7	4·8	6·7	6·3	7·4	6·4	6·0	5·7	5·4	5·3	5·6	6·2
October ..	8·3	9·3	7·8	7·1	6·7	7·1	7·1	7·2	7·1	7·5	7·4	7·6	7·3	7·0	6·7	6·4
November ..	6·5	[illegible]	6·0	5·7	5·6	5·7	6·0	6·5	7·2	7·5	7·7	7·9	9·6	9·3	10·8	10·5
December ..	5·9	6·4	6·5	6·1	5·9	5·5	5·4	5·1	4·9	4·6	4·4	4·3	4·2	4·0	4·0	3·9

Date.	17th.	18th.	19th.	20th.	21st.	22nd.	23rd.	24th.	25th.	26th.	27th.	28th.	29th.	30th.	31st.
May ..	2·3	2·3	2·2	2·1	2·1	2·6	2·3	2·2	2·1	2·1	2·1	2·1	2·2	2·2	2·7
June ..	4·7	6·5	6·9	7·2	7·5	7·2	7·2	6·9	6·4	6·0	5·7	5·3	4·9	4·7	..
July ..	3·5	4·4	4·6	4·9	4·6	4·4	4·3	[illegible]	4·7	6·6	7·5	8·7	9·3	9·9	9·9
August ..	5·4	5·5	5·5	5·3	5·1	4·9	4·8	4·5	4·3	4·1	4·4	4·5	5·3	5·3	4·9
September..	6·9	6·7	6·2	5·8	5·7	5·8	5·7	5·8	6·3	6·5	6·9	7·2	8·8	8·3	..
October ..	6·3	6·7	7·4	8·1	7·1	6·3	5·9	5·9	5·5	5·3	4·9	5·3	4·9	6·6	7·0
November..	9·1	8·0	7·2	6·7	6·2	5·9	5·6	5·5	5·3	5·2	5·0	4·9	4·9	5·2	..
December ..	3·7	3·6	3·5	3·5	3·4	3·4	3·4	3·4	3·4	3·7	4·1	4·9	5·7	5·6	6·5

WORKING of the Cauvery Reservoir for the year 1898.

Period.	Issue required from Reservoir.	Loss by Evaporation.	Total loss to Reservoir.	Supply available for Reservoir.	Loss or Gain to Reservoir.	Balance remaining in Reservoir.	Remarks.
1st to 31st May ..	..	..	..	..	..	..	
1st to 30th June ..	650	82	732	1[illegible],968	19,236	19,236	
1st to 31st July ..	7,424	242	7,666	28,430	20,764	40,000	
1st to 31st August ..	2,649	355	3,004	..	3,004	36,996	
1st to 15th September ..	2,064	192	2,256	..	2,256	34,740	
16th to 30th September.	975	197	1,172	6,432	5,260	40,000	
1st to 15th October ..	975	210	1,185	1,185	..	40,000	
16th to 31st October ..	1,040	224	1,264	1,264	..	40,000	
1st to 30th November ..	1,950	420	2,370	2,370	..	40,000	
1st to 31st December ..	655	421	1,076	..	1,076	38,924	

NOTE.—Clarendon figures show deductions.

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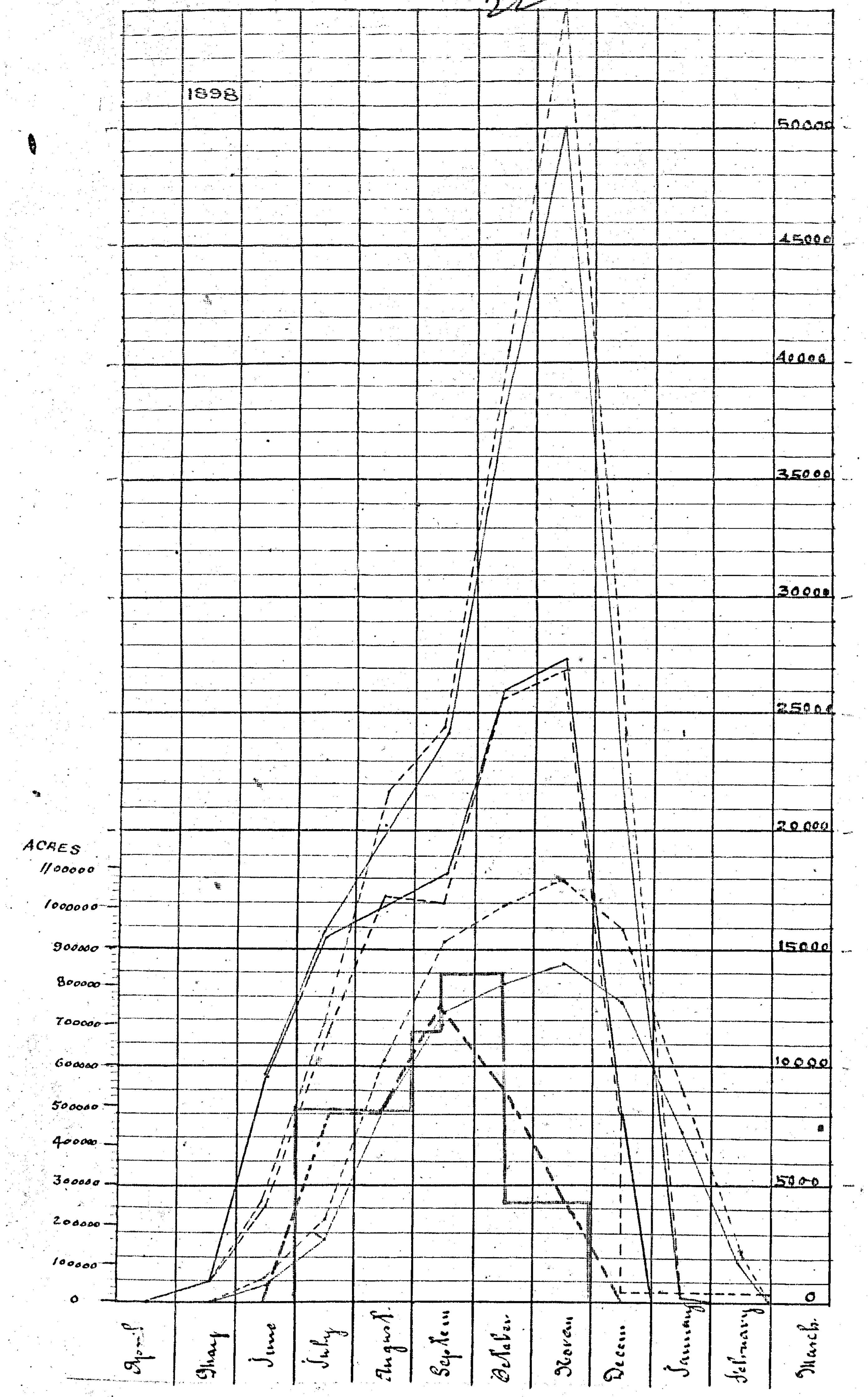


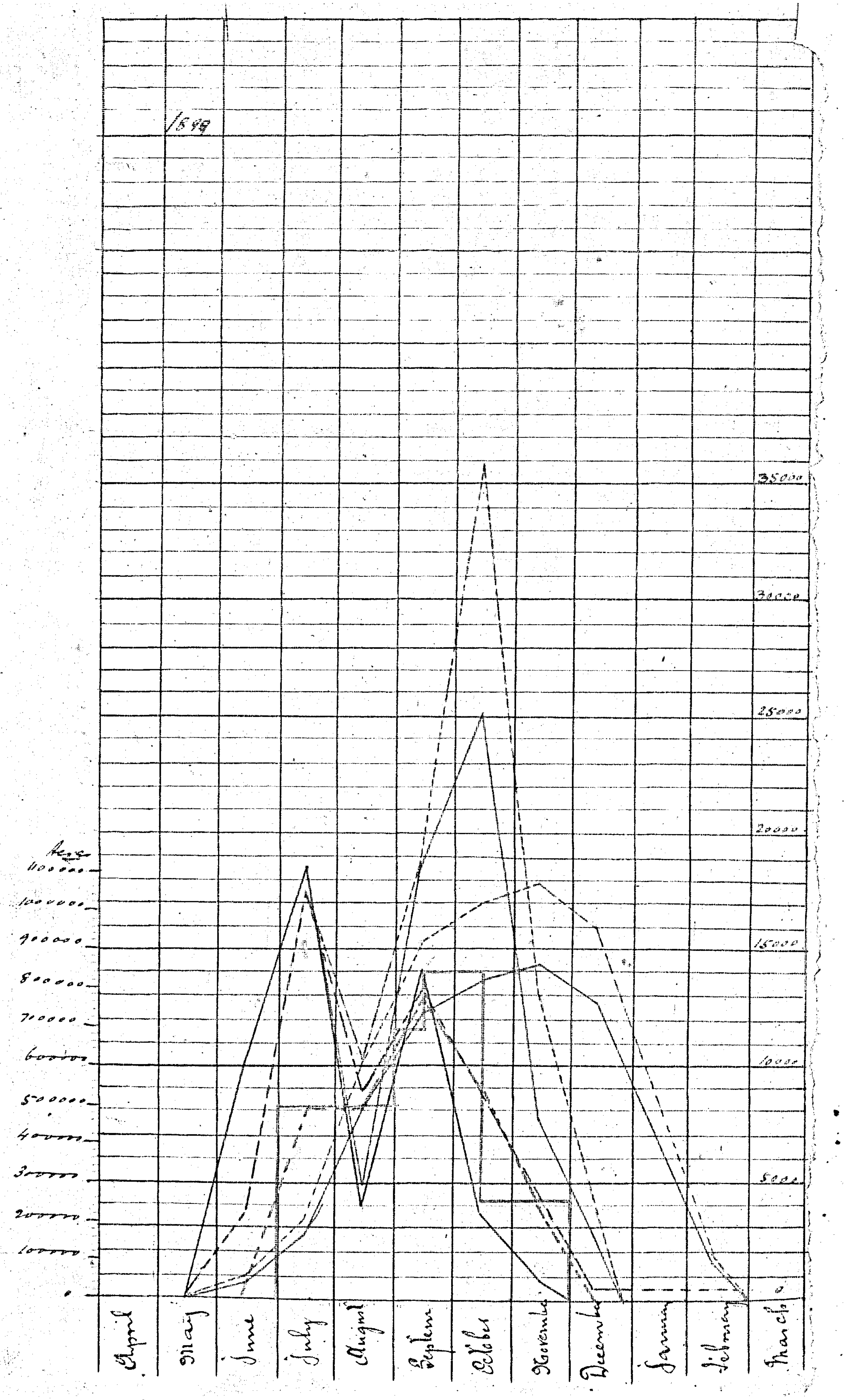


Diagram and statement for 1899.

This is not only the worst year of the ten taken into consideration but the worst on record up to date.

A comparison of the dotted lake and green curves shows that nevertheless the proposed minimum supply to the delta would have been maintained.

The reservoir would have been filled during the first half of July and left empty at the end of the year. As a protective work it would have been of very great value and just sufficient.

ACTUAL Gauge Readings, Cauvery Dam (North Gauge), for the year 1899.

Date.	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.	13th.	14th.	15th.	16th.
May ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
June ..	3·0	2·7	2·6	2·5	2·7	2·8	2.7	2·6	2·5	2·7	2·5	2·8	2·5	2·4	2·3	2·2
July ..	3·8	3·9	6·7	8·2	8·6	8·4	8·3	8 0	7·5	7·1	6·7	6·5	6·9	7 3	6·9	6·5
August ..	3·6	3·7	4·2	3·7	3·4	3·3	3·1	3·0	2·8	2·7	2·5	2 1	2·0	2 0	5·3	6·8
September ..	3·9	3·9	3·8	4·3	4·3	4·5	6·6	6·9	6·9	6·5	6 1	6·2	6·1	5·6	5·5	5·2
October ..	3 8	3·9	3·7	3·6	3·5	3·7	3·7	3·7	3·5	3·3	3·2	3·2	4·3	3·9	3·8	4·4
November ..	3 7	3·6	3 5	3·4	3·3	3·6	3·3	3·0	2·9	2·8	2·7	2·7	2·7	2·7	2·7	2·7
December ..	0 7	0·8	0·8	0·5	0·9	1·5	1·2	1·0	1·5	1·5	1·0	1·0	0·9	0·9	0·8	0·8

Date.	17th.	18th.	19th.	20th.	21st.	22nd.	23rd.	24th.	25th.	26th.	27th.	28th.	29th.	30th.	31st.
May ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
June ..	4·4	4·8	8·2	8·6	8·8	8·2	7·3	6·5	5·9	5·3	4·9	4·5	4·3	4·0	..
July ..	6·1	5·7	5·5	5·2	5·1	5·0	4·9	4·6	4·4	4·1	4·0	4·0	3·9	3·9	3·7
August ..	5·4	5·2	4·9	4·6	4·4	4·2	4·0	3·8	3·7	3·0	3·8	3·5	3·3	3·1	3·7
September ..	5·1	5·2	7·0	7·7	6·8	7·1	7·4	6·4	5·8	5·4	5·0	4·7	4·4	4·1	..
October ..	4·5	4·5	4·5	4·4	4·2	4·3	4·2	3·9	4·0	4·1	3·9	4·6	4·5	4·3	4·0
November ..	2·3	2·0	2·0	1·8	1·3	0·7	0·7	0·7	0·7	0·6	0·6	0·6	0·6	0·6	..
December ..	0·8	0·7	0·7	0·7	0·7	0·6	0·6	0·6	0·5	0·7	0·7	0·7	0·5	0·6	0·6

WORKING of the Cauvery Reservoir for the year 1899.

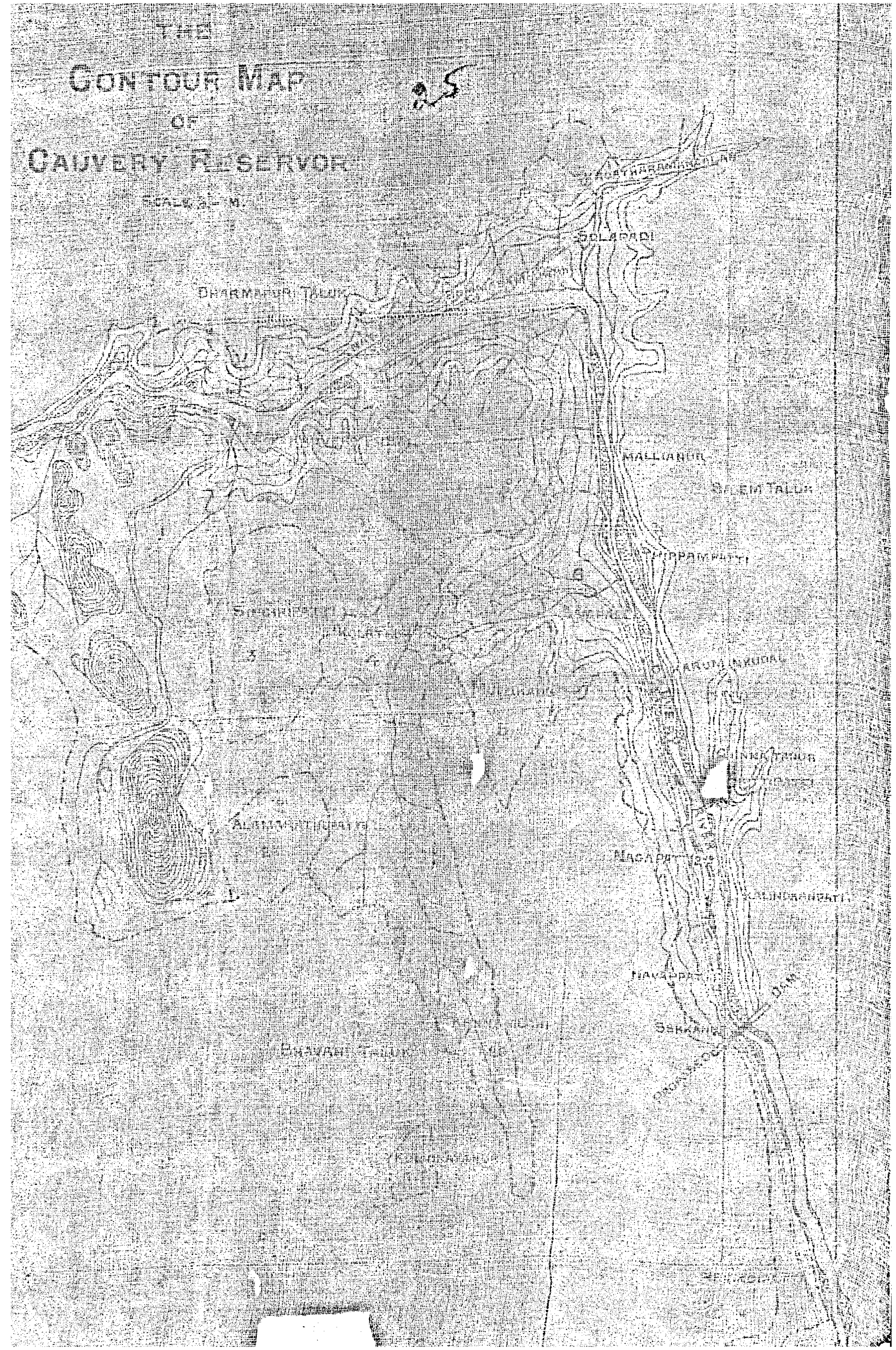
Period.	Issue required from reservoir in millions of cubic feet.	Loss by evaporation in millions of cubic feet.	Total loss to reservoir in millions of cubic feet.	Supply available to reservoir in millions of cubic feet.	Loss or gain to reservoir in millions of cubic feet.	Balance remaining in reservoir in millions of cubic feet.	Remarks.
1st to 31st May ..	..	..	..	..	..	..	
1st to 30th June ..	650	106	756	28,916	28,160	28,160	
1st to 31st July ..	4,517	302	4,819	12,458	7,639	35,799	
1st to 31st August ..	15,390	343	15,733	..	15,733	20,066	
1st to 15th September ..	16	127	143	..	143	19,923	
16th to 30th September.	5,143	159	5,302	12,556	7,254	27,177	
1st to 15th October ..	15,831	132	15,963	..	15,963	11,214	
16th to 31st October ..	514	96	610	..	610	10,604	
1st to 30th November ..	9,961	110	10,071	..	10,071	535	
1st to 31st December ..	..	..	..	..	..	..	

Clarendon figures show deductions.

TABLE of Capacity, Waterspread and Evaporation for the Cauvery Reservoir.

Evaporation is taken at 0·015 feet per day.

Reduced level.	Water spread in square miles.	Capacity in millions of cubic feet.	Daily evaporation in millions of cubic feet.	Reduced level.	Water-spread in square miles.	Capacity in millions of cubic feet.	Daily evaporation in millions of cubic feet.
600·0	·32	0	0·134	666·0	9·13	6,253	3·80
601·0	·39	18	0·162	667·0	9·41	6,500	3·90
602·0	·45	36	0·190	668·0	9·68	6,747	4·10
603·0	·52	55	0·218	669·0	9·96	6,994	4·20
604·0	·58	73	0·246	670·0	10·24	7,241	4·30
605·0	·65	91	0·274	671·0	10·61	7,577	4·40
606·0	·71	109	0·302	672·0	10·97	7,913	4·60
607·0	·78	127	0·330	673·0	11·33	8,248	4·70
608·0	·84	146	0·358	674·0	11·69	8,584	4·90
609·0	·91	164	0·386	675·0	12·05	8,920	5·00
610·0	·98	182	0·410	676·0	12·41	9,256	5·20
611·0	1·05	218	0·436	677·0	12·77	9,592	5·30
612·0	1·11	254	0·463	678·0	13·13	9,927	5·50
613·0	1·17	290	0·489	679·0	13·49	10,263	5·60
614·0	1·23	326	0·515	680·0	13·85	10,599	5·80
615·0	1·30	362	0·542	681·0	14·22	11,038	6·00
616·0	1·36	399	0·568	682·0	14·60	11,477	6·10
617·0	1·42	435	0·594	683·0	14·98	11,916	6·30
618·0	1·48	471	0·620	684·0	15·36	12,354	6·40
619·0	1·54	507	0·647	685·0	15·74	12,793	6·60
620·0	1·61	543	0·673	686·0	16·12	13,232	6·70
621·0	1·65	595	0·694	687·0	16·50	13,671	6·90
622·0	1·70	646	0·714	688·0	16·88	14,109	7·10
623·0	1·75	698	0·735	689·0	17·26	14,548	7·20
624·0	1·80	750	0·755	690·0	17·63	14,987	7·40
625·0	1·85	802	0·776	691·0	18·07	15,539	7·60
626·0	1·90	853	0·796	692·0	18·50	16,090	7·80
627·0	1·95	905	0·817	693·0	18·93	16,642	7·90
628·0	2·00	957	0·837	694·0	19·36	17,193	8·10
629·0	2·05	1,008	0·858	695·0	19·79	17,745	8·20
630·0	2·10	1,060	0·878	696·0	20·22	18,297	8·50
631·0	2·23	1,136	0·929	697·0	20·65	18,848	8·70
632·0	2·35	1,212	0·981	698·0	21·08	19,400	8·90
633·0	2·47	1,287	1·033	699·0	21·51	19,951	9·10
634·0	2·59	1,363	1·084	700·0	21·95	20,503	9·20
635·0	2·72	1,439	1·136	701·0	22·35	21,171	9·40
636·0	2·84	1,515	1·187	702·0	22·75	21,838	9·60
637·0	2·96	1,591	1·239	703·0	23·15	22,506	9·80
638·0	3·08	1,666	1·290	704·0	23·55	23,174	9·90
639·0	3·20	1,742	1·342	705·0	23·95	23,842	10·10
640·0	3·33	1,818	1·393	706·0	24·35	24,509	10·20
641·0	3·52	1,937	1·471	707·0	24·75	25,177	10·40
642·0	3·70	2,055	1·548	708·0	25·15	25,845	10·50
643·0	3·89	2,174	1·626	709·0	25·55	26,512	10·70
644·0	4·07	2,293	1·704	710·0	25·96	27,180	10·90
645·0	4·26	2,412	1·782	711·0	26·39	27,965	11·00
646·0	4·44	2,530	1·859	712·0	26·83	28,750	11·20
647·0	4·63	2,649	1·937	713·0	27·27	29,535	11·40
648·0	4·81	2,763	2·015	714·0	27·71	30,320	11·60
649·0	5·00	2,886	2·10	715·0	28·15	31,105	11·80
650·0	5·19	3,005	2·20	716·0	28·59	31,889	12·00
651·0	5·41	3,182	2·30	717·0	29·03	32,674	12·10
652·0	5·64	3,358	2·40	718·0	29·47	33,459	12·30
653·0	5·87	3,535	2·50	719·0	29·91	34,244	12·50
654·0	6·10	3,721	2·60	720·0	30·34	35,029	12·70
655·0	6·33	3,883	2·65	721·0	30·78	35,935	12·90
656·0	6·56	4,055	2·75	722·0	31·21	36,842	13·10
657·0	6·79	4,241	2·80	723·0	31·64	37,748	13·20
658·0	7·02	4,418	2·90	724·0	32·08	38,654	13·40
659·0	7·25	4,594	3·00	725·0	32·51	39,561	13·60
660·0	7·48	4,771	3·10	763·0	32·94	40,467	13·80
661·0	7·73	5,018	3·20	727·0	33·38	41,373	14·00
662·0	8·03	5,255	3·40	728·0	33·81	42,279	14·10
663·0	8·31	5,512	3·60	729·0	34·24	43,186	14·30
664·0	8·58	5,769	3·60	730·0	34·68	44,092	14·50
665·0	8·86	6,006	3·70				



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GENERAL DESCRIPTION OF CAUVERY PROJECT AND ESTIMATE OF RETURNS.

A masonry dam 130 feet high and 4,900 feet long will be built across the valley of the Cauvery at a point 5 miles north of Neringipet. It will be capable of holding up a depth of 126 feet of water (or more if ultimately found necessary) and storing 40,000 mils. cubic feet in the valley above. It will be provided with sluices capable of passing the full flood discharge of the Cauvery, with a comparatively low head, with a view to intercepting as little as possible of the silt when the water is in its muddiest condition.

In working the reservoir will as a rule be filled from a falling flood when there is less silt in the water.

The stored water will be chiefly utilized in improving the present irrigation (including 50,000 acres extension of second crop) in the Tanjore Delta and for new irrigation to the extent of 216,460 acres in the Tanjore, Tiruttoraippúndi, Mannárgudi and Pattukkóttai taluks. But some will also be used in irrigating the portions of the Salem and Coimbatore district bordering on the Cauvery, 18,870 acres in Bhaváni taluk (Coimbatore district), and 27,000 acres in Tiruchengódu and Námakkal taluks, Salem district. The irrigation channels for this supply take off at the dam itself and are shown with the extent of irrigation in the sketch maps attached.

These are the present proposals but there is a possibility of considerable extension of irrigation in the future, should it be found that sufficient water is available. 70,000 acres of land are commanded in the Pattukkóttai taluk south of Agniar river (for which revenue information has been received), and the Coimbatore and Salem channels might be extended to supply a further 100,000 acres. The capacity of the reservoir can be increased if necessary to 50,000 mils. cubic feet by simply raising the water level, the dam being of a sufficiently strong design to permit of such raising with safety.

The estimates of cost are as follows:—

	RS.
Dam	1,05,82,500
Sluices	20,00,000
Land Compensation for Reservoir	5,00,000
West Side Channel	23,03,250
East Side Channel	31,12,500
Pattukkóttai Project	49,80,000
Tirutturaippúndi extension	3,75,000
Perambúr extension	53,000
Total ...	2,39,06,250

The above sums include establishment charges, tools and plant and compensation.

The ultimate yearly return to be expected is —

		RS.
Delta second crop extension ...	50,000 acres	1,50,000
West Side Channel (double crop)	18,870 „	1,01,355
East Side Channel (double crop)	27,000 „	1,62,000
Tirutturaippúndi (first crop) ...	20,000 „	79,048
Perambúr extension (double crop)	5,300 „	32,892
Pattukkóttai project (first crop) ...	101,160 „	7,86,602
Do. „ (second crop)	60,000 „	1,80,000
Total ...		14,91,897
Deduct maintenance charges at 8½ annas per acre on 262,330 acres		1,39,363
Collection charges at 5 per cent on gross revenue		74,596
Total deductions ...		2,13,959
Net Revenue ...		12,77,938

or 5·33 per cent. on capital.

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One site suggested for the dam is at Sampalli, 7 miles further up the river than the one selected. This has been examined, but it has been found unsuitable chiefly on account of the much greater expense in construction which it would entail, though also because the rock does not seem to be quite so good as at the site chosen. The dam for the same capacity of reservoir would have to be quite as big as the one now proposed and, owing to its situation, its construction would be much more expensive. In addition to this about 20 miles would have to be added to the length of the side channels and that in ground where construction and maintenance would be most difficult and expensive.

Design of the Cauvery Dam.

The dam is designed of two sections. The centre portion which is pierced by the sluices which pass the flood waters, is formed on the lines of the Nile dam at Assuan. At the flanks the dam assumes the ordinary form of masonry dams.

The drawings attached show the profiles of the two sections of the dam and the lines of resultant pressure both with the reservoir full and empty. The calculated maximum stresses in tons per square foot at various points are also given.

In designing the dam 8 tons per square foot has been taken as the limiting stress allowable with the reservoir full, but at some points the stress has been permitted to exceed this in the case of the reservoir empty. The risk, however, is not then so great and the portions of the dam where such excessive stress may come are built of exceptional strength. In no case does the stress reach $9\frac{1}{2}$ tons per square foot. With the reservoir full the maximum stresses are all well below the limit of 8 tons and that limit would not be reached even if the water topped the parapets of the dam.

The lines of resultant pressures both with the reservoir full and empty are also well within the middle third of the width at any point and would be so under the worst conditions.

It has been judged advisable to make the dam of this somewhat unusual strength for three reasons—

(1) The danger to the large population below if from any accident the vast body of water held up by the dam were suddenly let loose down the river.

(2) The great probability there is of the capacity of the reservoir having to be increased in the near future by raising the water-level.

(3) The fact that there is no surplus weir and that consequently the whole surplus discharge has to be passed through sluices. From inattention or accident to these, and a flood coming suddenly down with the reservoir full, a temporary raising of the high water-level might result. It is not anticipated that such would be at all likely to occur but it is considered advisable to take the precaution of providing against such an accident.

It will be observed that, on the section of the portion of the dam containing the sluices, two lines of resultant pressure are shown both for the reservoir full and empty. Those to the left have been calculated on the assumption that the whole weight of the dam comes into play and those to the right on the assumption that only the portion to the rear of the line XY is effective.

The latter method is based on the recommendation of the Committee reporting on the Nile dam.

It will be seen that ample margin is provided in the design against all possible contingencies.

In the calculations the general weight of concrete and masonry has been taken at 140 lb. per cubic foot. That is probably somewhat less than it will actually be.

The face of both sections of the dam is continuous with a uniform batter of 1 in 16. The change of section will be seen in the rear.

Construction—Cauvery Dam.

The trial pits dug along the proposed line of the dam show that good sound rock can be found everywhere for the foundation. But it is overlaid (except in the river bed) with from 20 to 30 feet of very hard red earth and to a certain extent with

DETAILED DESCRIPTION OF THE CAUVERY PROJECT.

The Cauvery Project, as now submitted, includes the following separate works :—

(1) The construction of a masonry dam across the Cauvery near Neringipet and the formation of a reservoir of 40,000 mils. cubic feet capacity.

(2) The formation of a channel from the dam along the right bank of the Cauvery irrigating 18,870 acres in the Coimbatore district called the West side channel.

(3) The formation of a similar channel from the dam along the left bank irrigating 27,000 acres in the Salem district (called the East side channel).

(4) The irrigation of a block of 5,300 acres of dry land near the village of Perambúr (known as the Perambúr block) including the bed of the present Perambúr tank.

(5) The improvement of the Mulliyar Channel (taking off from the Coryar) and the extension of its irrigation by 20,000 acres of dry land in Tirutturaippúndi taluk (known as the Tirutturaippúndi block).

(6) The excavation of a channel from the Vadavar and the formation of a tank of 3,300 mils. cubic feet capacity to irrigate 60,000 acres in Pattukkóttai taluk. This portion of the project is known as the Pattukkóttai Project.

These various works are described in detail in the following reports :—

CAUVERY DAM.

Situation of Cauvery Dam and Reservoir.

The point finally selected for the construction of the masonry dam across the Cauvery is $4\frac{3}{4}$ miles above the village of Neringipet.

The Cauvery valley here is only about $\frac{3}{4}$ of a mile wide, bounded by steep hills and forms, as has long been known, about as favourable a site for a dam as could be found.

The river runs in a natural cutting towards the eastern side of the valley. This cutting or deep bed is about 100 feet wide with steep sides. The bed is chiefly of bare rock with here and there banks of sand. The margins are seldom reached by the water even in high floods.

Trial pits were dug at several points in the neighbourhood and the bed of the river carefully examined with a view to finding the best possible position for the dam. That finally chosen is as above stated $4\frac{3}{4}$ miles north of Neringipet.

Here the ground was carefully examined by sinking numerous trial pits at various points on the site. Specimens of rock taken from a number of the trial pits along the proposed line of the dam were sent to the Superintendent of the Geological Survey of India for his opinion. His report on them is annexed—*vide* Appendix A. Further specimens from the river bed and the left bank (where he considered the rock from one of the pits to be of an inferior character) are being sent.

The bed of the river consists of hard rock which also underlies the whole valley at a moderate depth and forms the hills on either side. A mass of this rock crops up at the west side of the river forming a small rocky hill which will be included in the body of the dam as shown in the plan.

Above the site of the dam the valley wi[illegible]s out and extends in a northerly direction for 13 miles when it turns at right ang[illegible] to the west. The lake formed by the dam will, when full, stretch up the river for [illegible] distance of 34 miles and have a varying width of from 1 to 3 miles.

The area of land to be taken up for the bed [illegible] this reservoir is 35 square miles. It is at present occupied by a number of small villages with a total population of 5,000, mostly engaged in dry cultivation.

An amount of Rs. 5,00,000, as settled by the Revenue Department, has been provided in the estimate for compensation, and the Collectors of Coimbatore and Salem will probably be able to provide for settling the inhabitants on waste lands not far from their present abodes when the land is taken up.

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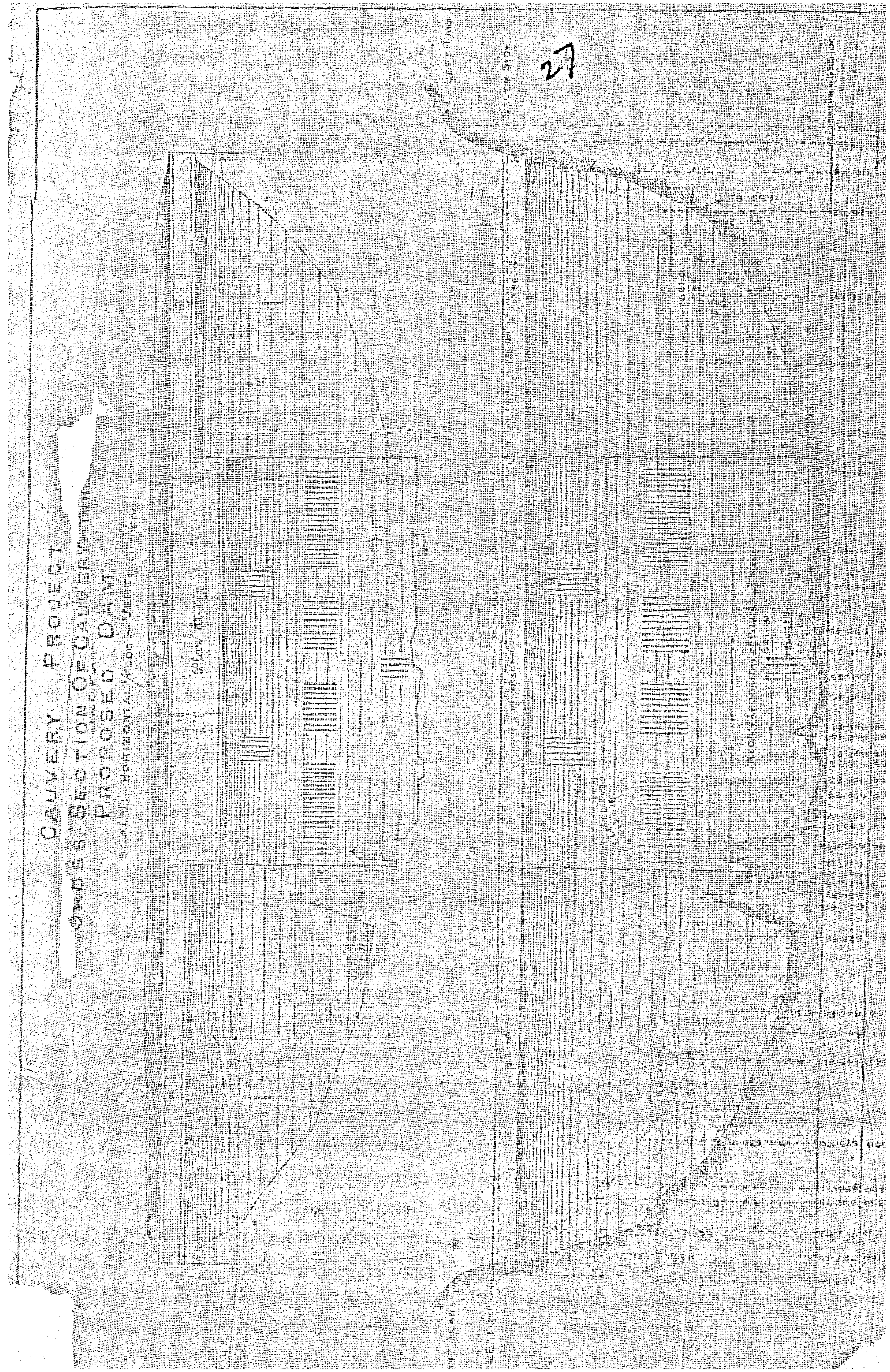

rotten and decayed rock. This overlying earth and soft rock will have to be removed. The work of removal will be expensive, but it is believed that the allowance in the estimate is ample.

No building will be done until the soundest of the solid rock has been reached.

The surface for the foundation will be roughly cut into steps as shown in the drawing, the tops of the steps or ridges being approximately at right angles to the resultant pressure when the reservoir is full.

It is proposed to build the dam mainly of concrete and where masonry is necessary to use only such sizes of stone as can be economically handled by manual labour. Where exceptional strength is required it will be obtained by setting the stone in cement mortar or even (as in the case of the sluice vents) facing the work with iron plates.

By an extensive use of concrete as proposed a large expenditure in heavy plant will be saved, as the powerful cranes, etc., necessary to handle heavy stones will not be needed. On this account the work will probably also be cheaper than it would be if the dam were built of, or packed with, large stones. A large stone may be of itself cheaper than the same mass of concrete, but when the cost and time of getting it into place are taken into account it probably proves in the end the more expensive item. There is always the danger too of its being dumped violently down on the new work and causing cracks and otherwise damaging it and, unless great care is exercised, hollows and spaces are sure to be left in setting it.

With concrete on the other hand sound work is obtainable with inferior labour and less difficulty in supervision and there is less risk to be encountered. On these considerations it has been judged best to provide for building the body of the dam of concrete alone.

Possibly it may be found in actual construction advantageous to introduce rough stone of moderate size into the concrete. In that case the stones should be carefully bedded in mortar with the largest face down. They should have no overhanging corners and should be set not less than one foot apart to allow of the concrete being easily packed and rammed between them.

The water face of the dam will be built of rubble of moderate size set in strong surki mortar and backed by a richer and denser concrete than that used for the body of the dam. As it is most important that this face should be thoroughly tight, the greatest care will be taken to make it as solid and close as possible to prevent water under pressure penetrating into the body of the dam.

The down stream face will be built (especially in the lower part) 3′ thick of fairly large rough stones carefully and solidly set in mortar. Below the sluices these stones will be set in cement mortar.

The courses of the stone facing will be so arranged as to bond it well into the concrete backing, and the back of each course will be built vertical so that the concrete can be rammed solidly against it.

The middle of the dam is pierced by 76 sluice vents. The majority of these have their sills at R.L. 656 at which level the capacity of the reservoir is 4,000 millions of cubic feet. These sluices will be used mainly in passing flood water. They will pass the maximum flood discharge of 250,000 cubic feet per second with a head of about 33′ and a velocity of not more than 30′ per second.

The six upper sluices are for the purpose of passing the irrigation supply of 16,500 cubic feet per second when the reservoir is full. Five would do, but an extra one is added to be on the safe side. All these sluices measure 20′ × 7′ in the ventway.

The four undersluices of 12′ × 4′ vent at the bottom of the dam are for the purpose of unwatering the reservoir of the lower 4,000 millions cubic feet when necessary.

The sluices will all be of Stoney's pattern, but no design has been prepared for them as this is a special work and can be better worked out at the shops where they are to be built. A lump sum of Rs. 25,000 has been provided in the estimate for building and erecting each sluice.

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It is proposed to form the top and bottom of the vent ways of heavy cast or wrought iron plates, suitably stiffened each plate being 10′ long, sufficient to stretch right across the vent and bond $1\frac{1}{2}'$ into each side.

The sides of the vents will be built of the hardest granite ashlar in courses of about $1\frac{1}{2}'$ depth set in 1 to 1 cement mortar. One-fourth or more of the stones will be header bond stones tailing well back into the concrete of the dam.

About $\frac{1}{4}$ mile below the site of the dam a small dam or wall 16′ high will be built across the river bed to hold up the water and form a cushion for the water falling from the high sluices, to prevent undue damage to the rocks in the neighbourhood of the dam foundation. This cushion wall will be provided with four vents 4′ wide which will allow the water retained by the wall above the sills of the lower sluices in the dam to gradually pass off down the river when the reservoir is emptied.

Sluices are provided at each end of the dam for the supply of the side channels irrigating portions of the Coimbatore and Salem districts. It is proposed to build these sluices in the manner shown in the drawings, discharging into substantial wells built against the upper face of the dam. The wells will serve as water-cushions to break the force of the flow and the water will be drawn from the wells into the channels through vent ways in the dam.

The interior of the wells will be lined with hard cut stone in cement. They will be each provided with three sluices—one about half way up and two at the bottom. The extra sluice at the bottom is to provide for the requisite discharge with a low head.

The sluices are arranged round the well, so that the gearings may not interfere with one another and it is intended that the two side sluices should alone be used when the head is great in order that the force of the flow may be broken against the opposite wall. The sluice opposite the vent will only be used with a low head.

When getting in the foundations of the dam, the disposal of the hot weather flow of the river will have to be taken into consideration. It is not anticipated, however, that this will give much trouble.

A temporary dam of earth and stone will be made across the deep bed at a favourable point about a furlong above the site of the dam to divert the water into two side channels for the supply of the turbines which will be located above flood level on the river margin below the dam. Rupees 5,000 has been allowed for the construction of the temporary dam and side channels. This sum allows for the bund to be renewed twice.

The small quantity of water received by leakage and percolation from the river banks and bed below the temporary dam will easily be dealt with by leaving small gaps for it in the work as it proceeds. Once the height of the low level sluices has been reached there will be no further trouble.

When the dam is high enough water for the turbines will be drawn from the side channels which are 60′ above the deep bed of the river.

It is estimated that the construction of the dam will extend over a period of five years.

Materials for the Dam.

There is an abundant supply of excellent stone of the best description for the work in the hills which overlook the site and form the abutments of the dam itself.

Sand of good quality and in large quantities is found in beds within a mile or two of the site of the work.

Good lime is to be had at a point about 3 miles from the work, where there are large deposits of lime stone, and clay for surki at Neringipet.

It is proposed to use for the body of the dam surki mortar made of one part lime, one part surki and two parts sand which seems to make a good strong hydraulic mortar. For the face work and the concrete immediately behind it, where the masonry and concrete must be as dense and impervious as possible, it is proposed to use mortar made of two parts of lime to three of surki. Careful tests of the mortar should be made before the work is started.

SECTION OF

CAUVERY DAM AT RIGHT FLANK

ON THE HEAD SLUICE FOR THE PROPOSED COIMBATORE DISTRY

SCALE 1/240

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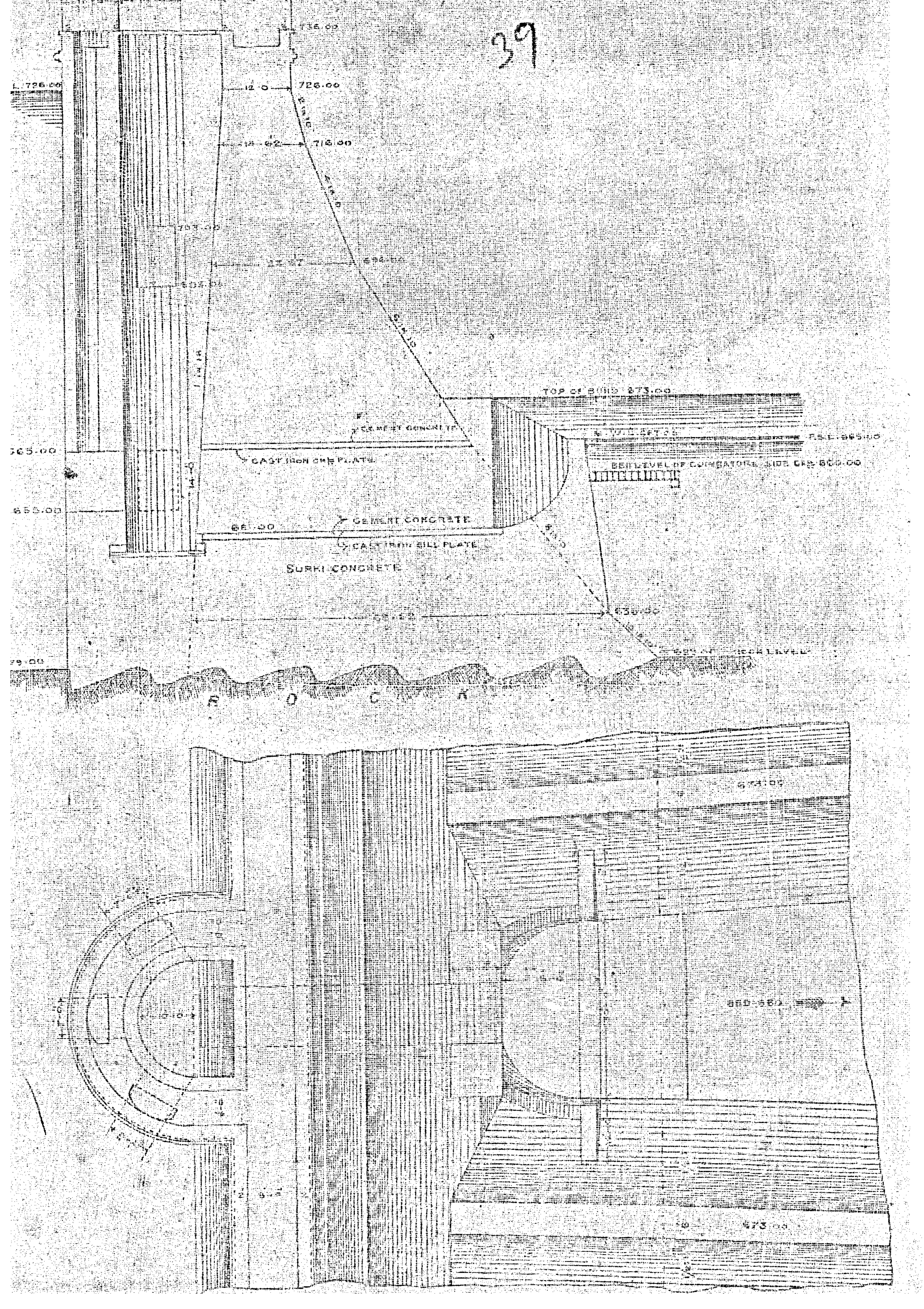


WEST SIDE CHANNEL.

This channel, starting from the Cauvery reservoir, commands an area of 50,000 acres, of which 18,870 acres are irrigable north of Bhaváni river and there are about 50,000 acres more available in Erode taluk if the channel should be extended south of the Bhaváni.

The head regulator consists of sluices built as shown in a well against the masonry dam. The sills of the lowest sluices are 71 feet below the F.S.L. of the reservoir and 55 feet above the average bed level of the river.

The channel follows approximately the contour of the country except at nala crossings where it has been found economical to carry it between embankments and in passing some ridges of land where it has been found more economical to cut through the same, rather than make a long detour round them. The total length of the channel is 34 miles with a fall of one foot per mile and it is divided into five reaches; length, bed-width of channel, depth of water, side slopes and bed fall for each reach are given in the following table:—

First Reach, up to 10¼ miles. Bottom width, 50 feet.

Reach number.	Mileage.		Hydraulic information.				Top width of bank.	Discharge at F.S.L.	Area to be irrigated in acres.
	From	To	Bottom width.	F.S.L.	M.W.L. above F.S.L.	Top of bank above M.W.L.			
..	..	10¼	50	5	2	6	6	629·37 cubic feet per second. Side slope 1½ to 1 and fall 1 foot per mile throughout.	18,870
2 ..	10¼	20¼	40	5	3	6	6	507·55 cubic feet per second.	15,210
3 ..	20¼	27¾	30	5	2	6	6	386·75 ,, ,,	11,610
4 ..	27¾	32¾	20	4	2	4	6	175·00 ,, ,,	5,250
5 ..	32¾	34¾	12	3	2	4	6	63·69 ,, ,,	1,920

The cross section of the channel is designed according to the nature of the material met with. In earth-cutting the side slopes are 1½ to 1 and in rock ½ to 1. The channel is in double bank throughout, with two exceptions, *i.e.*, where it skirts the Palamalai and Kuruchi hills. There the drainages are taken into the channel and passed out at convenient places by outlets. The lower or left bank is made up to a height of 6 feet and the upper or right bank 3 feet above the channel M.W.L. The reason for this difference is the less risk of breach in the right bank. The consequences of such a breach, too, would not be so serious as if it happened in the left bank.

The Index map and longitudinal section give a fair idea of the nature of the country through which the channel passes, and show the difficulties encountered in locating the line so as to obtain the best positions for crossing the numerous water courses met with.

The first 7 miles are a series of embankments across drainages, and the rest of the main channel is carried in cuttings and embankments alternately. The chief points to be noted are the deep rock cuttings through ridges at the following places:—

Name of cutting.	Mileage.	Quantity of hard rock.	Remarks.
			RS.
Unjapaliem	10 to 12	3,836·260	2,33,468
Kalbavi	16 to 17	1,002·540	70,178
Kurichi	18 to 19	422·070	29,545
	And other minor cuttings.		

In all these cases it was found more economical to take the channel across ridges than to follow the contour round. The other advantages are a saving of head and reduction in the length of the main channel to be maintained. The reduction in the length of the canal by these short cuts amounted to not less than 10 miles altogether.

The soil met with along the line of the channel is generally red earth or red earth mixed with small stones. As a rule, it was found by digging trial pits at places where there are deep cuttings, that the top layer was red earth to a depth of 6 feet, then soft rock to a depth of 4 feet, and below that, hard rock. The soil met with is good enough for the banks.

The channel being contained by a single bank in the first $6\frac{1}{2}$ miles, all the drainage from above has to be passed by means of outlets. This has been provided for by four outlets. The channel is practically in double bank from $6\frac{1}{2}$ miles to the end where it tails into the Bhavâni. From that point ($6\frac{1}{2}$ miles) all the drainage will be passed by culverts or aqueducts. The details of these masonry works are given below in a tabular form :—

Position.		Description of masonry.	Drainage area in square miles.	Value of co-efficient.	Discharge.	Cost of masonry.	Remarks.
Miles.	Feet.						
		First Reach				RS.	
2/3	..	Outlet No. 1	3	1,000	2,080	11,000	Three vents of 15′ span.
4/6	..	" " 2	6	1,000	3,300	13,600	Four vents of 15′ span.
6/2	330	" " 3	6	..	3,300	13,600	Do.
		~~First Reach.~~					
7/2	330	Aqueduct No. 1	2	800	1,264	11,200	Three vents of 16′ span.
8	330	" " 2	$1\frac{1}{4}$	..	1,160	10,600	Do.
9	..	" " 3	1	..	800	8,800	Two vents of 16′ span.
10	..	" " 4	2	..	1,264	11,200	Three vents of 16′ span.
		Second Reach.					
12/2	..	Aqueduct No. 5	60	800	12,264	51,000	Six vents of 30′ span.
12/5	..	" " 6	1	600	600	8,400	Two vents of 16′ span.
13/4	330	" " 7	4	..	1,512	11,800	Four vents of 16′ span.
16	330	Outlet No. 4	11	..	2,964	13,600	Four vents of 15′ span.
16/2	..	Aqueduct No. 8	$1\frac{1}{4}$	..	780	13,100	Two vents of 26′ span.
17/5	330	" " 9	2	..	948	13,100	Do.
19/3	..	" " 10	$3\frac{1}{2}$	..	1,380	11,800	Four vents of 16′ span.
		Third Reach.					
21/3	..	Aqueduct No. 11	$1\frac{1}{4}$	..	780	8,400	Two vents of 16′ span.
22/5	330	" " 12	$\frac{1}{2}$	..	450	6,700	One vent of 16′ span.
		Fourth Reach.					
23/5	330	Aqueduct No. 13	$6\frac{3}{4}$	..	2,670	18,000	Three vents of 20′ span.
24/3	330	" " 14	$\frac{1}{2}$	..	450	8,700	One vent of 26′ span.
25/2	330	" " 15	$5\frac{1}{4}$	..	1,866	11,100	Two vents of 20′ span.
27/2	330	" " 16	2	..	948	9,200	One vent of 20′ span.
28/6	330	" " 17	$\frac{3}{4}$	..	600	7,500	Two vents of 16′ span.
30/3	..	" " 18	$1\frac{3}{4}$	..	900	9,200	One vents of 20′ span.
31	..	" " 19	46	..	7,080	25,000	Six vents of 30′ span.
31/6	..	" " 20	$\frac{1}{2}$	..	450	6,300	One vent of 16′ span.
		Fifth Reach.					
32/6	..	Aqueduct No. 21	$\frac{1}{4}$	..	300	8,100	One vent of 26′ span.
33/7	8	" " 22	2	..	948	8,500	One vent of 26′ span.
		Road Bridges.					
9/4	..	Road bridge No. 1 ..	..	..	..	5,200	Two vents of 30′ span.
10/8	..	" " 2 ..	..	..	..	5,200	Do.
12/3	..	" " 3 ..	..	..	..	4,400	Two vents of 24′ span.
20/2	..	" " 4 ..	..	..	..	4,400	Do.
22/3	330	" " 5 ..	..	..	..	3,600	Two vents of 19′ span.
34/1	330	" " 6 ..	..	..	..	960	One vent of 15′ span.
..	..	Drop No. 1 to B channel ..	..	..	..	910	
..	..	" " 2 " ..	..	..	..	800	
..	..	" " 3 " ..	..	..	..	800	
..	..	Drop No. 1 to C channel ..	..	..	..	830	
..	..	" " 2 " ..	..	..	..	780	
..	..	" " 3 " ..	..	..	..	780	
		Total ..	..	..	..	3,58,160	

Details of Sluices of West side Channel.

Position.		Description.	Area irrigated in acres.	Discharge required, cubic feet.	Cost of masonry.	Remarks.
Miles.	Feet.					
		First Reach.			RS.	
..	330	Sluice No. 1	120	4	400	2′ diameter pipe sluice.
0/5	200	" " 2	120	4	400	Do.
2/3	100	" " 3	120	4	400	Do.
3/4	100	" " 4	150	5	400	Do.
4/6	100	" " 5	420	14	480	One vent of $2\frac{1}{2}$′ × 2′.
5/6	..	" " 6	150	5	400	2′ diameter pipe sluice.
6/6	..	" " 7	240	8	400	Do.
7/5	..	" " 8	240	8	400	Do.
8/5	..	" " 9	870	29	670	One vent of 5′ × 3′.
9/1	200	" " 10	420	14	480	One vent of $2\frac{1}{2}$′ × 2′.
10/2	..	" " 11	810	27	560	One vent of $3\frac{1}{2}$′ × $2\frac{1}{2}$′.
			3,660	122	..	
		Second Reach.				
11/7	..	Sluice No. 12	240	8	400	2′ diameter pipe sluice.
12/3	..	" " 13	360	12	450	One vent of $2\frac{1}{2}$′ × 2′.
13/5	150	" " 14	150	5	400	2′ diameter pipe sluice.
15/5	200	" " 15	750	25	560	One vent of $3\frac{1}{2}$′ × $2\frac{1}{2}$′.
18/1	..	" " 16	1,350	45	670	One vent of 5′ × 3′.
20/1	400	" " 17	750	25	560	One vent of $3\frac{1}{2}$′ × $2\frac{1}{2}$′.
			3,600	120	..	
		Third Reach.				
20/6	..	Sluice No. 18	2,040	68	700	One vent of 5′ × 3′.
21/5	100	" " 19	2,160	72	700	Do.
22/3	200	" " 20	2,160	72	700	Do.
			6,360	212	..	
		Fourth Reach.				
23/1	330	Sluice No. 21	540	18	560	One vent of $3\frac{1}{2}$′ × $2\frac{1}{2}$′.
24/2	..	" " 22	210	7	400	2′ diameter pipe sluice.
24/7	330	" " 23	240	8	400	Do.
25/7	330	" " 24	450	15	480	One vent of $2\frac{1}{2}$′ × 2′.
26/5	..	" " 25	510	17	560	One vent of $3\frac{1}{2}$′ × $2\frac{1}{2}$′.
27/6	..	" " 26	510	17	560	Do.
29/3	..	" " 27	270	9	400	2′ diameter pipe sluice.
30/5	..	" " 28	270	9	400	Do.
31/4	..	" " 29	180	6	400	Do.
32/1	..	" " 30	150	5	400	Do.
			3,330	111	..	
		Fifth Reach.				
32/7	..	Sluice No. 31	300	10	400	2′ diameter pipe sluice.
33	..	" " 32	300	10	400	Do.
..	..	Direct irrigation	1,320	44	..	
			1,920	64	..	
		Total ..	...	..	15,520	

Calculations for Aqueducts.

(1) Aqueduct of 16′ span and 5′ up to springing.

$D = C\,A\,\sqrt{2g}\,H$ where $C = \cdot75$ and $H = 0\cdot64$.

$= \cdot75 \times 80 \times 8 \times \cdot8 = \cdot6 \times 640 = 384$ cubic feet per second.

(2) Aqueduct of 16′ span and 6′ up to springing.

$D = \cdot75 \times 96 \times 8 \times \cdot8 = \cdot6 \times 768 = 460\cdot8$ or 461 cubic feet.

(3) Aqueduct of 20′ span and 10′ up to springing.

$D = C\,A\,\sqrt{2g\,H} = \cdot6 \times 200 \times 8 = 960$ cubic feet per second.

(4) Aqueduct of 26′ span and 5′ height.

$D = C\,A\,\sqrt{2g}\,H = \cdot75 \times 130 \times 8 \times \cdot8 = \cdot6 \times 130 \times 8 = 624$ cubic feet per second.

(5) Aqueduct of 30′ span and 11′ height.

$D = C\,A\,\sqrt{2g\,H}$ where $C = \cdot64$ and $H = \cdot5$

$= \cdot64 \times 330 \times 8 \times \cdot7 = 1{,}183$ cubic feet per second.

or $D = 5\,A\,\sqrt{H} = 5 \times 330 \times \cdot7 \times 1{,}155$ cubic feet per second.

(6) Aqueduct of 30′ span and 15′ 6″ up to springing.

$D = 5\ A\ \sqrt{H}$ where $H = \cdot 81$

$= 5 \times 465 \times \cdot 9 = 2{,}092 \cdot 5$ cubic feet per second.

or $D = C\ A\ \sqrt{2g\ H}$ where $c = \cdot 64$ and $H = \cdot 81$

$= \cdot 64 \times 465 \times 8 \times \cdot 9 = 2{,}142 \cdot 72$ cubic feet per second.

(7) Outlet of 15′ span. M.W.L. of channel 7′.

$D = 5\ A\ \sqrt{H}$ where $H = 2 \cdot 25'$.

$= 5 \times 105 \times 1 \cdot 5 = 787 \cdot 5$ cubic feet per second.

Estimate for West Side channel.

No.	Description.	Cost.
		RS.
1.	Earthwork, main channel	12,00,000
2.	Do. A channel	9,050
3.	Do. B do.	6,310
4.	Do. C do.	4,230
5.	Outlets, aqueducts, road bridges, drops, etc.	3,53,160
6.	Sluices	15,520
	Minor distributaries at Rs. 4 per acre for 4,500 acres (investigated)	18,000
	Minor distributaries for the remaining 14,370 acres at Rs. 12.	1,72,440
	Unforeseen works	71,290
	Total ...	18,50,000
	Establishment, tools and plant, etc., at 24½ per cent. ...	4,53,250
	Grand Total ...	23,03,250

The cost, Rs. 23,03,250, is analysed below :—

Earthwork	11,89,340
Land compensation	30,250
Masonry works	3,68,080
Minor distributaries	1,90,440
Unforeseen	71,290
Establishment, tools and plant, etc., at 24½ per cent.	4,53,250
Total ...	23,03,250

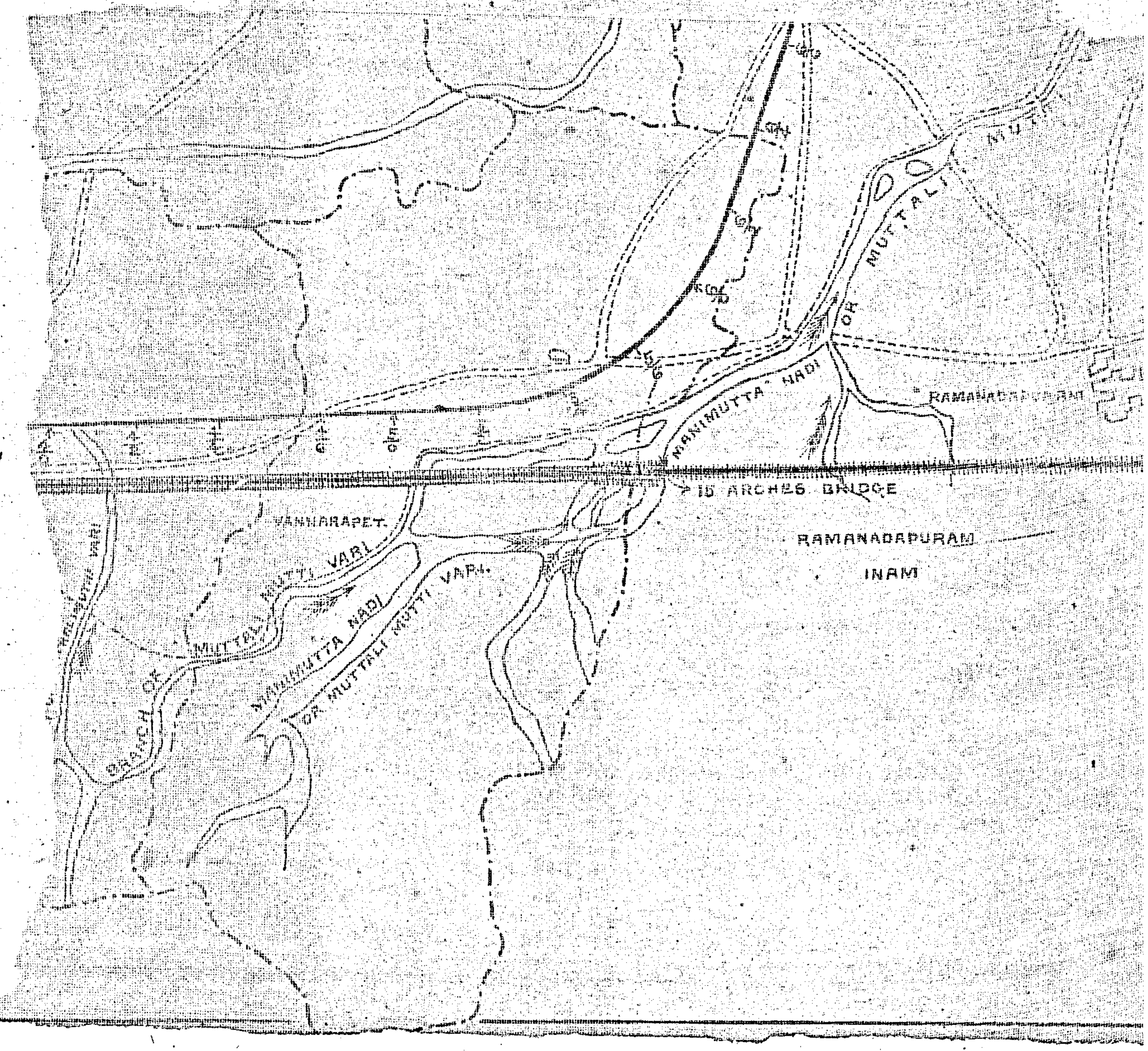
Revenue expected.

Area likely to be benefited by the project, 37,492·4 acres; area taken up at present 18,870 acres; increase of revenue on the 18,870 acres is Rs. 1,01,355–12–0.

The following is a list of drawings for the East Side channel.

Book No. 5.

No.	Description.	Page number.
1.	Index plan	1
2.	Longitudinal section	2
3.	General design for outlets of 13′ span	3
4.	Detailed plan and elevation of shutters	4 & 5
5.	General design for aqueducts of 16′ span	6 & 7
6.	Design for an aqueduct across Chittar	8
7.	An aqueduct of 26′ span	9
8.	An aqueduct of 20′ span	10
9.	An aqueduct of 30′ span	11
10.	A bridge of two vents of 30′ span	12
11.	A bridge of two vents of 24′ span	13
12	A bridge of two vents of 19′ span	14
13.	A culvert of 15′ span	15
14.	General design for pipe sluices of 2′ diameter	16
15.	General design for sluices of 6′ × 3′, 5′ × 3′, 4′ × 3′, 3′ 6″ × 2′ 6″	17
16.	General design for sluices of 2′ 6″ × 2′	18
17.	Distributaries	19 to 21
18.	Survey plans	22
19.	A drop	23



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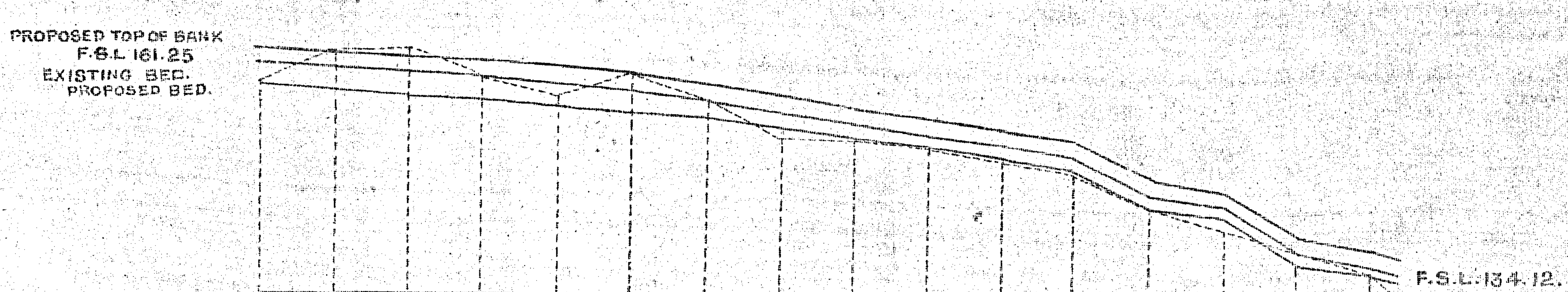
Cauvery Project
Peramboor Block
Longitudinal Section of Proposed New Channel

SCALE :— HORIZONTAL 1" = 1 MILE, VERTICAL $\frac{1}{240}$



	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	7⅞+46'
PROPOSED TOP OF BANK	163.25	162.50	161.77	161.00	160.27	159.49	158.75	157.25	155.75	154.25	152.75	151.25	146.25	144.75	138.75	137.25	136.12
PROPOSED BED	158.00	157.38	156.79	156.12	155.51	154.73	154.00	152.85	151.75	[illegible]	148.75	147.25	142.41	141.08	135.25	134.03	133.12
EXISTING BED DATUM+100.	158.31	162.71	162.44	159.17	156.50	159.35	156.48	151.62	151.36	[illegible]	143.47	146.66	142.70	139.71	136.91	134.48	130.13

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PERAMBUR BLOCK.

This is an area of land, 5,300 acres in extent, lying almost wholly to the north of the South Indian Railway at Alakudi station and including the bed of the present Perambur tank, the use of which as a storage will be abandoned, and its irrigation shared by the new Perambur channel and the present Anantha-Cauvery which now supplies the tank.

The new Perambur channel utilises an old branch of the Anantha-Cauvery as far as the village of Kalivaryampet. It then runs parallel to the railway line for three miles and from thence in a north-easterly direction for two miles further and discharges ultimately into a small tributary of the Maniamutha nadi.

The channel is of a simple character without any difficult works.

There is a considerable fall in the ground in the direction of the channel necessitating the use of two drops and rather a heavy bedfall.

It is divided into six reaches, particulars of which are given in the table below :—

Reaches.	Length. From Miles.	From Furlongs.	From Feet.	To Miles.	To Furlongs.	To Feet.	Area proposed to be irrigated.	Duty allowed.	Dimensions of the channel. Bed width.	Side slopes.	Depth at F.S.L.	Bed fall per mile.	Surface fall per mile.	Discharge in cubic feet per second. Discharge required.	Discharge provided for.	Area proposed to be commanded by branch-channels taken off in the reaches.	Corresponding discharge.	Remarks.
									FT.		FT.	FT.	FT.					
1 ..	..	..	..	1	7	180	5·300	75	11	1½ to 1	3	1·24	1·50	71	72	925	125	By 2 offtakes on the left bank.
2 ..	1	7	180	3	..	..	4·375	..	10	Do.	2·75	1·50	1·50	53	56	975	13	By 2 offtakes on the left bank and one on the right.
3 ..	3	..	..	3	7	520	3·400	..	8	Do.	2·38	2·22	3·00	45	49	1,255	17	By 2 offtakes on the left and two on the right bank.
4 ..	3	7	520	5	4	..	2·145	..	7	Do.	2·00	3·00	3·00	29	31	1,190	16	By 2 offtakes on the left and two on the right bank.
5 ..	5	4	..	7	..	..	955	..	4	Do.	1·75	2·66	3·00	13	15	465	6	By 2 offtakes on the right bank and one on the left.
6 ..	7	..	..	7	7	46	490	..	4	Do.	1·25	2·43	3·00	7	7	425	7	By 2 offtakes on the right bank and 65 acres direct irrigation.

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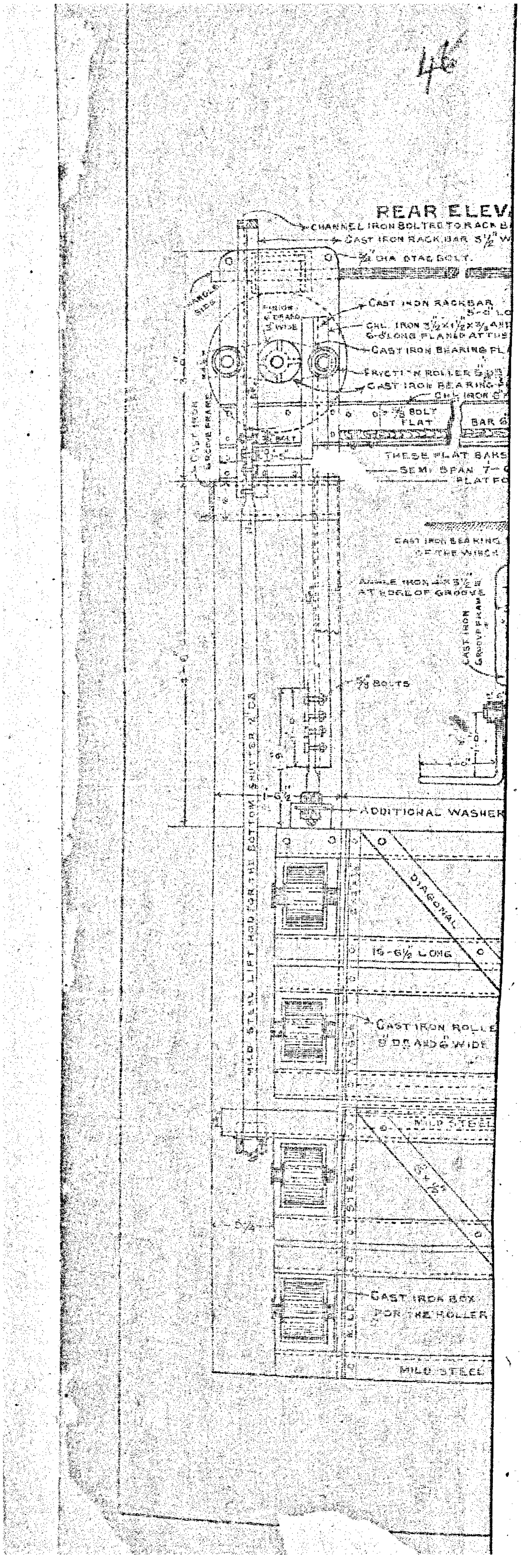

REAR ELEV
CAST IRON RACKBAR
CAST IRON BEARING
CAST IRON BEARING
THESE FLAT BARS
SEMI SPAN
ANGLE IRON
AT EDGE OF GROOVE
CAST IRON GROOVE FRAME
BOLTS
ADDITIONAL WASHER
DIAGONAL
15-6½ LONG
CAST IRON ROLLE
MILD STEEL
CAST IRON BOX
FOR THE ROLLER
MILD STEEL
MILD STEEL LIFT ROD FOR THE BOTTOM SHUTTER

PLAN OF IRON LIFT SHUTTER FOR THE

PROPOSED REGULATOR

AT THE HEAD OF MULLIYAR

SCALE 1/20

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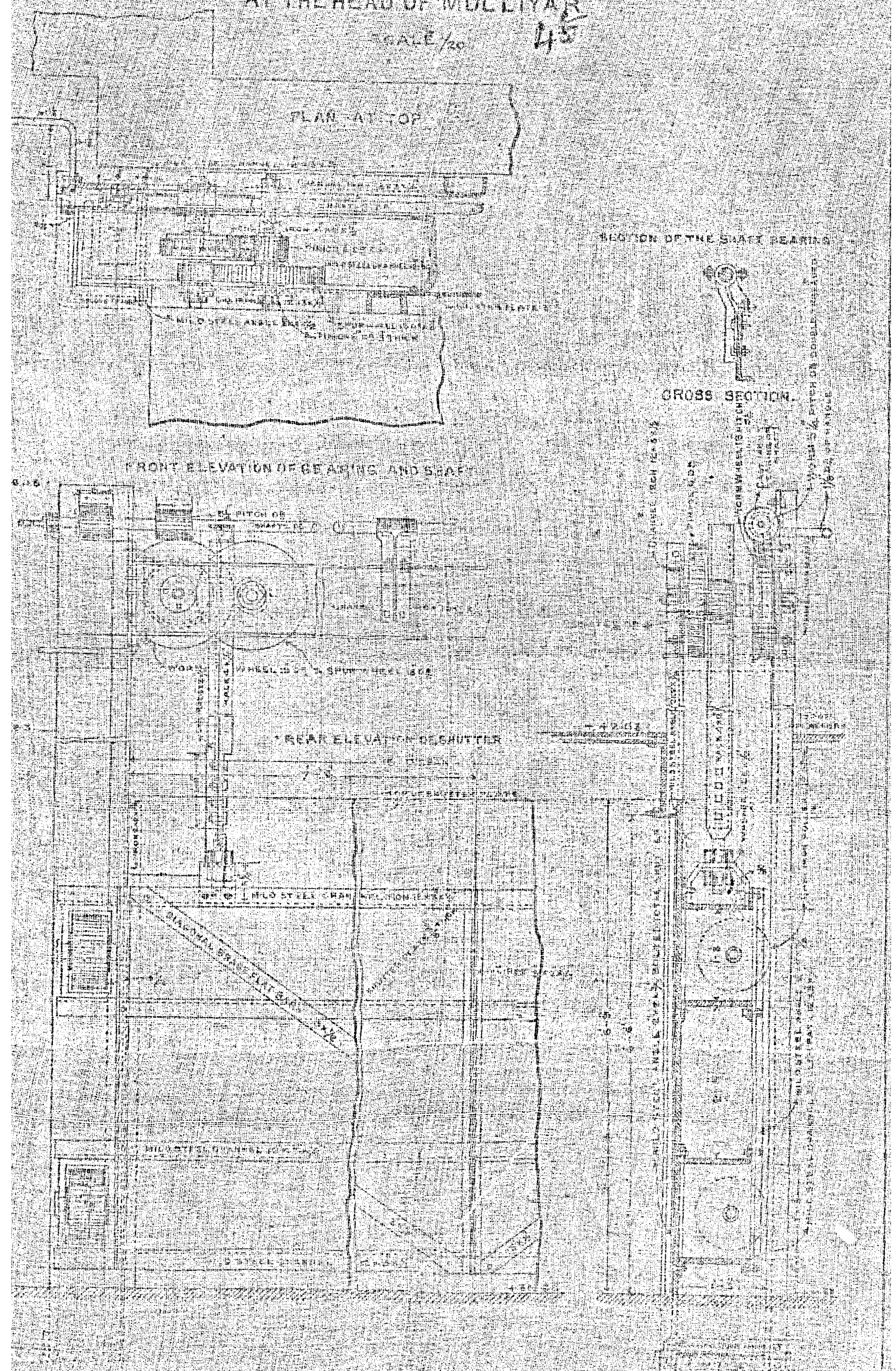

There are five other small drainage channels on the left side emptying into the Mulliyar, particulars of which are given below :—

Mileage.		Name.	Drainage area in acres.
Miles.	Furlongs.		
1	..	(1) Kottagadieu vadi voikal	637
1	1½	(2) Thiruvaramesuram voikal	270
1	1½	(3) Pua kottagam voikal	56
1	..	(4) Alvan kottagam voikal	38
5	3	(5) Anjanar	620

NOTE.—(1) and (4) will have one inlet sluice similarly with (2) and (3).

Of the five existing syphons, three will not be affected by the new arrangements. The one at the head of the river will have to be rebuilt and another at 15 miles 5 furlongs will have its end walls raised to suit the new M.F.L.

There are four road culverts by which the Mannargudi-Tirutturaippundi road crosses and recrosses the Mulliyar. One at 3 miles 2 furlongs will be rebuilt. The others are not affected by the new conditions, as is also the case with that on the Sengandi-Tirutturaippundi road. Another on the Tagattur-Tirutturaippundi road will have to be renewed.

The following table gives the position and particulars of the masonry works proposed for the Mulliyar :—

Table giving the position and particulars of the masonry works proposed for the Mulliyar.

Number.	Name of channel.	Description of works.	Distance from head.			Acres.
			Miles.	Furlongs.	Feet.	
1	....	Regulator	..	..	..	54,429
2	....	Syphon	..	..	360	..
3	....	Syphon for irrigation.	..	..	470	..
3_1	Kottagacheri Vadigal	Inlet	1	..	..	..
4	....	Road bridge ..	1	..	520	..
4_1	Tiruramaswaram drainage	Inlet	1	1	300	..
5	Adichapuram channel	Sluice	1	1	560	109
6	Arasadi voikal	....	1	2	110	97
7	Kambangudi voikal	....	1	2	330	114
8	Pappan voikal	....	2	2	100	1,181
9	Nemmeli Vadakkusetti voikal	....	2	2	180	241
10	Adichapuram voikal	....	2	3	330	206
11	Nemmeli Thekkusetti voikal	....	2	4	510	296
12	Ouercheri voikal	....	2	5	..	154
13	....	Road bridge ..	3	1	610	..
14	Pattamadugu voikal	Sluice	3	3	330	30
15	Kunamadugu voikal	....	3	5	200	95
16	Ponnur voikal	....	3	7	120	1,316
17	Kudithangi voikal	....	4	1	50	175
18	Adappur	....	4	7	250	13,448
19	Mungil voikal	....	5	..	150	194
20	Sadagopan Kattalai voikal	....	5	2	560	137
20	Aiyanar drainage	Inlet	5	3	..	..
21	Kilasetti voikal	Sluice	5	6	560	210
22	Easanakudi voikal	....	5	6	630	140
23	Kilappalichandan voikal	....	5	7	300	167
24	Settimulai Vadapathi voikal	....	6	3	..	380
25	Kaduvangudi Vaikayara voikal ..	....	6	3	400	598
26	Thiruppathur voikal	....	6	4	100	121
27	....	Road bridge ..	6	4	200	..
28	Vilakkudi voikal	Sluice	6	5	..	1,158
29	Settimulai voikal	....	6	7	300	195
30	Rayanallur voikal	....	6	7	330	790
31	Murugampalayam voikal	....	7	4	330	78
32	Mottupalayam voikal	....	7	6	510	441
33	....	Drainage syphon ..	7	7	60	..
34	Melabrahmaslikanni	Sluice	8	1	20	14
35	Nattu voikal	....	8	3	330	1,467
36	Nallanallur voikal	....	8	4	450	218
37	....	Road bridge ..	9	1	100	..

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Table giving the position and particulars of masonry works proposed for the Mulliyar—*cont.*

Number.	Name of channel.	Description of works	Distance from head.			Acres.
			Miles.	Furlongs.	Feet.	
38	Tholacheri voikal	Sluice	9	4	500	373
39	Varambian voikal	....	9	5	210	349
40	Vettukattai voikal	....	10	2	150	369
41	Pattangal voikal	....	10	3	640	110
42	Pallankovil voikal	....	10	4	540	174
43	Do.	Syphon	11	..	60	..
44	Kulaiyar	Sluice	11	2	100	..
45	Ariyalur Abishegakattalai voikal ..	....	12	..	490	421
46	Tiruturaipundi voikal	....	12	2	370	347
47	Vettukattu voikal	....	12	2	530	222
48	Valammapuram voikal	Syphon	12	5	610	..
49	Agaramanakkal voikal	Sluice	13	5	100	220
50	Sathamangalam voikal	....	14	..	540	75
51	....	Road bridge ..	14	3	335	..
52	....	Railway Girder bridge.	14	3	395	..
53	Kalluvamallikanni	Sluice	14	3	475	20
54	Vidvan Manaikal voikal	....	14	6	195	97
55	....	Drainage sluice ..	14	7	530	..
56	Periyanagipuram voikal	Sluice	15	..	330	145
57	....	Bridge	15	1	..	..
58	Anaikalmadai	Sluice	15	2	60	13
59	Pundaveli voikal	....	15	2	70	85
60	Pundaveli dam	....	15	2	100	..
61	Kanni	....	15	3	115	..
62	....	Drainage syphon ..	15	3	635	..
63	Menatchi voikal	Do. sluice ..	15	4	400	..
64	....	Do. syphon ..	15	5	370	..
65	Iyanarkovilpathu voikal	Sluice	15	6	..	102
66	Singalandi voikal	....	16	2	630	223
67	....	Drainage syphon ..	16	3	120	..
68	Kottapalayam voikal	Sluices	16	5	84	75
69	Sekaikottagam voikal	Do.	16	5	84	201
70	Kadamurti	Do.	16	6	314	386
71	Pirayadi	Do.	17	1	560	232
72	Adirungam voikal	Do.	17	3	190	568
73	Madai	Do.	17	6	60	..
74	Do.	Do.	18	..	20	5
75	Thoppadi	Do.	18	..	480	10
76	Madai	Do.	18	3	..	4
77	Do.	Do.	18	3	350	3
78	Aladi	Do.	18	4	85	485
79	Vyravan	Do.	18	4	350	326
80	Arasadi	Do.	18	7	340	79
81	Pakkumadayan	Do.	19	2	450	248
82	Kandyanmadaikusavan	Do.	19	3	310	420
83	Shotriyam	Do.	19	4	500	61
84	Vadakku voikal	Do.	19	6	440	688
85	Mavedi voikal	Do.	19	7	434	294
86	Elanthadimadai	Do.	20	..	35	..
87	Puliyadimadai	Do.	20	..	400	..
88	Pirappadi	Do.	20	..	610	54
89	Pirandiyangarai	Do.	20	1	370	519
90	Tharagamaruthur	Do.	20	1	420	182
91	Pattaivirthi	Do.	20	3	530	62
92	Vadamalaivoikal	Do.	20	4	560	635
93	Melamaruthur	Do.	20	5	..	287
94	Melamaruthurnadu	Do.	21	1	..	607
95	Mathukattalai Kandayanmadai ..	Do.	21	1	250	480
96	Tirukkulam	Do.	21	2	50	..
97	Manakkadu Vaddakku voikal ..	Do.	21	2	180	397
98	Sengathalai bridge	Do. Bridge and Regulator.	21	5	188	..

7. *Distributaries for new irrigation.*—For the distribution of water for the new irrigation two principal and four subsidiary channels are provided as will be seen from the index map.

The two principal channels known as the "Main" and "Tagattur" channels take off at the same point on the Mulliyar but from separate sluices. The acreage under the main channel is 12,200 and its head sluice has three vents measuring 5′ 6″ × 4′. The Tagattur channel has 7,800 acres and its head sluice has three vents of 4′ 8″ × 3′. The discharges are 165 and 105 cubic feet per second, respectively.

The main channel is 4 miles, 3 furlongs, 285 feet long and is divided into two reaches. It has two branch channels (Nos. 1 and 2) the "Collimodu" and "Kathripulam, South" channels.

Another subsidiary channel the "Kathripulam North" is an off-shoot from the Kallimodu.

Particulars of the main channel reaches are given in the table below :—

Number of reach.	Length. From Miles.	Fur-longs.	Feet.	To Miles.	Fur-longs.	Feet.	Side slopes.	Depth.	Surface fall.	Bed fall.	Discharge in cubic feet per second.	Bottom width.	Area irrigated.
1	0	0	0	2	6	430	2 to 1	4′	0·25	0·25	165	37	8,460
2	2	6	430	4	3	235	2 to 1	4′	0·25	0·25	60	12	3,750

The following table gives particulars of all masonry works on the main channel :—

Position. Miles.	Fur-longs.	Feet.	Description.	Left or right bank.	Area irrigated in acres.	Discharge required in cubic feet per second.	Remarks.
0	5	0	Irrigation sluice	R	1,080	14·4	One vent, 3′×2′
0	6	100	Road culvert	..	..	..	Three arches, 13′
1	0	0	Irrigation sluice	L	230	3·01	One vent, 1′3″×1′
1	1	0	Do.	R	530	7·01	One vent, 2′×1′4½″
2	0	0	Do.	R	460	6·13	One vent, 2′×1′3″
2	4	0	Do.	R	90	1·20	12″ diameter pipe sluice, Kallimodu channel head.
2	6	430	Head sluice	L	6,000	80·00	Two vents, 4′6″×3′9″.
3	0	0	Irrigation sluice	L	60	0·80	9″ pipe sluice.
3	3	500	Aqueduct	..	..	..	3 spans of 15′
3	4	0	Irrigation sluice	R	530	7·07	One vent, 2′×1′3½″
3	4	0	Do.	L	340	4·53	One vent, 2′×1′
3	7	0	Do.	L	260	3·47	One vent, 1′4½″×1′, Kathripulam South channel.
4	3	285	Head sluice	L	2,400	32·00	One vent, 4′3″×3′
4	3	285	Dam with vent	..	220	3·00	One vent, 1′×1′6″

All irrigation sluices will be provided with iron plate shutters capable of being locked. Head sluices will have teakwood shutters worked by rack and pinion gear. Minor distributaries have not been investigated, but a sufficient provision of Rs. 1–8–0 per acre has been allowed for them in the estimate.

No. 1 Distributary, Kallimodu channel.—This distributary takes off from the left side of the main channel at 2 miles 6 furlongs 430 feet from its head. It is 6 miles 6 furlongs long and irrigates 6,000 acres, the supply required being 80 cubic feet per second. The head sulice has 2 vents of $4\frac{1}{2}' \times 3\frac{3}{4}'$ each and is capable of discharging 82 cubic feet per second. It is fitted with shutters worked by rack gearing.

Kathripulam North channel.—At 0 mile 4 furlongs 360 feet from the head of the Kallimodu channel, a minor distributary, called the Kathripulam North channel, takes off from the right bank irrigating 1,200 acres and with a head sluice of one vent $2\frac{1}{4}' \times 3'$ capable of discharging 20 cubic feet per second.

The Kallimodu channel is divided into four reaches. Particulars of these and the Kathripulam north channel are given in the following table :—

Number of reach.	Length. From Miles.	Fur-longs.	Feet.	To Miles.	Fur-longs.	Feet.	Bottom width.	Side slope.	Depth.	Surface fall.	Bed fall.	Discharge in cubic feet per second.	Area to be irrigated in acres.
						Kallimodu channel.							
1	..	..	..	0	4	360	20′	2 to 1	3′9″	0·25′	0·25′	82	6,000
2	..	4	350	2	0	0	15′	2 to 1	3′9″	0·25′	0·25′	64	4,800
3	2	0	0	4	3	0	12′	2 to 1	3′6″	0·25′	0·25′	46·5	3,480
4	4	3	0	6	6	0	6′	..	3′0″	0·25′	0·25′	20	1,520
						Kathripulam North channel.							
1	..	..	..	3	0	0	6′	2 to 1	3′0″	0·25′	0·5′	20	1,200

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The following is a list of the masonry works provided for the Kallimodu and Kathripalem channels with particulars of each :—

Position. Miles.	Furlong.	Feet.	Description.	Right or left bank.	Area irrigated in acres.	Discharge in cubic feet per second.	Remarks.
			Kallimodu Channel.				
0	1	330	Road culvert	..	..	..	Two spans of 10′ each.
0	2	0	Irrigation sluice	L.	210	2·8	One vent, 1′ × 1′.
0	4	360	Do.	R.	1,200	16	Do. 2¼′ × 3′.
1	2	0	Do.	R.	260	3·47	Do. 1¼′ × 1′.
2	0	0	Do.	R.	510	6·8	Do. 2′ × 1¼′.
2	0	0	Do.	L.	340	4·53	Do. 2′ × 1′.
2	5	0	Do.	R.	440	5·87	Do. 2′ × 1¼′.
2	5	0	Do.	L.	600	8·00	Do. 2′ × 1½′
3	3	0	Aqueduct	..	..	..	
3	8	330	Road culvert	..	..	..	One span of 12′
4	3	0	Irrigation sluice	R.	610	8·13	One vent, 2′ × 1½′.
4	3	0	Do.	L.	310	4·13	Do. 1¼′ to 1′
5	0	0	Do.	R.	600	8·00	Do. 2′ × 1½′.
5	1	150	Aqueduct	..	..	..	Three spans of 15′ each.
5	4	0	Irrigation sluice	L.	150	2·00	One vent, 1′ × 0′ 10″.
5	6	0	Do.	R.	500	6·66	Do. 2′ × 1½′.
6	6	0	Dam at tail end	..	270	3·60	Do. 3½′ × 2′.
			Kathripalem North Channel.				
1	5	..	Irrigation sluice	R.	500	6·66	One vent, 2′ × 1½′.
..	..	..	Dam at end	..	700	9·33	Do 1′ × 3′.

A provision of Rs. 1–8–0 per acre is allowed as elsewhere for the smaller distributaries which have not been investigated.

No. 2 Distributary, Kathripalem South channel.—This takes off from the left side of main channel at 4 miles 3 furlongs 285 feet from the head. It is 2 miles 4 furlongs long and is divided into two reaches and irrigates 2,100 acres with a supply of 32 cubic feet per second.

Particulars of the channel and its masonry works are given in the following tables :—

Number of reach.	Length. From Miles.	Furlongs.	Feet.	To Miles.	Furlongs.	Feet.	Bottom width.	Side slopes.	Depth.	Surface fall.	Bed fall.	Discharge in cubic feet per second.	Area irrigated in acres.
1	..	..	..	1	2	..	11	2 to 1	3′	0·25′	0·25′	32	2,400
2	1	2	..	2	4	..	6	2 to 1	2½′	0·25′	0·25′	10·4	770

Position. Miles.	Furlongs.	Feet.	Description.	Right or left bank.	Area irrigated in acres.	Discharge in cubic feet per second.	Remarks.
0	3	0	Irrigation sluice	L.	525	6·00	One vent 2′ × 1½′.
0	5	0	Do.	R.	380	5·07	Do. 2′ × 1′.
1	2	0	Do.	L.	730	9·73	Do. 2′ × 1½′.
1	6	115	Road culvert	..	..	..	One span of 6′.
2	4	0	Dam at end	..	770	10·27	One vent 1½′ × 3′.

Tagattur channel.—As already stated, this channel takes off from the left bank of the Molliar at 5 miles 4 furlongs from the head. It is divided into five reaches and is designed to irrigate 7,800 acres of wet land with a supply of 104 cubic feet per second. Its total length is $5\frac{1}{2}$ miles.

At 3 miles 6 furlongs 580 feet a distributary, called the Panchanadikulam channel, takes off from the left bank and irrigates 2,400 acres. It has a head sluice of 1 vent, $4\frac{1}{4}' \times 3'$, fitted, a shutter worked by rack-gearing and capable of discharging 32 cubic feet per second.

The annexed tables give particulars of the various reaches and masonry works on the Tagattur and Panchanadikulam channels :

Number of reach.	Length. From Miles.	From Furlongs.	From Feet.	To Miles.	To Furlongs.	To Feet.	Bottom width.	Depth.	Side slopes.	Surface fall.	Bed fall.	Discharge.	Area to be irrigated in acres.
							Tagattur Channel.						
1	0	0	0	2	2	0	40	3'	2 to 1	0·25'	0·25'	104·24	7,800
2	2	2	0	3	3	0	32	3'	2 to 1	0·25'	0·25'	83·64	6,240
3	3	3	0	3	6	580	23	3'	2 to 1	0·25'	0·25'	61·36	4,540
4	3	6	580	4	4	0	10	3'	2 to 1	0·25'	0·25'	29·95	2,140
5	4	4	0	5	4	0	4	3'	2 to 1	0·25'	0·25'	15·33	600
							Panchanadikulam Channel.						
1	0	0	9	1	5	0	11	3'	2 to 1	0·25'	0·25'	32·08	2,400
2	1	5	0	2	4	0	6	3'	2 to 1	0·25'	0·25'	20·26	1,230
3	2	4	0	4	0	0	4	3'	2 to 1	0·25'	0·25'	15·33	750

Position. Miles.	Furlongs.	Feet.	Description.	Right or left bank.	Area to be irrigated in acres.	Discharge in cubic feet per second.	Remarks.
			Tagattur Channel.				
0	1	0	Road culvert	..	..	..	Three spans of 13'.
0	2	0	Irrigation sluice	R.	160	2·13	One vent, 1' × 1'.
0	4	0	Aqueduct	..	..	..	Do. 3' × 2'.
0	5	0	Irrigation sluice	L.	530	7·07	Do. 2' × 1½'.
1	0	0	Aqueduct	..	..	..	Do. 2' × 1½'.
1	1	0	Road culvert	..	..	..	Three spans of 13'.
1	3	0	Irrigation sluice	L.	610	8·13	One vent, 2' × 1½'.
2	0	0	Aqueduct	..	..	..	Do. 3' × 2'.
2	2	0	Irrigation sluice	R.	260	3·47	Do. 1½' × 1½'.
2	3	0	Aqueduct	..	..	..	Do. 3' × 2'.
2	4	0	Irrigation sluice	L.	800	10·67	Do. 2½' × 1½'.
3	2	0	Do.	L.	850	11·33	Do. 2½' × 2'.
3	2	640	Road culvert	..	..	..	Three vents of 11' spans.
3	3	0	Irrigation sluice	R.	60	0·67	Pipe sluice, 6" diameter.
3	3	495	Aqueduct	..	..	..	Two spans of 15'.
3	6	580	Irrigation sluice	L.	2,400	32·00	One vent, $4\frac{1}{4}' \times 3'$. Panchanadikulam channel head.
4	4	0	Do.	R.	680	9·07	One vent, 2' × 2'.
4	4	0	Do.	L.	860	11·46	Do. 2½' × 2'.
..	..	..	Dam at end	..	600	8·00	Do. 2' × 1½'.
			Panchanadikulam Channel.				
0	4	0	Irrigation sluice	R.	280	3·73	One vent, 1½' × 1'.
0	4	0	Do.	L.	440	5·86	Do. 2' × 1½'.
1	5	0	Do.	R.	450	5·99	Do. 2' × 1½'.
2	4	0	Do.	L.	480	6·40	Do. 2' × 1½'.
..	..	..	Dam at end	..	750	10·00	Do. 2' × 2'.

As before Rs. 1-8-0 per acre has been allowed for small distributaries not investigated.

The estimate for the Tirutturaippundi block is made up as follows :—

	RS.
Excavation	1,00,590
Masonry works	1,06,485
Allowance for distributaries at Rs. 1-8-0 per acre	30,000
Land compensation	54,648
Unforeseen works	11,952
Establishment, tools and plant	71,325

Revenue expected is Rs. 79,048.

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The following is a list of plans connected with this portion of the work :—

Plan number.	Description.	Number of sheets.
	Book No. 1.	
1.	Index plan	1
2.	Longitudinal section of Mulliyar	7
3.	Do. of proposed Main channel	2
4.	Land plan of proposed Main channel	1
5.	Longitudinal section of Kallimodu channel	3
6.	Land plan of Kallimodu channel	1
7.	Longitudinal section of Kathripulam North channel	1
8.	Land plan of Kathripulam North channel	1
9.	Longitudinal section of Kathripulam South channel	1
10.	Land plan of Kathripulam South channel	1
11.	Longitudinal section of Tagattur channel	2
12.	Land plan of Tagattur channel	1
13.	Longitudinal section of Panchanadikulam channel	2
14.	Land plan of Panchanadikulam channel	1
	Book No. 2.	
15.	Cross sections of Mulliyar from 0 to 237	33

PATTUKKÓTTAI PROJECT.

This was originally a separate scheme of itself and it was proposed with the two-fold object of relieving the Vennar by providing an additional outlet for its flood water and at the same time using some of the surplus water to extend irrigation. As the Cauvery reservoir project will tend greatly to improve the results of the Pattukkóttai project by steadying and improving the supply, the latter has been incorporated with it.

Still as this portion of the project is not directly dependent on the Cauvery reservoir for its supply but to a large extent will make use of the local rainfall, it is a work which can be put in hand at once and will begin to be useful and bring in a return at an early date.

All the land which it is proposed to irrigate is good land and favourable for conversion to wet, it will yield a good return and the development of irrigation and revenue will be rapid.

As shown in the index map, the scheme includes the improvement of a portion of the Vadavar, the formation of a large new channel and distributaries and a large new tank to be fed by the channel.

It is proposed to irrigate 131,160 acres direct from the new channel and some new distributaries from the Vadavar and 60,000 acres from the tank. This was the original proposal and it has been adhered to, though there is little doubt that, under the new conditions of improved regulation and better supply of Cauvery water, the estimated area will be greatly extended. There is ample room for such extension to the south of the Agniar as can be seen from the sketch-map and as much as 70,000 acres more can be brought under irrigation should sufficient water be available.

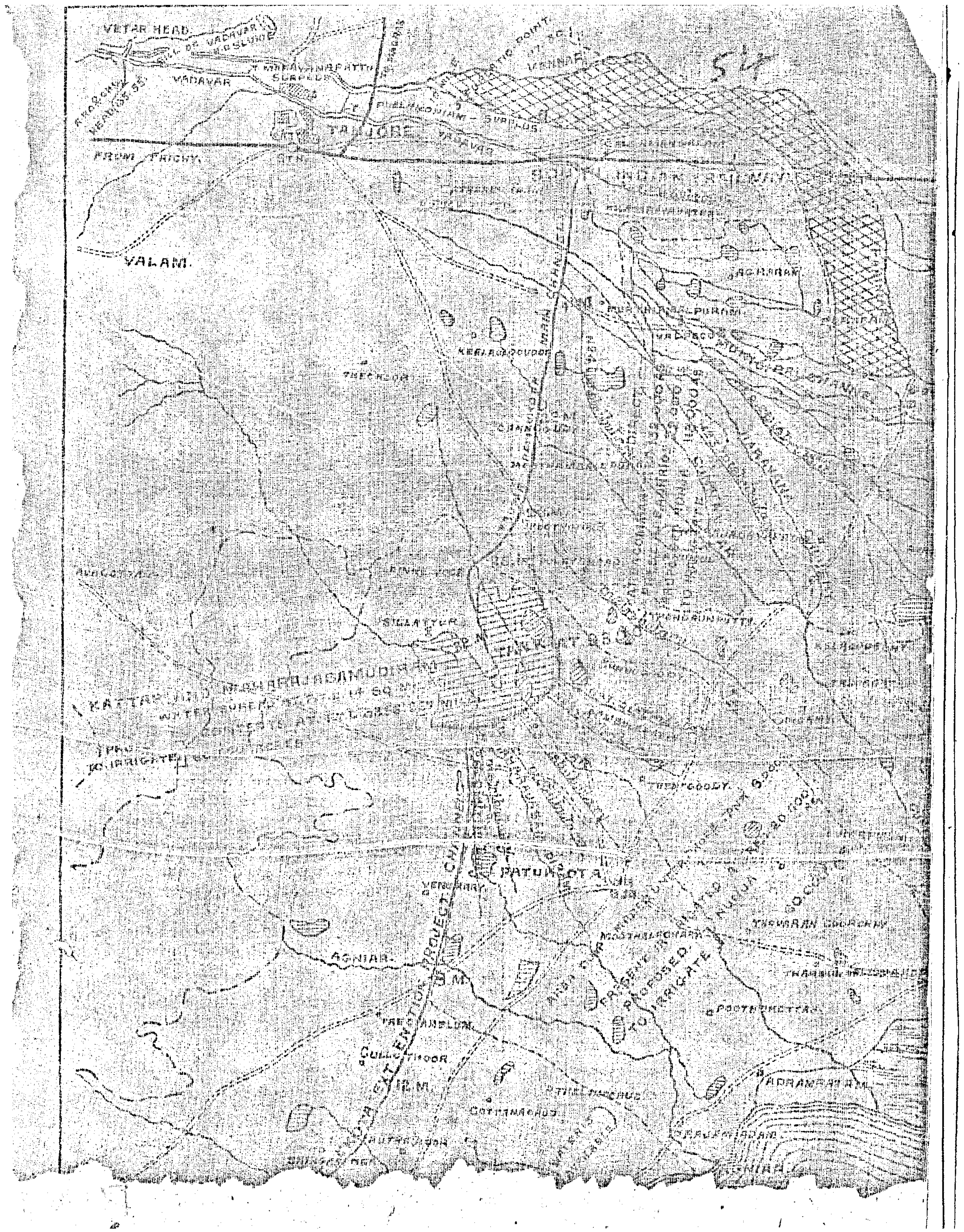
The index map shows the whole scope of the Pattukkóttai project, and a small longitudinal section is given showing the character of the new Pattukkóttai channel and the improvements to the present Vadavar channel.

The new work starts at the head of the Vadavar which will be widened and improved, where necessary, to enable it to safely carry the increased supply.

At $16\frac{3}{4}$ miles on the Vadavar the new Pattukkóttai channel takes off to the right proceeding southward and irrigating 66,000 acres direct through three distributaries and tailing into the proposed Kattar tank which it will supply.

From the left side of the Vadavar at about the same point, two distributing channels take off and irrigate 15,160 acres. Further down at $19\frac{1}{2}$ miles, another distributary will take off also to the left from the Vadavar and will irrigate 50,000 acres in the Mannárgudi taluk.

The work of widening the Vadavar and excavating the new channel and distributaries is nowhere of a difficult or unusual character. The soil passed through is mostly red earth, not difficult to excavate and suitable for banks.



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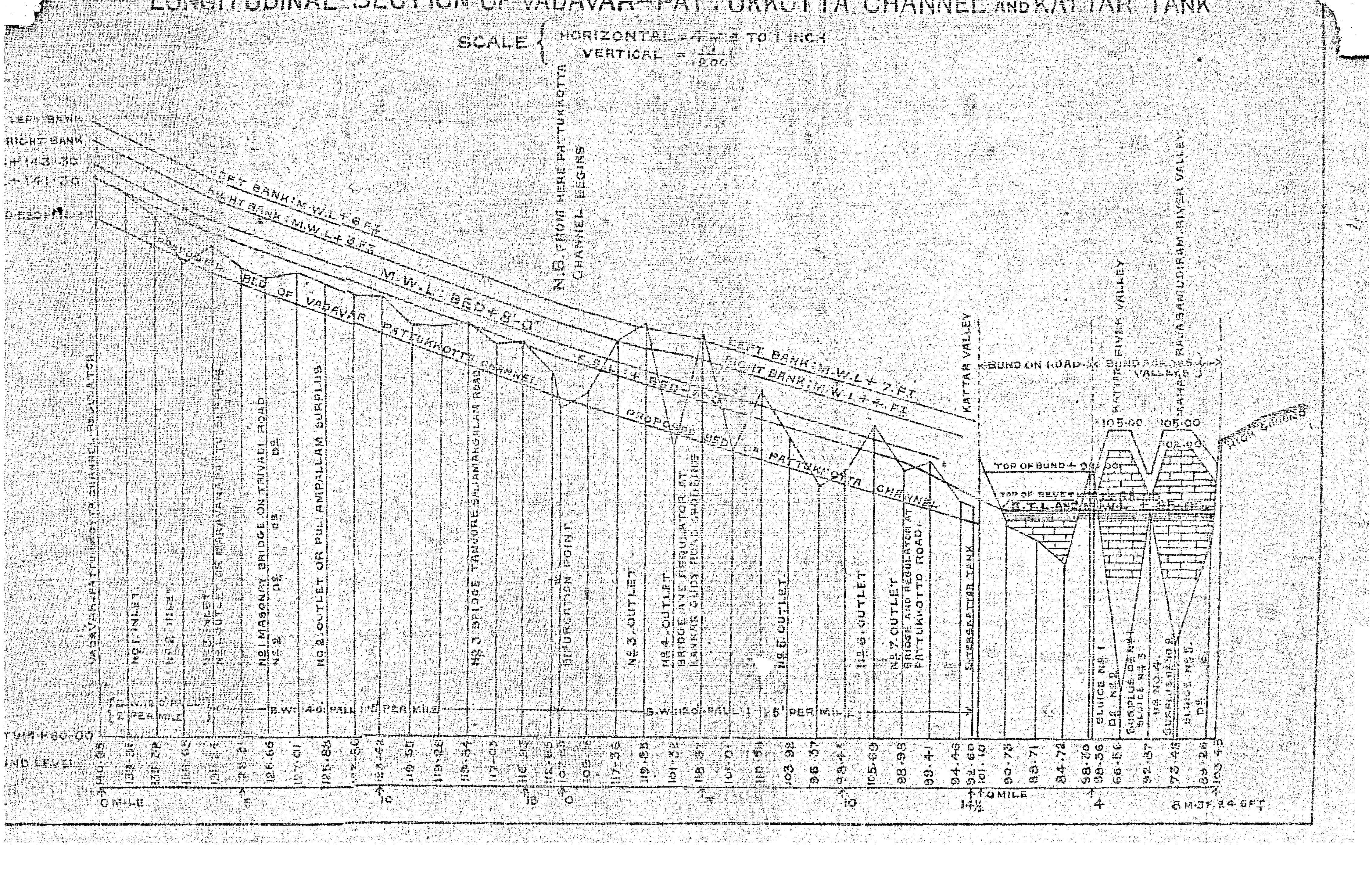
LONGITUDINAL SECTION OF VADAVAR–PATTUKKOTTA CHANNEL AND KATTAR TANK



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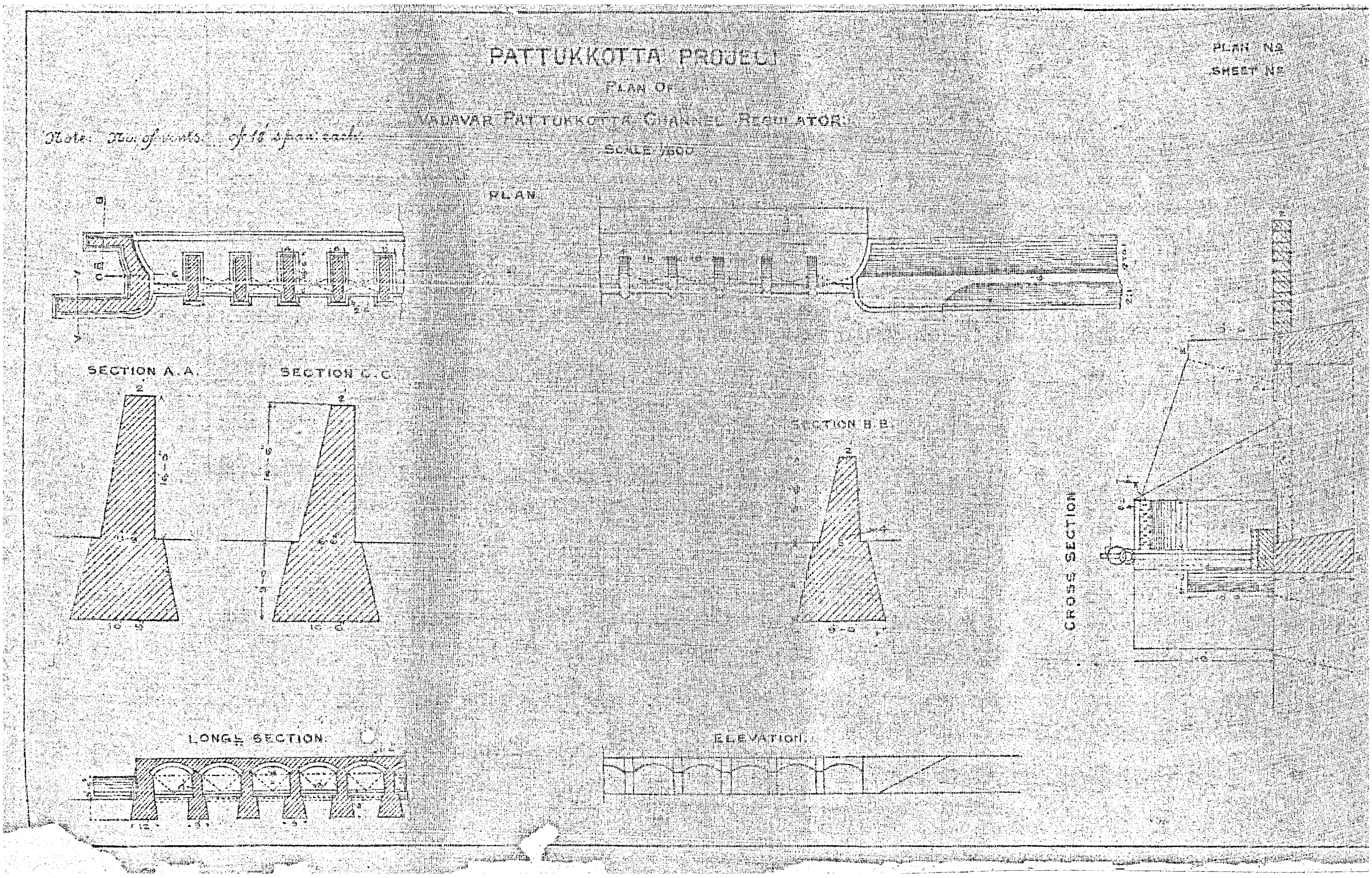

PATTUKKOTTA PROJECT
PLAN OF
VADAVAR PATTUKKOTTA CHANNEL REGULATOR.
SCALE 1/500
PLAN No
SHEET No
Note: No. of vents ... of 16' span each.
PLAN.
SECTION A.A.
SECTION C.C.
SECTION B.B.
CROSS SECTION
LONGL. SECTION.
ELEVATION.

PATTUKKOTTA PROJECT

PLAN

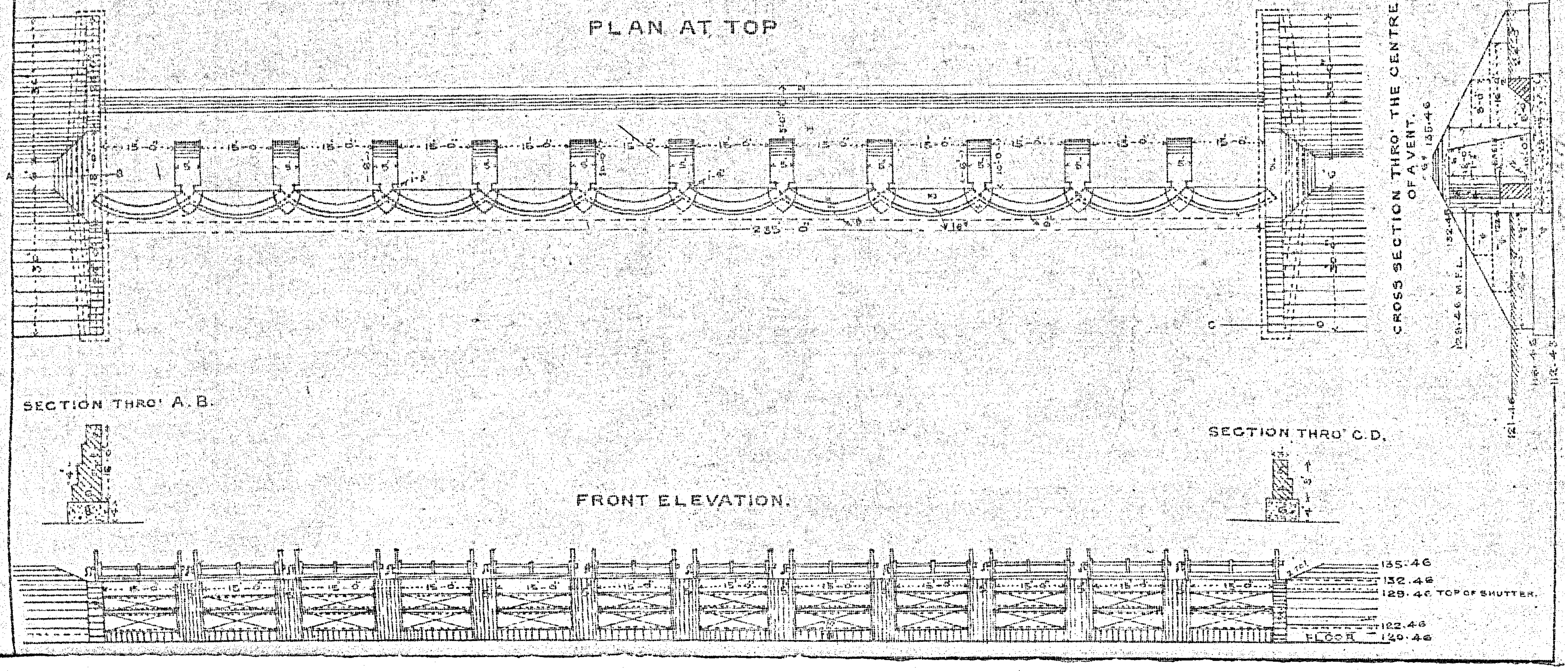
OF

Nº 2-OUTLET

OR

PULIAMPALLAM SURPLUS.

SCALE 1/300.



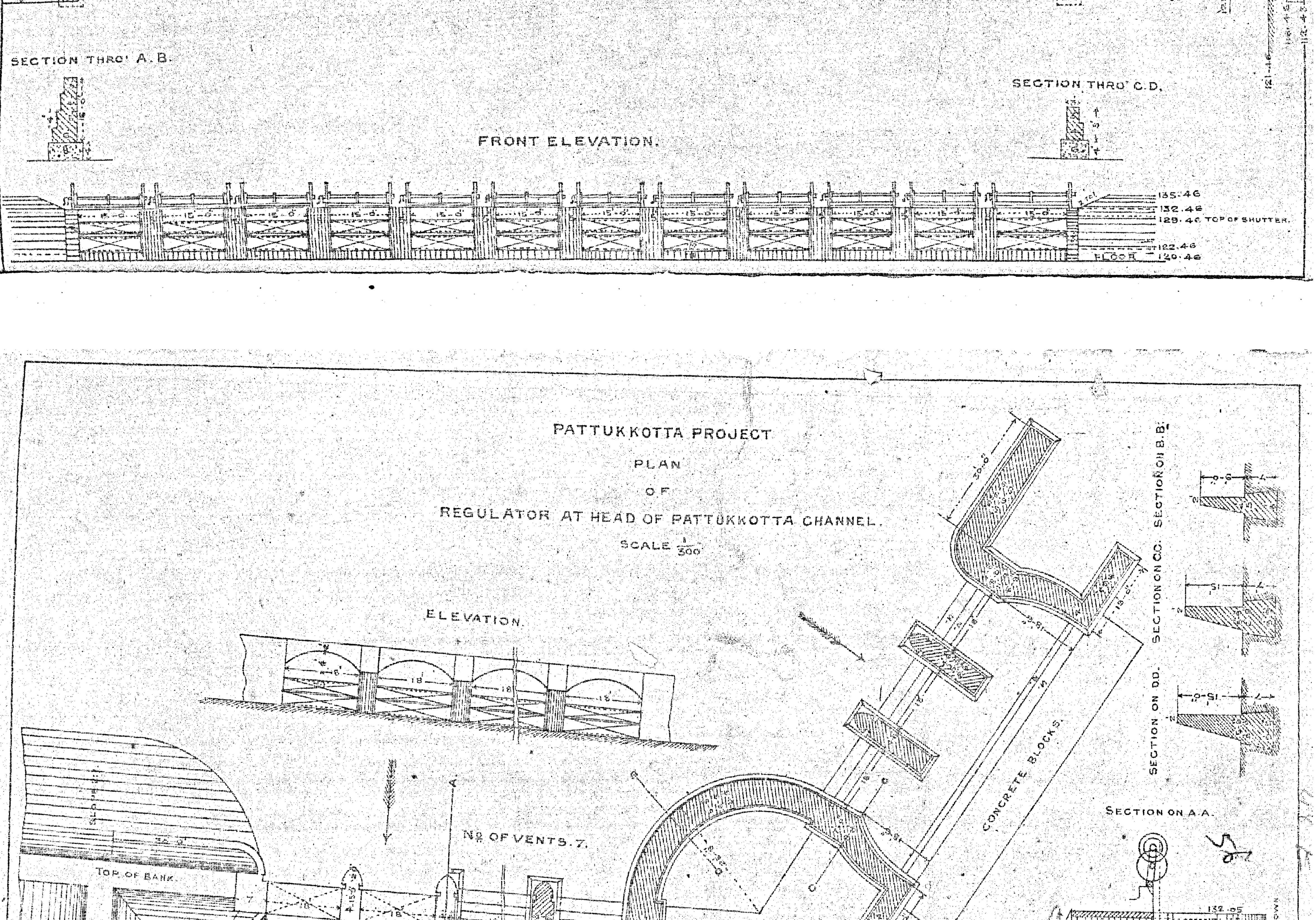
PATTUKKOTTA PROJECT

PLAN

OF

REGULATOR AT HEAD OF PATTUKKOTTA CHANNEL.

SCALE 1/300



The following is a table giving details of the three reaches into which the Vadavár and new channel are divided :—

Reaches.	Length. From. Miles.	Furlongs.	Feet.	Length. To. Miles.	Furlongs.	Feet.	Area proposed to be irrigated.	Duty allowed per cubic feet.	Dimensions of the channel. Bottom width.	Depth at F.S.L.	Depth at M.W.L.	Side slopes.	Bed fall.	Discharge. Discharge required.	Discharge provided at F.S.L.	Discharge at M.W.L.	Area proposed to be irrigated by branch channels taken off in the reach or at the end of the reach.	Corresponding supply.
Vadavar old channel.																		
							ACS.	ACS.	FT.	FT.	FT.		PER MILE.	C FT.P. SEC.	C.FT.P. SEC.	C.FT P. SEC.	ACS. C.	FT. P. SEC.
1st Reach ..	..	..	..	4	..	..	191,160	66	120	6	8	1½–1	2'	2,900	2,837	4,728	..	..
2nd ,, ..	4	..	..	16	2	..	191,160	..	140	6	8	..	1¼'	2,900	2,900	4,700	* 141,160	2,083
3rd ,, ..	16	2	..	19	2	..	60,000	..	52	5	7	..	1¼'	817	817	..	† 60,000	758
4th ,, ..	19	2	..	20	2	..	..	..	70	1½	6	..	2¼'	59	157	..	Enters into the Vadavoor tank.	
Pattukkóttai new channel.																		
1st Reach ..	..	..	..	14	5	..	126,000	..	120	6	8	..	1½'	1,658	2,232	3,740	‡ 66,000	1,000

		ACS.			ACS.
* No. 1 Distributary for	.. ..	8,310	† No. 2 Distributary for	..	60,000
,, 1A. Do.	.. .. ..	6,850	‡ ,, 3. Do.	.. ..	11,000
Pattukótai channel	.. ..	126,000	,, 4. Do.	.. ..	8,500
			,, 5. Do.	.. ..	46,500
	Total ..	141,160		Total ..	66,000

REMARKS.—Balance available in the Vadavar at F.S.L. after deducting 988 cubic feet required for distributaries 1, 1-A and 3 and 59 cubic feet of supply to Vadavoor tank.

Note.—The Pattukkóttai channel is expected to discharge at M.F.L. 3,740 cubic feet per second of which the branch channels 3, 4 and 5 take away 1,000 cubic feet per second and the balance 2,740 cubic feet enters into the Kattar tank, which has a capacity of 3,300 mills of cubic feet and can be filled in about 14 days. The total annual storage required in the Kattar tank for the 60,000 acres proposed to be irrigated by it at ·216 mills cubic feet per acre = 12,960 mills cubic feet. It is anticipated that the tank will be filled thrice in a year by the Pattukkóttai channel and once from the drainage of its own catchment basin.

The channel has been given a uniform section throughout with the view that the tank might be filled as quickly as possible during floods.

The following is a list of masonry works required for the Vadavár and new channel :—

No.	Position. Miles.	Position. Feet.	Right or left bank.	Names of works.	Amount.	Reference to plan. Group number.	Plan number.	Sheet number.	Book number.
					RS.				
1	..	..	..	Constructing Vadavár-Pattukkóttai channel regulator	41,300	..	..	..	..
	1	1,000	R.B.	No. 1 inlet	4,530	..	..	..	..
2	2	2,640	Do.	,, 2 ,, ...	5,960	..	..	..	..
3	3	4,900	Do.	,, 3 ,, ...	4,200	..	..	..	..
4 5	4	1,000	L.B.	,, 1 outlet or Maravanapattu surplus	17,000	..	..	..	..
6	5	4,550	..	No. 1 bridge of 3 vents of 40' span for Tanjore-Tiruvádi road ..	15,200	..	..	..	..
	5	600	..	No. 2 Do. do. ..	15,200	..	..	..	..
7 8	7	4,400	L.B.	,, 2 outlet or Puliampallam surplus	37,500	..	..	..	..
9	13	1,980	..	Tanjore - Saliamangalam road bridge	17,850	..	..	..	..
10	16	1,000	L.B.	Constructing a head sluice for Adanur channel	1,360	..	..	..	..
11	16	1,320	Do.	Constructing a head sluice to Chettichatram channel	1,500	..	..	..	..
12	19	1,320	..	Regulator across central channel head	13,800	..	..	..	..
	..	..	L.B.	Central channel regulator ..	16,400	..	..	..	..
13	..	..	..	Southern channel regulator ..	18,000	..	..	..	..
14 15 or	At head of Pattukkottái channel.			Regulator at 16¼ miles of Pattukkóttai channel	37,400	..	..	..	..
16	2	2,310	L.B.	No. 3 outlet	14,200	..	..	..	..
17	2	Do.	Do.	,, 3 distributary head sluice ..	5,400	..	..	..	..
18	3	4,290	Do.	,, 4 outlet	11,200	..	..	..	..
19	4	330	Do.	,, 4 distributary head sluice ..	5,200	..	..	..	..
20	..	..	..	Regulator at Tanjore-Mannárgudi road crossing	37,000	..	..	..	..
21	7	4,850	L.B.	No. 5 outlet	11,200	..	..	..	..
22	10	3,630	Do.	,, 6 ,, ...	17,350	..	..	..	..
23	11	4,350	Do.	,, 7 ,, ...	11,200	..	..	..	..
24	12	990	Do.	Head sluice to No. 5 distributary.	12,000	..	..	..	..
25	..	..	..	Regulator at Tanjore-Pattukkóttai road crossing	37,000	..	..	..	..
				Two Railway culverts L.S. ..	23,000				
					4,32,000				

The most important of these are (1) the regulator at the head of the Vadavár, (2) the Puliampallam surplus, and (3) Pattukkóttai channel regulator.

(1) *Vadavár Regulator.*—This is a regulator of the ordinary pattern with 11 vents of 18 feet width. It is provided with a 2½ feet dam or body wall to keep out sand and prevent an excessive amount of water being drawn off to the detriment of the other lands under the Vennár and Vettár. The vents are fitted with roller shutters 6 feet high. The main details of construction are given in the accompanying small plan.

(2) *Puliampallam surplus.*—This is a large surplus work in the left bank of the Vadavár at 7¾ mile from the head to discharge the drainage intercepted above that point and prevent damage to lands by flooding, a small drawing of it is also furnished here. It has 12 vents of 15 feet width and is calculated to discharge 10,155 cubic feet per second against a calculated maximum surplus of 9,820 cubic feet. The vents are fitted with double roller shutters which are self-balancing and capable of being rapidly opened. The discharge finds its way into the Vennár.

(3) *Pattukkótai channel regulator.*—This work is to be built at the head of the new Pattukkóttai channel and divides the discharge of Vadavár at that point between the new channel and the remaining portion of the old Vadavár in the proportion of 7 to 3. The vents are all 18 feet wide and provided with roller shutters 6 feet high. The work is in other respects of the usual design of such regulators.

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Kattar tank.—This is the new tank which it is proposed to form at the tail end of the Pattukkóttai channel to store flood water from the Vennár and to irrigate (with the assistance of its own supply from local drainage) an area of 60,000 acres.

It will be a double tank as shown in the plan made by bunding the adjacent valleys of two small rivers—the Kattar and Maharajasamudram. The two valleys will be connected as indicated by a channel cut through the narrowest part of the dividing ridge.

The character of the ground in both valleys is eminently suitable for the formation of a tank and the nature of the soil available for the banks is such that it can be safely trusted to form a high watertight bund without the use of a puddle wall.

It is proposed to store water up to the level 93·00 which will make the greatest depth against the bank (in the Kattar valley) 25 feet.

The bank across the valleys will be very carefully formed in thin layers well rammed. The earth will be obtained from pits on both sides, but in the deep bed care will be taken that the pits are never less than 90 feet from the toe of the bank.

Across the deeper portions of the valleys, the bank will have a top width of 9 feet and be 12 feet above M.W.L. Towards the flanks these measurements are both reduced to 6 feet.

The profile of the bank is formed on the front face with a varying slope of from 1 to 1 at top to 4 to 1 at bottom. The rear slope is 2 to 1. The front slope is revetted with 1 foot thickness of laterite on a backing of 6 inches of gravel.

On the eastern side, the water-spread is confined by the Tanjore-Pattukkóttai road. The bank of this will be raised to 6 feet above M.W.L. and have a top width of 15 feet.

The tank is provided with two powerful surplus sluices of the description shown in the accompanying plan (made from the smaller one). The one on the Kattar valley has 5 vents of 10 feet and the other one, the Maharajasamudram valley, 10 vents of the same size.

The vents are fitted with double balanced shutters of a total height of 15 feet. The two sluices are capable of discharging 27,700 cubic feet per second between them which is more than ample for the calculated discharge from the catchment area of 220 square miles. With a co-efficient of 600, the latter gives 22,000 cubic feet per second.

The sluices for the distribution of water from the tank are of the circular pattern used for some canal locks in France. They are very suitable for deep sluices of this kind, the pressure on the sluice gates being balanced and the friction small. A small plan of a two vent sluice of this description is here given.

The water-spread of the tank is 14 square miles. The mean depth is 10 feet. The capacity is, therefore, 3,300 millions of cubic feet.

It is anticipated that it will be filled thrice in each year by the Pattukkóttai channel and once from its own catchment. This gives a capacity of 216,000 cubic feet for each acre of the 60,000 acres to be irrigated.

The following is a table giving a list of masonry works on the tank :—

	Position. Miles.	Position. Feet.	Names of works.	Cost of masonry.	Acres.
				RS.	
1	4	3,346	Sluice No. 1	8,200	8,000
2	4	3,796	,, ,, 2	9,500	20,000
3	5	700	Surplus sluice No. 1. Discharge 9,257 cubic feet per second ..	35,700	..
4	5	1,016	Sluice No. 3	8,200	16,000
5	6	1,036	,, ,, 4	4,200	6,000
6	6	3,346	Surplus sluice No. 2. Discharge 18,515 cubic feet per second ..	62,000	..
7	7	2,406	Sluice No. 5	9,100	8,000
8	7	3,846	,, ,, 6	4,000	2,000
			Total ..	1,40,900	60,000

DISTRIBUTARIES of Pattukkóttai Channel and Kattar Tank.

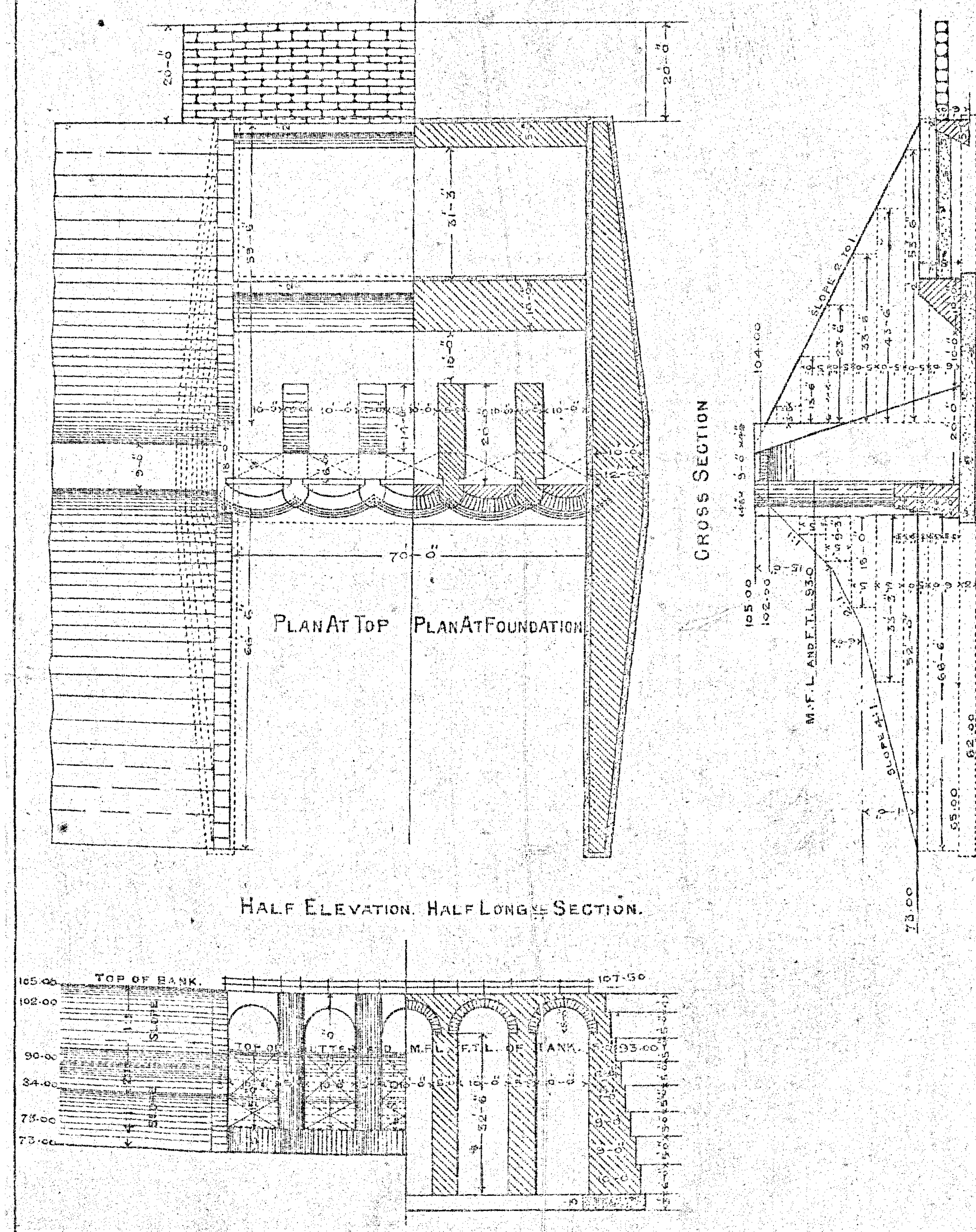
Miles. From	Miles. To	Area to be irrigated in acres.	Discharge required in cubic feet.	At acres per cubic foot.	Bed-fall in feet per mile.	Depth of water in feet.	Bottom width allowed in feet.	Will discharge cubic feet per 1 second.	Remarks.
				PATTUKKOTTAI CHANNEL.					
				No. 1 Distributary, Adamur Branch.					
0	2,970	8,310	126	66	2·00	4·0	9	124	
2,970	4/4	5,500	88	66	1·75	3·5	8	88	
4/4	7	2,950	45	66	1·50	2·5	8	44	
7	8/4 + 330	340	5	66	1·75	1·33	2	58	
				No. 1-A. Distributary, Chettichattram Branch.					
0	3/0	6,860	104	66	0·33	3·5	15	106	
3/0	5/2	4,720	72	66	1·77	2·75	11	71	
5/2	7/1	1,370	21	66	2·47	2·00	6	23	
7/1	7/7 + 450	290	5	66	2·00	1·13	3	5	
				No. 2 Distributary, Central channel.					
0	3630	50,000	758	66	1·50	5	50	772	At 0/5 + 330 Keelapati channel branches.
3630	2	45,599	691	66	1·50	5	45	696	At 2/0, Muvanallur channel branches.
2	4/1	38,787	588	66	1·26	4·75	42	594	
4/1	6	30,072	456	66	1·50	4·50	35	454	At 4/0 + 330, Mannárgudi channel branches.
6	7/7 + 330	30,072	456	66	0·74	4·25	45	453	
7/7 + 330	9/4 + 330	24,410	370	66	1·00	4·00	45	373	At 7/7 + 330, Edayanatham channel branches.
9/4 + 330	11/2	21,865	331	66	1·00	4·00	40	338	
11/2	15/4	11,777	178	66	1·25	3·50	21	176	At 10/7, Palaiyur channel branches.
15/4	16/6	6,636	101	66	1·06	2·75	19	102	
16/6	18	2,772	42	66	2·27	2·00	10	43	
18	21/4 + 570	714	11	66	2·70	1·00	10	11	
				Kilapattu branch.					
0	1	4,150	63	66	..	4·5	5	73	
1	2/3	3,640	55	66	2·00	3·0	9	70	
2/3	3/7 + 330	2,100	32	66	1·33	2·5	7	39	
3/7 + 330	4/3	880	14	66	2·67	1·75	5	18	
4/3	6	220	4	66	0·33	1·0	5	6	
				Muvanallur branch.					
0	3	5,712	87	66	1·83	3·75	7	89	
3	4/3	3,746	57	66	1·64	3·25	6	59	
4/3	8/3	1,819	28	66	1·5	2·0	8	30	
8/3	8/7	25	1	..	..	1·0	4	1	
				Mannárgudi branch.					
0	2/3 + 330	7,963	121	66	1·59	4·00	10	135	
2/3 + 330	5/1	5,053	77	66	1·62	3·00	12	90	
5/1	6	2,808	43	66	0·86	2·00	15	52	
6	7/2	808	12	66	1·25	1·13	12	14	
				Edayanatham branch.					
0	1	4,586	69	66	0·5	3·75	10	84	
1	2/4	3,555	54	66	1·0	3·50	9	67	
2/4	3/6 + 330	2,766	42	66	0·24	3·0	9	50	
3/6 + 330	5/5	1,880	29	66	0·73	2·25	11	34	
5/5	7/1 + 400	820	13	66	1·2	1·5	7	14	

VADAVAR PATTUKKOTTA PROJECT

KATTAR TANK

No. 1 SURPLUS SLUICE

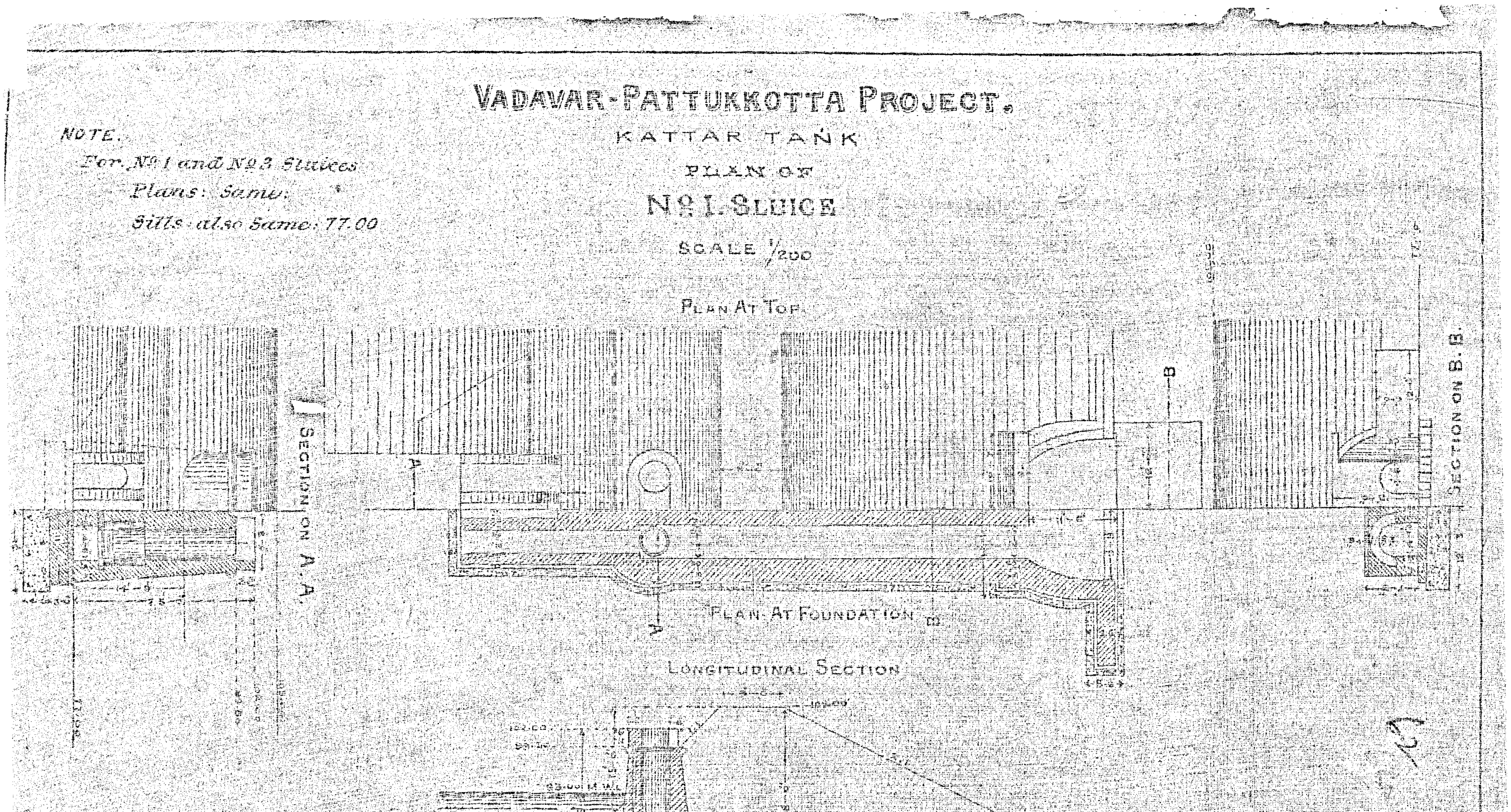
SCALE $\frac{1}{300}$



63 65 (l.c)

Distributaries of Pattukkóttai channel and Kattar Tank—*cont.*

Miles. From	Miles. To	Area to be irrigated in acres.	Discharge required in cubic feet.	At acres per cubic feet.	Bed-fall in feet per mile.	Depth of water in feet.	Bottom width allowed in feet.	Will discharge cubic feet per 1 second.	Remarks.
		PATTUKKOTTAI CHANNEL—*cont.*							
		No. 2 Distributary—cont.							
		Palaiyur Branch.							
0	2/6	9,441	143	66	2·0	4	13	169	
2/6	6/0 + 330	7,091	106	66	1·67	3·5	12	122	
6/0 + 330	7/6	4,221	64	66	1·71	2·75	11	71	
7/6	8/3	1,401	21	66	·4	2·0	8	25	
8/3	9/6	141	2	66	1·14	1·13	4	5	
		No. 3 Distributary, Southern Channel.							
		11,000	167	66	1·00	4·0			
0	0/6	8,925	135	66	1·00	4·0	19	168	
0/6	2/2	7,795	118	66	0·83	3·8	16	136	
2/2	4/5	5,715	87	66	0·56	3·3	16	122	
4/5	6	3,756	57	66	0·56	2·75	14	88	
6	7/1	1,956	26	66	0·64	2·25	12	54	
7/1	8/4	930	14	66	1·33	1·75	9	25	
8/4	10						5	14	
		No. 4 Distributary.							
0	3/0 + 330	8,500	129	66	1·5	3·5	18	151	
3/0 + 330	7	5,500	83	66	1·5	3·25	14	105	
7	9/4 + 330	2,500	38	66	1·5	3	9	61	
9/4 + 330	10/2	1,000	15	66	1·5	2·5 to 3	6	28	
		No. 5 Distributary, Main Channel.							
		46,500	705	66	1·5	4·5			
0	2/0 + 330						60	761	At 1/0 + 330 A Branch takes off.
		35,500	584	66	1·5	4·5			
2/0 + 330	4	33,000	500	66	1·5	4·5	48	500	
4	6						40	494	At 2/0 + 330 B. Branch takes off.
		28,000	425	66	1·5	4·25			
6	9/4	24,000	364	66	1·5	4·0	40	445	
9/4	12/5						35	350	At 8/3 C. Branch takes off.
		20,000	303	66	1·5	4·0			
12/5	17/0+330	3,000	46	66	1·5	3·0	30	300	
17/0 + 330	18	2,000	30	66	1·5	3·0	9	61	At 17/0 + 330 D Branch takes off.
18	20/7						6	44	
		A Branch.							
		4,000	61	66	1·5	3·5			
1/0 + 330	3	3,000	46	66	1·5	3·0	12	105	
3	4¾	2,000	30	66	1·5	3·0	9	61	
4/6	6/6 + 330						6	44	
		B Branch.							
		4,000	61	66	1·5	3·5			
2/0 + 330	3	3,000	45	66	1·5	3·25	9	83	
3	4	2,000	30	66	1·5	3	8	52	
4	5/2						6	44	
		C Branch.							
8/3	8/4 + 330	500	8	66	1·5	3			
8/4 + 330	8/6 + 330						3	22	
8/6 + 330	9/6								
		D Branch.							
		13,000	198	66	1·5	3·25			
17/0+330	19						30	209	At 18/5 A Branch takes off.
		10,000	152	66	1·5	3			
19	21/4	1,000	15	66	1·5	3	25	157	At 21/3 B Branch takes off.
21/4	22/0+990						6	44	
		D(*a*) Branch.							
		1,000	15	66	1·5	3			
18/5	20/2+330						6	44	
		D(*b*). Branch.							
		4,500	68	66	1·5	3			
21/3	22/1+330	2,000	30	66	1·5	3	12	73	
22/1+330	22/5+330						6	44	
		KATTAR TANK.							
		No. 1 Distributary.							
0	1/6	8,000	121	66	1	4·5	12	118	
1/6	2/6	6,600	100	66	1	4	12	100	Side slopes 1 to 1 throughout.
2/6	5	4,750	72	66	1	4	10	84	
5	5/5	2,750	41	66	1	3·5	9	59	
5/5	6/2	1,000	15	66	1	3	5	26	


VADAVAR-PATTUKKOTTA PROJECT.
KATTAR TANK
PLAN OF
No. I. SLUICE
SCALE 1/200
NOTE.
For No. 1 and No. 3 Sluices
Plans: Same:
Sills also Same: 77.00
PLAN AT TOP.
SECTION ON A.A.
SECTION ON B.B.
PLAN AT FOUNDATION
LONGITUDINAL SECTION

l.c.

Distributaries of Pattukkóttai channel and Kattar Tank.—*cont.*

Miles. From	Miles. To	Area to be irrigated in acres.	Discharge required in cubic feet.	At acres per cubic feet.	Bed-fall in feet per mile.	Depth of water in feet.	Bottom width allowed in feet.	Will discharge cubic feet per 1 second.	Remarks.
			KATTAR TANK—*cont.*						
			No. 2 Distributary.						
0	6/1 + 330	20,000	303	66	1	5	25	302	At 7 mile 1,772 feet A Branch takes off.
6/1 + 330	7/2 + 440	18,100	274	66	1	4·5	27	279	
7/2 + 440	8/2	14,800	224	66	1	4·5	22	226	
8/2	9/6	13,900	211	66	1	4·5	20	213	
9/6	11/4	12,000	182	66	1	4	22	179	
11/4	13/2	9,800	148	66	1·5	4	15	152	
13/2	14/2	7,800	118	66	1·5	3·5	15	119	At 14/2 B Branch takes off.
14/2	17	5,800	88	66	1·5	3·5	12	97	
17	17/4	3,750	57	66	1·5	3	12	73	
17/4	18	2,500	38	66	1·5	3	10	67	
18	19	1,450	22	66	1·5	3	6	44	
			A Branch.						
0	0/4	2,300	35	66	1	3·5	7	48	
0/4	1/6	1,950	30	66	1	3·5	6	42	
1/6	2/1	800	12	66	1	3	4	22	
2/1	3	800	12	66	1·5	3	3	22	
			B Branch.						
0	0/4	1,400	21	66	1	3·5	5	36	
0/4	1/4	950	14	66	1	3	4	22	
1/4	2/4	500	8	66	1·5	2·5	3	15	
			No. 3 Distributary.						
0	4/7	16,000	242	66	1	5	20	245	At 7/5 + 330 A Branch takes off. At 12/3 B Branch takes off.
4/7	7/6	13,650	207	66	1	4·5	20	218	
7/6	8/4	7,400	112	66	1	4	15	120	
8/4	9/5	6,000	90	66	1·5	4	12	121	
9/5	13/0 + 330	5,450	82	66	1·5	3·5	12	97	
13/0 × 330	14	1,300	20	66	1·5	3	6	44	
14	15	400	6	66	1·5	2·5	3	15	
			A Branch.						
0	0/3 + 330	5,000	76	66	1	3·5	14	89	
0/3 + 330	2/1 + 330	4,700	73	66	1·5	3·5	10	81	
2/1 + 330	4/1 + 330	1,950	30	66	1·5	3	7	43	
4/1 + 330	5/0 + 330	800	12	66	1·5	3	3	22	
5/0 + 330	5/4	500	8	66	1·5	2·5	3	15	
			B Branch.						
0	1/6	2,350	36	66	1·5	3	8	49	
1/6	2/2	400	6	66	1·5	2·5	3	15	
			No. 4 Distributary.						
0	2	6,000	91	66	1	4	12	100	
2	3	4,650	70	66	1	4	10	84	
3	5/6	4,250	64	66	1	3·5	11	71	
5/6	7	3,290	48	66	1	3·5	9	59	
7	7/6	2,780	41	66	1·5	3·5	8	56	
7/6	8/3	1,800	27	66	1·5	3	7	43	
8/3	9	900	14	66	1·5	2·5	6	22	
			No. 5 Distributary.						
0	1/2 + 330	8,000	121	66	1	4·5	12	118	
1/2 + 330	5	2,950	45	66	1	4	7	62	At 1/2 + 330 A Branch takes off.
5	6/6	1,300	20	66	1	3·5	5	36	
6/6	8/0 + 330	500	8	66	1	2·5	4	15	
			A Branch.						
0	2/3 + 330	3,450	52	66	1	4	8	69	
2/3 + 330	3/3 + 330	1,550	23	66	1	3.5	6	36	
3/3 + 330	5	850	13	66	1	3	6	26	
5	5/2	450	7	66	1	2·5	4	15	
			No. 6 Distributary.						
0	1/2	2,000	30	66	1	3	9	45	
1/2	2/4	1,360	20	66	1	3	7	35	
2/4	5/5	1,000	15	66	1	2·5	7	25	
5/5	6/1	400	6	66	1	2	5	11	

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DETAILS of masonry works on the Distributary channels of Pattukkóttai channel and Kattar tank.

Position. Miles.	Position. Feet.	Description.	Area taken at present for irrigation.	Required discharged.	Cost of masonry.	Remarks.
		PATTUKKOTTAI CHANNEL.	ACS.		RS.	
		No. 1 Distributary, Adanur Channel.				
0/4	330	No. 1 sluice, R.B.	2,420	37	960	One vent of 5′ 0″ × 3′ 0″.
..	..	,, 2 ,, L.B.	90	2	580	Do. of 1′ 0″ × 0′ 7″.
0/5	..	Railway culvert	..	..	2,250	Do. of 6′ span.
0/6	..	No. 3 sluice, R.B.	180	2·72	580	Do. of 1′ 3″ × 1′ 0″.
..	..	,, 4 ,, L.B.	190	3	580	Do. of 1′ 3″ × 1′ 0″.
1/7	..	,, 5 ,, R.B.	160	2	580	Do. of 1′ 0″ × 1′ 0″.
..	..	,, 6 ,, L.B.	150	2	580	Do. of 1′ 0″ × 1′ 0″.
2/3	..	,, 7 ,, R.B.	290	4	580	Do. of 1′ 6″ × 1′ 3″.
..	..	,, 8 ,, L.B.	260	4	580	Do. of 1′ 6″ × 1′ 0″.
3/7	550	Road bridge	..	..	1,280	Do. of 12′ span.
4	..	No. 9 sluice, R.B.	120	2	620	Do. of 1′ 0″ × 0′ 9″.
..	..	,, 10 ,, L.B.	400	6	620	Do. of 2′ 0″ × 1′ 3″.
4/2	330	,, 11 ,, R.B.	770	12	620	Do. of 2′ 6″ × 2′ 0″.
..	..	,, 12 ,, L.B.	320	5	620	Do. of 1′ 6″ × 1′ 4½″.
4/4	..	,, 1 drop of 4′	..	..	930	....
5/1	345	Syphon culvert	..	..	1,550	....
5/2	330	No. 13 sluice, R.B.	230	4	610	One vent of 1′ 3″ × 1′ 1½″.
..	..	,, 14 ,, L.B.	250	4	610	Do. of 1′ 6″ × 1′ 0″.
6	..	,, 15 ,, R.B.	360	5	480	Do. of 1′ 0″ × 0′ 9″.
..	..	,, 16 ,, L.B.	360	5	480	Do. of 1′ 1″ × 1′ 0″.
..	..	,, drop of 4′	..	..	780	....
6/6	..	No. 17 sluice, R.B.	930	14	480	One vent of 3′ 0″ × 2′ 2″.
..	..	,, 18 ,, L.B.	480	7	450	Do. of 2′ 0″ × 1′ 6″.
7	..	,, 3 drop of 4′	..	..	730	....
		Direct irrigation at tail end	340	5	..	....
		Total ..	8,310	125·72	18,210	
		No. 1-A Distributary, Chattichattram Channel.				
0/3	..	No. 1 sluice, L.B.	260	4	580	One vent of 1′ 6″ × 1′ 1″.
0/5	200	,, 1 road bridge	..	..	2,660	Do. of 22′ span.
0/7	..	,, 2 sluice, R.B.	450	7	580	Do. of 2′ 0″ × 1′ 4½″.
2/1	..	,, 3 ,, R.B.	500	8	620	Do. of 2′ 0″ × 1′ 6″.
..	..	,, 4 ,, L.B.	200	3	620	Do. of 1′ 3″ × 1′ 0″.
2/2	330	,, 2 road bridge	..	..	2,660	Do. of 22′ span.
2/5	..	,, 5 sluice, R.B.	600	9	630	Do. of 2′ 0″ × 1′ 10″.
..	..	,, 6 ,, L.B.	100	1·5	620	Do. of 1′ 0″ × 0′ 7″.
3/0	..	,, 1 drop of 5′	..	..	1,060	....
3/1	..	,, 7 sluice, R.B.	290	4	610	One vent of 1′ 9″ × 1′ 0″.
..	..	,, 8 ,, L.B.	130	2	610	Do. of 1′ 1″ × 0′ 9″.
3/5	..	,, 9 ,, R.B.	390	6	610	Do. of 1′ 3″ × 1′ 0″.
..	..	,, 10 ,, L.B.	140	2	610	Do. of 1′ 0″ × 0′ 6″.
4/1	..	,, 11 ,, R.B.	220	3	610	Do. of 1′ 1″ × 0′ 9″.
..	..	,, 12 ,, L.B.	200	3	610	Do. of 1′ 1″ × 0′ 9″.
4/2	..	,, 2 drop of 5′	..	..	1,010	....
4/7	..	,, 13 sluice, R.B.	220	3	610	One vent of 1′ 3″ × 1′ 1½″.
..	..	,, 14 ,, L.B.	230	4	610	Do. of 1′ 3″ × 1′ 1½″.
5/2	..	,, 15 ,, R.B.	290	4	610	Do. of 1′ 3″ × 1′ 0″.
..	..	,, 16 ,, L.B.	1,240	19	610	Do. of 3′ 0″ × 1′ 10″.
..	..	,, 3 drop of 6′	..	..	950	....
5/5	..	,, 4 ,, of 6′	..	..	860	....
6/3	..	,, 17 sluice, R.B.	80	1	520	One vent of 1′ 0″ × 0′ 6″.
..	..	,, 18 ,, L.B.	370	6	520	Do. of 2′ 0″ × 1′ 1½″.
7/1	..	,, 19 ,, R.B.	300	5	520	Do. of 1′ 6″ × 1′ 3″.
..	..	,, 20 ,, L.B.	330	5	520	Do. of 1′ 6″ × 1′ 4½″.
		Direct irrigation at tail end	290	4·5	..	
		Total ..	6,850	104	21,060	
		No. 2 Distributary, Central Channel.				
0/5	330	No. 1 sluice, R.B.	251	4	890	One vent of 1′ 0″ × 0′ 9″.
..	..	,, 2 head sluice, L.B.	4,150	63	1,690	(Keelapatti branch). Two vents of 4′ 0″ × 2′ 9″.
1/5	330	,, 3 sluice, R.B.	1,025	16	890	One vent of 3′ 0″ × 2′ 1½″.
..	..	,, 4 ,, L.B.	75	1	890	Do. of 1′ 0″ × 0′ 6″.
2	..	,, 5 head sluice, L.B.	5,712	87	1,690	(Muvallur branch). Two vents of 6′ 0″ × 2′ 6″.
..	..	,, 1 drop of 6′	..	..	4,050	....
3/1	..	,, 6 sluice, R.B.	130	2	890	One vent of 1′ 0″ × 0′ 9″.
..	..	,, 7 ,, L.B.	143	2	890	Do. of 1′ 0″ × 0′ 9″.
3/1	330	Under tunnel	..	..	2,800	....
3/3	..	No. 1 road bridge	..	..	4,460	....
4/1	..	,, 8 sluice, R.B.	479	7	890	One vent of 1′ 6″ × 1′ 0″.
..	..	,, 9 head sluice, L.B.	7,963	121	1,690	(Mannargudi branch). Two vents of 6′ 0″ × 3′ 6″.
6/7	..	,, 10 sluice, R.B.	420	6	715	One vent of 2′ 0″ × 1′ 3″.

Details of masonry works on the Distributary channels of Pattukkóttai Channel and Katta tank—*cont.*

Position. Miles.	Position. Feet.	Description.	Area taken at present for irrigation.	Required discharge.	Cost of masonry.	Remarks.
		PATTUKKOTTAI CHANNEL—*cont.*	ACS.		RS.	
		No. 2. Distributary, Central Channel —cont.				
..	..	No. 11 sluice, L.B.	395	6	715	One vent of 2′ 0″ × 1′ 3″.
7/7	330	,, 12 ,, R.B.	311	5	715	Do. of 2′ 0″ × 1′ 0″.
..	..	,, 13 head sluice, L.B.	4,536	69	1,570	(Edayanatha mbranch). Two vents of 6′ 0″ × 2′ 6″.
8/5	330	,, 14 sluice, R.B.	437	7	580	One vent of 2′ 0″ × 1′ 4½″.
..	..	,, 15 ,, L.B.	386	6	580	Do. of 2′ 0″ × 1′ 3″.
9/4	330	,, 16 ,, R.B.	1,218	18	580	Do. of 3′ 0″ × 2′ 6″.
..	..	,, 17 ,, L.B.	504	8	580	Do. of 2′ 0″ × 1′ 7½″.
10/7	..	,, 18 ,, R.B.	647	10	715	Do. of 2′ 6″ × 1′ 7½″.
..	..	,, 19 head sluice, L.B.	9,441	143	2,300	(Palayur branch). Three vents of 6′ 0″ × 4′ 0″.
11/2	..	,, 2 drop (of 8′)	..	..	2,100	....
12/0	330	,, 20 sluice, R.B.	437	7	580	One vent of 2′ 0″ × 1′ 4½″.
..	..	,, 21 ,, L.B.	739	11	580	Do. of 3′ 0″ × 1′ 6″.
12/3	..	,, 2 road bridge	..	..	2,900	Two vents of 15′ span.
13/3	..	,, 22 sluice, R.B.	706	11	580	One vent of 3′ 0″ × 1′ 6″.
..	..	,, 23 ,, L.B.	1,512	23	960	Do. of 4′ 0″ × 2′ 6″.
15/1	..	,, 24 ,, R.B.	529	8	620	Do. of 2′ 0″ × 1′ 7½″.
..	..	,, 25 ,, L.B.	1,213	18	620	Do. of 3′ 0″ × 2′ 6″.
15/4	..	,, 3 drop (of 9′)	..	..	1,900	....
16/1	330	,, 26 sluice, R.B.	1,428	22	750	One vent of 4′ 0″ × 2′ 6″.
..	..	,, 27 ,, L.B.	2,436	37	750	Do. of 5′ 0″ × 3′ 0″.
16/5	..	,, 4 drop (of 6′)	..	..	1,190	....
16/7	..	,, 3 road bridge	..	..	1,460	One vent of 15′ span.
17/3	..	,, 5 drop (of 6′)	..	..	1,030	....
18	..	,, 28 sluice, R.B.	798	12	520	One vent of 2′ 6″ × 2′ 0″
..	..	,, 29 ,, L.B.	1,260	19	520	Do. of 4′ 0″ × 2′ 0″
19/1	..	,, 6 drop (of 4′)	..	..	550	....
20/4	..	,, 7 ,, (of 3′)	..	..	540	....
..	..	Direct irrigation at tail end	714	11	..	....
		Total ..	50,000	760	49,000	
		Kilapatti Branch at sluice No. 2				
0/4	..	No. 1 sluice, R.B.	180	3	610	One vent of 1′ 3″ × 1′ 6″
..	..	,, 2 ,, L.B.	330	5	610	Do. of 2′ 0″ × 1′ 1½
1	..	,, 1 drop (of 4′)	..	..	1,190	....
[illegible]	[illegible]	,, 3 sluice, R.B.	200	3	610	One vent of 1′ 3″ × 1′ 3″
..	..	,, 4 ,, L.B.	200	3	610	Do. of 1′ 6″ × 1′ 0″
1/6	..	,, 5 ,, R.B.	200	3	610	Do. of 1′ 3″ × 1′ 0″
..	..	,, 6 ,, L.B.	260	4	610	Do. of 1′ 0″ × 1′ 0″
..	..	,, 2 drop (of 4′)	..	..	1,010	....
2/2	330	,, 1 road bridge	..	..	1,460	One vent of 15′ span.
2/3	..	,, 7 sluice, R.B.	400	6	610	Do. of 1′ 1½″ × 1′ 0
..	..	,, 8 ,, L.B.	280	4	610	Do. of 1′ 6″ × 1′ 0″
2/7	330	,, 9 ,, R.B.	460	7	610	Do. of 2′ 6″ × 1′ 3½
..	..	,, 10 ,, L.B.	300	5	610	Do. of 1′ 6″ × 1′ 4½
3	..	,, 3 drop (of 4′)	..	..	870	....
3/6	330	,, 11 sluice, R.B.	260	4	480	One vent of 1′ 6″ × 1′ 4½
..	..	,, 12 ,, L.B.	200	3	480	Do. of 1′ 3″ × 1′ 0″.
3/7	..	,, 4 drop (of 4′)	..	..	870	....
4/3	330	,, 13 sluice, R.B.	330	5	520	One vent of 2′ 0″ × 1′ 3″
..	..	,, 14 ,, L.B.	330	5	520	Do. of 2′ 0″ × 1′ 1½
5/3	..	,, 5 drop (of 5′)	..	..	750	....
		Direct irrigation at tail end	220	3	..	....
		Total ..	4,150	63	14,250	
		Muvanallur Branch at sluice No. 5.				
0/2	310	No. 1 road bridge	..	..	2,170	One vent of 15′ span.
0/4	..	,, 1 sluice, R.B.	160	2	660	Do. of 1′ 0″ × 0′ 9″.
..	..	,, 2 ,, L.B.	299	5	580	Do. of 1′ 6″ × 1′ 1″.
1	..	,, 1 drop of (of 8′)	..	..	1,500	....
1/4	..	,, 3 sluice, R.B.	108	2	580	One vent of 1′ 0″ × 0′ 9″.
..	..	,, 4 ,, L.B.	266	4	580	Do. of 1′ 6″ × 1′ 0″.
2/0	..	,, 2 drop (of 6′)	..	..	1,330	....
3/3	..	,, 5 sluice, R.B.	257	4	580	One vent of 1′ 6″ × 1′ 1″.
..	..	,, 6 ,, L.B.	249	[illegible]	580	Do. of 1′ 5″ × 1′ 1″.
2	..	,, 7 ,, R.B.	413	6	580	Do. of 2′ 6″ × 1′ 3″.
..	..	,, 8 ,, L.B.	224	3	580	Do. of 1′ 3″ × 1′ 0″.
4	..	,, 9 ,, R.B.	960	15	620	Do. of 3′ 0″ × 2′ 6″.
..	..	,, 10 ,, L.B.	967	15	620	Do. of 3′ 0″ × 2′ 6″.
4/3	..	,, 3 drop (of 3′)	..	..	520	....

Details of Masonry works on the Distributary channels of Pattukkóttai channel and Kattar tank—*cont.*

Position. Miles.	Position. Feet.	Description.	Area taken at present for irrigation.	Required discharge.	Cost of masonry.	Remarks.
		PATTUKKOTTAI CHANNEL—*cont.*				
		No. 2 Distributary—cont.				
5/6	..	Palaiyur Branch at sluice No. 19—*cont.*				
..	..					
7/2	..	No. 11 sluice, R.B.	455	7	480	One vent of 2′ 0″ × 1′ 4½″
..	..	,, 12 ,, L.B.	620	9	480	Do. of 2′ 6″ × 1′ 6″
8	..	,, 13 ,, R.B.	215	3	520	Do. of 1′ 3″ × 1′ 0″
	..	,, 14 ,, L.B.	504	8	520	Do. of 2′ 0″ × 1′ 4½″
		,, 4 drop (of 13′)	..	..	2,460	Do.
		Direct irrigation at tail end	25	1	..	....
		Total ..	5,712	88	16,210	
0/1	..	Mannargudi Branch at sluice No. 9.				
..		No. 1 sluice, R.B.	720	11	715	One vent of 2′ 6″ × 1′ 6″
1/5	..	,, 2 ,, L.B.	400	6	715	Do. of 2′ 6″ × 1′ 3″
..						
2/3	330	,, 3 ,, R.B.	530	8	580	Do. of 2′ 0″ × 1′ 10″
..	..	,, 4 ,, L.B.	530	8	580	Do. of 2′ 0″ × 1′ 9″
3/3	..	,, 5 ,, R.B.	330	5	580	Do. of 2′ 0″ × 1′ 1½″
..	..	,, 6 ,, L.B.	400	6	580	Do. of 2′ 0″ × 1′ 6″
4/2	330	,, 7 ,, R.B.	600	9	620	Do. of 2′ 6″ × 1′ 3″
4/4	330	,, 8 ,, L.B.	590	9	620	Do. of 3′ 0″ × 1′ 3″
..	..	,, 1 road bridge	..	..	2,070	Do. 18′ spans.
5/1	..	,, 9 sluice, R.B.	330	5	610	Do. of 2′ 0″ × 1′ 1½″
..	..	,, 10 ,, L.B.	330	5	610	Do. of 2′ 0″ × 1′ 3″
6	..	,, 11 ,, R.B.	400	6	610	Do. of 2′ 0″ × 1′ 4″
	..	,, 12 ,, L.B.	270	4	610	Do. of 1′ 6″ × 1′ 4½″
	..	,, 13 ,, R.B.	1,730	26	1,120	Three vents of 4′ 0″ × 1′ 6″
		Direct irrigation at tail end	803	13	..	....
		Total ..	7,963	121	10,620	
		Edayanathan Branch at sluice No. 13.				
0/1	..					
..	..	No. 1 sluice, R.B.	80	1	580	One vent of 1′ 0″ × 0′ 9″
1	..	,, 2 ,, L.B.	460	7	580	Do. of 2′ 0″ × 1′ 6″
..	..	,, 3 ,, R.B.	180	3	580	Do. of 1′ 3″ × 1′ 0″
..	..	,, 4 ,, L.B.	261	4	586	Do. of 1′ 6″ × 1′ 0″
1/4	..	,, 1 drop (of 4′)	..	..	1,070	....
2/3	..	,, 2 ,, (of 5½′)	..	..	1,400	....
..	..	,, 5 sluice, R.B.	460	7	580	One vent of 2′ 0″ × 1′ 7½″
2/4	..	,, 6 ,, L.B.	330	5	580	Do. of 2′ 0″ × 1′ 4½″
3/2	330	,, 3 drop (of 4′)	..	..	1,020	....
..	..	,, 7 sluice, R.B.	180	3	610	One vent of 1′ 3″ × 1′ 0″
3/6	330	,, 8 ,, L.B.	135	2	610	Do. of 1′ 0″ × 0′ 9″
..	..	,, 9 ,, R.B.	280	4	610	Do. of 2′ 0″ × 1′ 0″
4/1	630	,, 10 ,, L.B.	290	4	610	Do.
5	..	,, 1 Road bridge	..	..	1,460	One vent of 15′ span.
..	..	,, 11 sluice, R.B.	660	10	480	Do. of 2′ 6″ × 2′ 0″
5/1	..	,, 12 ,, L.B.	400	6	480	Do. of 2′ 0″ × 1′ 7½″
5/5	..	,, 2 Road bridge	..	..	1,460	Do. of 15′ span.
6/2	465	,, 4 drop (of 6′)	..	..	910	....
6/3	6330	,, 3 Road bridge	..	..	980	One vent of 10′ span.
6/7	..	,, 5 drop (of 4′)	..	..	680	....
		,, 6 ,, (of 3′)	..	..	480	....
		Direct irrigation at tail end	820	13	..	....
		Total ..	4,536	69	16,340	
		Palaiyur Branch at sluice No. 19.				
0/2	..	No. 1 sluice, R.B.	200	3	580	One vent of 1′ 6″ × 1′ 0″
..	..	,, 2 ,, L.B.	520	8	580	Do.
0/4	330	,, 1 drop (of 8′)	..	..	1,960	....
1	..	,, 1 Road culvert	..	..	2,350	One vent of 20′ × 4′
1/2	..	,, 3 sluice R.B.	280	4	580	One vent of 1′ 6″ × 1′ 0″
..	..	,, 4 ,, L.B.	200	3	580	Do. of 1′ 1″ × 1′ 0″
1/6	..	,, 2 drop (of 8′)	..	..	2,460	....
2/2	..	,, 2 Road culvert	..	..	2,350	One vent of 20′ × 4″
2/6	..	,, 5 sluice R.B.	720	11	580	Do. of 2′ 6″ × 2′ 1″
..	..	,, 6 ,, L.B.	520	8	580	Do. of 2′ 0″ × 1′ 10″
3/4	..	,, 3 drop (of 4′)	..	..	1,400	....
4	..	,, 7 sluice R.B.	800	12	580	One vent of 3′ 0″ × 2′ 0″
..	..	,, 8 ,, L.B.	600	9	580	Do. of 2′ 3″ × 2′ 0″
4	..	,, 4 drop (of 8′)	..	..	1,550	....
4/6	330	,, 3 Road culvert	..	..	2,070	One vent of 18′ span.
5/3	..	Wooden aqueduct	..	..	200	....

Details of Masonry works on the Distributary channels of Pattukkóttai channel and Kattar tank—*cont.*

Position. Mile.	Position. Feet.	Description.	Area taken at present for irrigation.	Required discharge.	Cost of masonry.	Remarks.
		PATTUKKOTTAI CHANNEL—*cont.*				
		No. 2. Distributary—cont.				
		Palaiyur Branch at sluice No. 19—*cont.*				
5/3	330	No. 9 sluice, L.B.	600	9	620	One vent of 2' 3" × 2' 0"
6/0	330	,, 10 ,, L.B.	780	12	620	Do. of 3' 0" × 2' 0"
6/7	330	,, 11 ,, R.B.	400	6	610	Do. of 2' 0" × 1' 4½"
..	..	,, 12 ,, L.B.	500	14	750	Do. of 4' 0" × 1' 7½"
7/5	..	,, 13 ,, R.B.	800	12	610	Do. of 3' 0" × 2' 0"
..	..	,, 14 ,, L.B.	720	11	610	Do. of 2' 6" × 2' 1"
..	..	,, 5 drop (of 2')	..	..	700	....
8/3	..	,, 15 sluice, R.B.	1,260	19	560	One vent of 4' 0" × 1' 6"
..	..	Direct irrigation at tail end	141	2	..	....
		Total ..	9,441	143	24,060	
		No. 3 Distributary, Southern Channel.				
0/6	..	No. 1 sluice, R.B.	890	14	580	One vent of 3' 0" × 2' 0".
..	..	,, 2 ,, L.B.	1,185	18	960	Do. of 4' 0" × 1' 10".
1/4	..	Under-tunnel	..	..	4,100	....
2/2	..	No. 3 sluice, R.B.	110	2	580	One vent of 1' 1" × 0' 9".
..	..	,, 4 ,, L.B.	1,020	16	960	Do. of 4' 0" × 1' 7½".
4/5	..	,, 5 ,, R.B.	890	14	680	Do. of 3' 0" × 2' 0".
..	..	,, 6 ,, L.B.	1,190	18	960	Do. of 4' 0" × 1' 10".
6	..	,, 7 ,, R.B.	800	12	670	Do. of 3' 0" × 1' 7½".
..	..	,, 8 ,, L.B.	1,160	18	750	Do. of 4' 0" × 1' 10".
6/1	..	,, 1 drop (of 4')	..	..	1,160	....
7/1	..	,, 9 sluice, R.B.	640	10	610	One vent of 3' 0" × 1' 6".
..	..	,, 10 ,, L.B.	1,160	18	750	Do. of 4' 0" × 1' 10".
8/2	..	,, 11 ,, R.B.	325	5	430	Do. of 1' 3" × 1' 1½".
..	..	,, 12 ,, L.B.	700	11	480	Do. of 2' 6" × 1' 3".
8/4	..	,, 2 drop (of 6')	..	..	700	....
8/5	330	,, 1 road bridge	..	..	980	One vent of 10' span.
8/7	..	,, 3 drop (of 6')	..	..	800	....
9/2	..	,, 4 ,, (of 6')	..	..	720	....
..	..	Direct irrigation at tail end	930	14	..	....
		Total ..	11,000	170	16,760	
		No. 4 Distributary.				
..	330	No. 1 sluice, L.B.	500	8	400	2' diameter pipe sluice.
1/4	330	,, 2 ,, L.B.	500	8	400	Do.
1/6	330	,, 3 ,, L.B.	500	8	400	Do.
2/6	330	,, 4 ,, L.B.	500	8	400	Do.
3/0	330	,, 5 ,, R.B.	1,000	15	480	One vent of 2' 6" × 2' 0".
3/2	330	,, 6 ,, L.B.	500	8	400	2' diameter pipe sluice.
3/6	330	,, 7 ,, R.B.	500	8	400	Do.
4/6	330	,, 8 ,, L.B.	500	8	400	Do.
5/0	330	,, 9 ,, R.B.	500	8	400	Do.
6/0	330	,, 10 ,, L.B.	500	8	400	Do.
6/4	330	,, 11 ,, R.B.	500	8	400	Do.
6/7	330	,, 1 drop (of 3')	..	..	1,130	....
7/0	330	,, 12 sluice, R.B.	500	8	400	2' diameter pipe sluice.
7/2	330	,, 13 ,, R.B.	500	8	400	Do.
7/4	330	,, 14 ,, L.B.	500	8	400	Do.
9/4	330	,, 2 drop (of 5')	..	..	1,080	....
..	..	Direct irrigation at tail end	1,000	15	..	....
		Total ..	8,500	134	7,890	
		No. 5 Distributary, Main Channel.				
1	330	No. 1 head sluice, R.B.	4,000	60	700	(A branch) one vent of 6' 0" × 3' 0".
2	..	,, 2 ,, L.B.	4,000	60	700	(B branch) one vent of 6' 0" × 3' 0".
3	..	No. 3 sluice, L.B.	2,500	38	670	One vent of 5' 0" × 3' 0".
..	..	,, 4 ,, R.B.	600	9	400	2' diameter pipe sluice.
3/4	..	,, 5 ,, L.B.	600	9	400	Do.
3/6	..	,, 6 ,, R.B.	600	9	400	Do.
4	..	,, 7 ,, R.B.	1,200	18	560	One vent of 3' 6" × 2' 6".
4/4	..	,, 8 ,, L.B.	600	9	400	2' diameter pipe sluice.
4/5	..	,, 9 ,, R.B.	600	9	400	Do.
..	..	,, 1 drop (of 2')	..	..	2,070	....
4/7	..	,, 10 sluice, L.B.	600	9	400	2' diameter pipe sluice.
5	..	,, 11 ,, R.B.	600	9	400	Do.
5/2	..	,, 12 ,, L.B.	600	9	400	Do.
5/4	..	,, 13 ,, R.B.	600	9	400	Do.
5/6	..	,, 14 ,, L.B.	600	9	400	Do.
5/7	..	,, 15 ,, R.B.	400	6	400	Do.
6	..	,, 16 ,, L.B.	400	6	400	Do.

Details of Masonry works on the Distributary channels of Pattukkóttai channel and Kattar tank—*cont.*

Position. Miles.	Position. Feet.	Description.	Area taken at present for irrigation.	Required discharge.	Cost of masonry.	Remarks.
		PATTUKKOTTAI CHANNEL—*cont.*				
		No. 5 Distributary Main Channel—cont.				
..	..	No. 2 drop (of 4')	..	..	2,350	....
6/2	..	,, 17 sluice R.B.	500	8	400	2' diameter pipe sluice.
6/4	330	,, 18 ,, L.B.	500	8	400	Do.
7	..	,, 3 drop (of 4')	..	..	2,350	....
7/2	..	,, 19 sluice R.B.	500	8	400	2' diameter pipe sluice.
7/6	..	,, 20 ,, L.B.	500	8	400	Do.
8/2	..	,, 21 ,, L.B.	500	8	400	Do.
8/3	..	,, 22 head sluice L.B.	500	6	400	Do. (C Branch)
8/5	330	Road culvert No. 1	..	..	3,100	Three vents of 15' span.
9/1	..	No. 23 sluice L.B.	500	8	400	2' diameter pipe sluice.
9/4	..	,, 24 ,, R.B.	500	8	400	Do.
10	..	,, 25 ,, L.B.	600	9	400	Do.
10/4	..	,, 26 ,, R.B.	600	9	400	Do.
..	..	,, 4 drop (of 2')	..	..	1,820	....
11	..	,, 27 sluice L.B.	500	8	400	2' diameter pipe sluice.
11/4	..	,, 28 ,, R.B.	500	8	400	Do.
12	..	,, 29 ,, L.B.	500	8	400	Do.
12/3	..	,, 30 ,, L.B.	600	9	400	Do.
12/5	..	,, 31 ,, L.B.	400	6	400	Do.
..	..	,, 5 drop (of 2')	..	..	1,820	....
13/3	..	Road culvert No. 2	..	..	2,340	Two vents of 15' span.
13/3	330	No. 32 sluice L.B.	500	8	400	2' diameter pipe sluice.
13/4	..	,, 33 ,, R.B.	500	8	400	Do.
14	..	,, 34 ,, L.B.	500	8	400	Do.
14/4	..	,, 35 ,, R.B.	500	8	400	Do.
15/0	330	Road culvert No. 3	..	..	2,340	Two vents of 15' span.
15/2	330	No. 36 sluice R.B.	500	8	400	2' diameter pipe sluice.
16	..	,, 37 ,, L.B.	500	8	400	Do.
16/5	330	Road culvert No. 4	..	..	2,340	Two vents of 15' span.
17	..	No. 6 drop (of 3')	..	..	1,670	....
17	330	,, 38 sluice R.B.	1,000	15	480	One vent of 2' 6" × 2' 0".
..	..	Open head R.B.	13,000	197	..	D Branch.
17/4	..	No. 39 sluice, L.B.	500	8	400	2' diameter pipe sluice.
17/6	..	,, 7 drop (of 4')	..	..	1,100	....
18	..	,, 40 sluice R.B.	500	8	400	2' diameter pipe sluice.
18/4	..	,, 8 drop (of 5')	..	..	1,080	....
18/6	..	,, 9 ,, (of 5')	..	..	1,080	....
19/6	..	,, 10 ,, (of 4')	..	..	1,030	....
		Direct irrigation at tail end	2,000	30	..	....
		Total ..	46,500	706	43,600	
		A. Branch at sluice No. 1.				
2	..	No. 41 sluice, L.B.	500	8	400	2' diameter pipe sluice.
3	..	,, 42 ,, R.B.	500	8	400	Do.
4	..	,, 43 ,, R.B.	500	8	400	Do.
4/2	330	,, 11 drop (of 2')	..	..	1,110	....
4/4	..	,, 44 sluice, L.B.	500	8	400	2' diameter pipe sluice.
5	..	,, 45 ,, R.B.	200	3	400	Do.
5/4	330	,, 12 drop (of 3')	..	..	920	....
		Direct irrigation at tail end	1,800	28	..	....
		Total ..	4,000	63	4,030	
		B. Branch at sluice No. 2.				
3	..	No. 46 sluice, R.B.	1,000	15	480	One vent of 2' 6" × 2' 0".
3/4	..	,, 47 ,, L.B.	500	8	400	2' diameter pipe sluice.
4	..	,, 48 ,, R.B.	500	8	400	Do.
4/4	..	,, 49 ,, L.B.	500	8	400	Do.
5	..	,, 50 ,, L.B.	500	8	400	Do.
		Direct irrigation at tail end	1,000	15	..	....
		Total ..	4,000	62	2,080	
		C. Branch at sluice No. 22.				
8/4	330	No. 13 drop (of 3')	..	..	870	....
8/6	330	,, 14 ,, (of 5')	..	..	1,000	....
		Total ..	..	..	1,870	

Details of Masonry works on the Distributary channels of Pattukkóttai channel and Kattar tank—*cont.*

Position. Miles.	Position. Feet.	Description.	Area taken at present for irrigation.	Required discharged.	Cost of masonry.	Remarks.
		PATTUKKOTTAI CHANNEL—*cont.*				
		No. 5 Distributary—cont.				
		D. Branch at 17 miles 330 feet.				
17/4	..					
18	..	No. 15 drop (of 3')	..	..	1,670	....
18/2	..	,, 51 sluice, R.B.	500	8	400	2' diameter pipe sluice.
..	..	,, 52 ,, L.B.	500	8	400	Do
18/5	..	,, 16 drop (of 3')	..	..	1,670	....
19	..	,, 53 head sluice, L.B.	1,000	15	480	One vent of 2' 6" × 2' 0" (A Branch.)
19/2	..	,, 54 sluice, R.B.	1,000	15	480	Do.
19/4	..	,, 17 drop (of 5')	..	..	1,500	....
19/6	..	,, 55 sluice L.B.	500	8	400	2' diameter pipe sluice.
20/0	..	,, 56 ,, R.B.	600	9	400	Do.
20/0	..	,, 57 ,, L.B.	600	9	400	Do.
20/2	..	,, 18 drop (of 4')	..	..	1,470	....
20/3	..	,, 19 ,, (of 4')	..	..	1,470	....
20/4	..	,, 58 sluice, R.B.	700	11	480	One vent of 2' 6" × 2' 0".
20/7	..	,, 20 drop (of 5')	..	..	1,500	....
..	..	,, 59 sluice, L.B.	600	9	400	2' diameter pipe sluice.
21/3	..	,, 21 drop (of 5')	..	..	1,500	....
21/4	..	,, 60 head sluice, L.B.	4,500	68	700	One vent of 6' × 3' (B. Branch.)
		,, 61 sluice, R.B.	1,500	23	560	One vent of 3' 6" × 2' 6".
		Direct irrigation at tail end	1,000	15	..	....
		Total ..	13,000	193	15,880	
		D (*a*) Branch at sluice No. 53.				
19/1	..	No. 22 drop (of 4')	..	..	1,030	....
19/3	..	,, 23 ,, (of 4')	..	..	1,030	....
		Total ..	..	..	2,060	
		D (*b*) Branch at sluice No. 60.				
21/6	..	No. 62 sluice, R.B.	1,000	15	480	One vent of 2' 6" × 2' 0".
21/7	330	,, 63 ,, R.B.	1,000	15	480	Do.
22/1	330	,, 64 ,, R.B.	500	8	400	2' diameter pipe sluice.
		Direct irrigation at tail end	2,000	30	..	....
		Total ..	4,500	68	1,360	
		KATTAR TANK.				
		No. 1 Distributary.				
0/3	..	No. 1 sluice, R.B.	500	8	400	2' diameter pipe sluice.
1/5	..	,, 1 road culvert	..	..	1,260	One vent of 12' span.
1/5	600	,, 2 sluice, R.B.	900	15	480	Do. of 2' 6" × 2' 0".
2/2	..	,, 3 ,, R.B.	850	13	480	Do.
2/4	..	,, 4 ,, R.B.	1,000	15	480	Do.
2/6	..	,, 1 outlet { M = 6 square miles; D = 323 cubic ft. per 1 sec. }	..	..	2,110	Two vents of 10' span.
3/5	..	,, 5 sluice, R.B.	1,250	19	560	One vent of 3' 6" × 2' 6".
4/6	..	,, 6 ,, R.B.	800	12	480	Do. of 2' 6" × 2' 0".
5/3	..	,, 7 sluice, R.B.	1,250	19	560	Do. of 3' 6" × 2' 6".
5/5	..	,, 8 ,, R.B.	450	7	400	2' diameter pipe sluice.
		Direct irrigation at tail end	1,000	15	..	....
		Total ..	8,000	123	7,210	
		No. 2 Distributary, Main Channel.				
0/6	..	No. 1 sluice, R.B.	500	8	400	2' diameter pipe sluice.
2/3	330	Road culvert, No. 1	..	..	2,340	W. = 25 (2 vents of 15').
2/4	..	No 2 sluice, R.B.	400	6	400	} 2' diameter pipe sluice.
4	..	,, 3 ,, R.B.	300	5	400	
4/2	..	,, 1 outlet { M = 3/4; D = ~~4~~ cubic ft. per sec. }	..	..	700	One vent of 6' 0" × 3' 0".
5	..	No. 2 outlet { M. = 3; D. = 161 c. ft. per sec. }	..	..	1,390	One vent of 10' span.
5/2	..	,, 4 sluice, R.B.	300	5	400	2' diameter pipe sluice.
5/7	..	,, 5 ,, R.B.	400	6	400	Do.
6/1	330	,, 3 out let { M. = ½; D. = 10 c. ft. }	..	..	700	One vent of 6' 0" × 3' 0".
6/3	..	Road culvert, No. 2	..	..	2,300	W. = 27' (2 vents of 15').
6/6	..	No. 6 sluice, R.B.	600	10	480	One vent of 2½' × 2'.
..	..	,, 7 ,, L.B.	400	6	400	2' diameter pipe sluice.

Cont

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l.c.

Details of Masonry works on the Distributary channels of Pattukkóttai channel and Kattar tank—*cont.*

Position. Miles.	Position. Feet.	Description.	Area taken at present for irrigation.	Required discharge.	Cost of masonry.	Remarks.
		KATTAR TANK—*cont.*				
		No. 2 Distributary, Main Channel—cont.	ACS.		RS.	
7/2	452	No. 8 or A channel head sluice ..	2,300	35	670	One vent of 5' 0" × 3' 0".
8/2	..	,, 9 sluice, R.B.	600	10	480	Do. of 2½' × 2'.
8/2	..	,, 10 ,, L.B.	300	5	400	2' diameter pipe sluice.
9/2	..	,, 11 ,, R.B.	500	8	400	Do.
..	..	Road culvert, No. 3	..	..	1,890	Two vents of 10'.
9/6	..	No. 12 sluice, R.B.	600	10	480	One vent of 2½ × 2'.
..	..	,, 13 ,, L.B.	800	12	480	Do.
10/4	..	,, 14 ,, R.B.	600	10	480	Do.
10/6	..	No. 15 sluice, R.B.	900	14	480	Do.
..	..	,, 16 ,, L.B.	700	11	480	Do.
12/2	..	,, 17 ,, R.B.	700	11	480	
..	..	,, 18 ,, L.B.	450	7	400	2' diameter pipe sluice.
13	..	,, 19 ,, R.B.	850	13	480	One vent of 2½' × 2'.
13/2	..	,, 1 drop (3·88 or 4 ft.)	..	..	1,500	Length = 15'.
13/4	..	,, 2 ,, (of 4·63)	..	..	1,430	D = 3½'; length = 15'.
13/6	..	Road culvert, No. 4	..	..	1,390	W = 15 (one vent of 15').
14	..	No. 20 sluice, R.B.	600	10	480	One vent of 2½' × 2'.
14	..	Road culvert, No. 5	..	..	1,390	Length = 15'.
14/2	..	No. 21 or B channel head sluice ..	1,400	21	660	One vent of 3½' × 3'.
14/2	..	,, 3 drop of 3' d = 3½'	..	..	1,500	Length = 15'.
15/4	..	,, 22 sluice, R.B.	400	6	400	2' diameter pipe sluice.
15/6	..	,, 4 drop of 2'	..	..	1,190	Length = 12'
16	..	,, 23 sluice, R.B.	650	10	480	One vent of 2½' × 2'.
16	..	,, 24 ,, L.B.	400	6	400	2' diameter pipe sluice.
16/4	..	,, 5 drop of 4½'	..	..	1,430	Length = 12'.
16/4	..	,, 25 sluice, R.B.	600	10	480	One vent of 2½' × 2'.
17	..	,, 6 drop of 4½'	..	..	1,430	Length = 12'.
17/2	..	,, 26 sluice, R.B.	800	12	480	One vent of 2½' × 2'.
..	..	,, 27 ,, L.B.	450	7	480	Do.
17/4	..	,, 7 drop of 4·75	..	..	1,250	Length = 12'.
17/6	..	,, 8 ,, of 3'	..	..	1,250	Do. = 10'.
18	..	,, 28 sluice, R.B.	700	11	480	One vent of 2½' × 2'.
..	..	,, 29 ,, L.B.	350	6	400	2' diameter pipe sluice.
..	..	,, 9 drop of 1'	..	..	900	Length = 10'.
18/2	330	,, 30 sluice, L.B.	200	3	400	2' diameter pipe sluice.
..	..	Direct irrigation	1,250	~~4~~	..	
		Total ..	20,000	~~298~~	37,450	
		A. Branch at sluice No. [illegible]				
0/4	..	No. 31 sluice, L.B.	350	6	400	2' diameter pipe sluice.
1/3	620	,, 32 ,, R.B.	650	10	480	One vent of 2½' × 2'.
..	..	,, 33 ,, L.B.	500	8	480	Do.
1/7	..	Road culvert, No. 6	..	..	1,070	W = 4' (one vent of 6').
2/1	..	No. 10 drop of 4½'	..	..	1,050	Length = 4'.
2/3	..	,, 11 ,, of 3·63	800	12	930	Do. = 3'.
		Total ..	2,300	36	4,410	
		B. Branch at sluice No. 21.				
0/4	..	No. 34 sluice, L.B.	450	7	400	2' diameter pipe sluice.
1/4	..	,, 35 ,, R.B.	450	7	400	Do.
1/4	..	,, 12 drop of 5'	..	..	1,030	
1/6	..	,, 13 ,, of 4'	..	..	930	
..	..	Direct irrigation	500	8	..	
		Total ..	1,400	22	2,810	
		No. 3 Distributary.				
0/4	..	No. 1 sluice, L.B.	400	6	400	2' diameter pipe sluice.
2	..	,, 2 ,, L.B.	390	5	400	Do.
3	..	,, 3 ,, L.B.	450	7	400	Do.
4/5	..	,, 4 ,, L.B.	500	8	400	Do.
4/6	495	Road culvert, No. 1	..	..	1,890	W = 20' (2 of 10').
4/7	..	No. 5 sluice, L.B.	700	11	480	One vent of 2½' × 2'.
6/1	..	,, 6 ,, L.B.	600	9	400	2' diameter pipe sluice.
6/6	330	Road culvert, No. 2	..	..	1,890	W = 20' (2 of 10').
6/4	..	No. 7 sluice, L.B.	850	4	400	2' diameter pipe sluice.
6/7	..	,, 8 ,, L.B.	300	4	400	Do.
7/5	..	Road culvert, No. 3	..	..	1,890	W = 20' (2 of 10').

The actual discharges, especially when the sides are plastered, will be more than what this formula would give—

(a) With 6 ft. depth of water—

Discharge through one vent. $A = 35 \times 6 = 210$; $B = 47$; $r = \frac{210}{47} = 4·47$; $r + 0·82 = 5·29$. Discharge $= 860$ c. ft. per second. Discharge through 4 vents $= 4 \times 860 = 3,440$ cubic feet per second.

(b) With 9 ft. depth of water—

Discharge of one vent. $A = 35 \times 9 = 315$; $B = 53$; $r = \frac{315}{53} = 5·94$; $r + 0·82 = 6·76$. Discharge $= 1,516$ c. ft. per second. Discharge through 4 vents $= 4 \times 1,516 = 6,064$ c. ft.

(2) Bridge of 3 vents of 40 ft. span each: $d = 6$ and 9 ft.; fall of channel bed, $1\frac{1}{2}$ ft. per mile; sides vertical.

(a) With 6 feet depth of water—

$A = 40 \times 6 = 240$; $B = 52$; $r = \frac{240}{52} = 4·61$; $r + 0·82 = 5·43$. Discharge through one vent $= 866$ c. ft. per second. Discharge through 3 vents $= 3 \times 866 = 2,598$ c. ft.

(b) $d = 9$ feet—

$A = 40 \times 9 = 360$; $B = 58$; $r = \frac{360}{58} = 6·21$; $r + 0·82 = 7·03$. Discharge through one vent $= 1,538$ c. ft. per second. Discharge through 3 vents $= 3 \times 1,538 = 4,614$ c. ft. per second.

(3) Regulators with 18 ft. vents—

Fall of channel, 2 ft. per mile; $d = 6$ and 9 ft.; sides vertical.

(a) $A = 18 \times 6 = 108$; $B = 30$; $r = \frac{108}{30} = 3·6$; $r + 0·82 = 4·42$. Discharge of one vent $= 421$ c. ft. per second.

(b) With $d = 9$ ft.—

$A = 18 \times 9 = 162$; $B = 36$; $r = \frac{162}{36} = 4·5$; $r + 0·82 = 5·32$. Discharge of one vent $= 719$ c. ft. per second.

(c) With $d = 4$ ft.—

$A = 72$; $B = 26$; $r = 2·80$; $r + 0·82 = 3·62$. Discharge of one vent $= 241$ c. ft. per second.

(d) With $d = 5$ ft.—

$A = 90$; $B = 28$; $r = 3·21$; $r + 0·82 = 4·03$. Discharge of one vent $= 327$ c. ft. per second.

(e) With $d = 7$ ft.—

$A = 126$; $B = 32$; $r = 3·94$; $r + 0·82 = 4·76$.

(4) The same regulators in channels with $1\frac{1}{2}$ ft. fall per mile; the other conditions remaining unaltered—

Discharge through one vent—

(a) $d = 4$; $D = ·866 \times 241 = 209$ c. ft. per second.
(b) $d = 5$; $D = ·866 \times 327 = 283$ do.
(c) $d = 6$; $D = ·866 \times 421 = 364$ do.
(d) $d = 7$; $D = ·866 \times 518 = 448$ do.
(e) $d = 9$; $D = ·866 \times 719 = 623$ do.

(5) Irrigation sluice of 3 vents of 15 ft. each—

For irrigation, with $4\frac{1}{2}$ ft. depth of water in rear; head $= ·64$ ft. Discharge of one vent $= D = 5 \times 15 \times 4\frac{1}{2} \times \sqrt{·64} = 75 \times 4\frac{1}{2} \times ·8 = 270$ c. ft. per second. For floods, $D = 5 \times 15 \times 4\frac{1}{2} \sqrt{1} = 337$ c. ft. per second.

(6) Irrigation sluice of 3 vents, $5' \times 3\frac{1}{2}'$ each —

d in rear $= 4\frac{1}{2}$ ft.; head $= 6$ inches. Discharge through one vent $= 5 \times 5 \times 3\frac{1}{2} \times \sqrt{·5} = 25 \times 3\frac{1}{2} \times ·707 = 62$ c. ft. per second.

(7) Sluice of 2 vents, $6\frac{1}{2}' \times 3\frac{1}{2}'$ each—

d in rear $= 4\frac{1}{2}$ ft.; head $= 6$ inches. Discharge through one vent $= 5 \times 6\frac{1}{2} \times 3\frac{1}{2} \times \sqrt{·5} = 49$ c. ft. per second.

(8) Sluice of one vent, 10 ft. wide—

d in rear $= 3\frac{1}{2}$ ft.; head $= 6$ inches; $D = 5 \times 10 \times 3\frac{1}{2} \times ·707 = 124$ c. ft. per second; $C = \frac{5}{8}$; $D = 6 \times 10 \times 3\frac{1}{2} \times ·707 = 148$ c. ft. per second; $C = \frac{3}{4}$. For floods, with $h = 2$ ft.; $D = 5 \times 10 \times 3\frac{1}{2} \times 1·414 = 247$ c. ft. per second.

(9) Sluice of one vent of $6' \times 3'$—

Rear depth $= 3\frac{1}{2}$ ft.; $h = ·64$; $D = 5 \times 6 \times 3 \times ·8 = 72$ c. ft. per second; $C = \frac{5}{8}$; with $C = \frac{3}{4}$; $D = 86$ c. ft. per second.

(10) Sluice of one vent, $5' \times 3'$—

d in rear $= 3\frac{1}{2}$ ft.; $h = ·5$ ft.; $D = 5 \times 5 \times 3 \times ·707 = 53$ c. ft. per second.

(11) Sluice of one vent, $4' \times 3'$—

$h = ·64$. $D = 5 \times 4 \times 3 \times ·8 = 48$ c. ft. per second.

(12) Sluice of one vent, $3\frac{1}{2}' \times 2\frac{1}{2}'$—

$h = ·36$; $D = 5 \times 3\frac{1}{2} \times 2\frac{1}{2} \times ·6 = 26$ c. ft. per second.

(13) Sluice of one vent of $2\frac{1}{2}' \times 2'$—

$h = ·36$; $D = 5 \times 2\frac{1}{2}' \times 2 \times ·6 = 15$ c. ft. per second.

(14) Pipe sluice of 2 ft. diameter—

$h = ·36$; $D = 5 \times 3\frac{1}{7} \times ·6 = 9·4$ c. ft. per second.

(15) Road culverts —

Discharges of one vent with different widths, depths and bed falls—

One vent of 15 ft.; $d = 5$ ft.; fall $= 1$ ft. per mile. $A = 15 \times 5 = 75$; $B = 15 + 10 = 25$; $r = \frac{75}{25} = 3$; $r + ·82 = 3·82$. $D = 185$ c. ft. per second.

(16) One vent of 10 ft.—

$d = 5$ ft.; $f = 1$ ft. per mile; $A = 50$; $B = 20$; $r = \frac{50}{20} = 2·50$; $r + ·82 = 3·32$; $D = 110$ c. ft. per second.

(17) One vent of 15 ft.—

$d = 4·5$; $f = 1\frac{1}{2}$ ft. per mile; $A = 15 \times 4\frac{1}{2} = 67·5$; $B = 15 + 9 = 24$; $r = \frac{67·5}{24} = 2·81$; $r + ·82 = 3·63$; $D = 196$ c. ft. per second.

(18) One vent of 15 ft.—

$d = 4\frac{1}{2}$ ft.; fall $= 1$ ft. per mile; $A = 15 \times 4\frac{1}{2} = 67·5$; $B = \frac{67·5}{24}$; $r = 2·81$; $r + ·82 = 3·63$; $D = 160$ c. ft. per second.

(19) One vent of 10 ft.—

$d = 4\frac{1}{2}$ ft.; fall $1\frac{1}{2}$ ft. per mile; $A = 10 \times 4\frac{1}{2} = 45$; $B = 10 + 9 = 19$; $r = \frac{45}{19} = 2·37$; $r + ·82 = 3·19$; $D = 116$. ft. per second.

(20) One vent of 10 ft.—

$d = 4\frac{1}{2}$ ft.; fall $= 1$ ft. per mile; $D = \frac{40}{49} \times 116 = 95$ c. ft. per second.

(21) One vent of 12 ft.—

$d = 4\frac{1}{2}$; fall $= 1$ ft. per mile; $A = 12 \times 4\frac{1}{2} = 54$; $B = 21$; $r = \frac{54}{21} = 2·57$ $r + ·82 = 3·39$; $D = 121$ c. ft. per second.

(22) One vent of 10 ft.—

$d = 4$ ft.; fall $= 1$ ft. per mile; $A = 10 \times 4 = 40$; $B = 18$; $r = \frac{40}{18} = 2·22$. $r + ·82 = 3·04$; $D = 82$ c. ft. per second.

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(l.c.)

Details of masonry works on the Distributary channels of Pattukkóttai Channel and Kattar tank—*cont.*

Position. Miles.	Position. Feet.	Description.	Area taken at present for irrigation.	Required discharge.	Cost of masonry.	Remarks.
		KATTAR TANK—*cont.*				
		No. 3 Distributary—cont.				
7/5	300	No. 9 or A branch sluice	5,000	76	700	One vent of 6′ × 3′.
7/6	..	Road culvert No. 4	..	..	1,890	W = 20′ (2 of 10′).
7/7	..	No. 10 sluice, R.B.	550	9	400	2′ diameter pipe sluice.
..	..	„ 11 „ L.B.	800	4	400	Do.
8/3	..	„ 12 „ R.B.	650	[illegible]	480	One vent of 2½′ × 2′.
8/4	..	„ 1 drop of 4′	..	..	1,500	Length = 15′.
9/4	..	„ 13 sluice, L.B.	450	7	400	2′ diameter pipe sluice.
9/5	..	Road culvert No. 5	..	..	1,260	W = 12′ (one of 12′).
10/2	..	No. 2 drop of 2′	..	..	1,190	Length = 12′.
10/7	..	„ 14 sluice, R.B.	750	12	480	One vent of 2½′ × 2′.
..	..	„ 15 „ L.B.	500	8	400	2′ diameter pipe sluice.
11/2	..	„ 3 drop of 3′	..	..	1,300	
12	..	„ 16 sluice, R.B.	550	8	400	2′ diameter pipe sluice.
12/3	..	„ 17 head sluice, R.B.	2,350	36	670	One vent of 5′ × 3′. (B. branch.)
12/4	..	„ 4 drop of 5′	..	..	1,380	
13/0	330	„ 6 road culvert	..	..	1,260	One vent of 12′ span.
13/4	..	„ 18 sluice, L.B.	300	5	400	2′ diameter pipe sluice.
13/6	..	„ 5 drop of 5′	..	..	1,030	
14	..	„ 19 sluice, R.B.	600	10	480	One vent of 2′ 6″ × 2′.
14	..	„ 6 drop of 4½′	..	..	1,660	
..	..	Direct irrigation at tail-end	400	6	..	
		Total ..	16,500	246	26,070	
		A. Branch at sluice No. 9.				
0/2	330	No. 20 sluice, L.B.	300	4	400	2′ diameter pipe sluice.
0/3	330	„ 7 drop of 3·88	..	..	1,370	
0/6	330	„ 21 sluice, L.B.	350	4	400	2′ diameter pipe sluice.
..	..	„ 8 drop of 3·44	..	..	1,240	
1/6	330	„ 22 sluice, L.B.	450	7	400	2′ diameter pipe sluice.
1/7	330	„ 7 road culvert	..	..	1,200	One vent of 10′ span.
2/0	330	„ 9 drop of 3½′	..	..	1,240	
2/1	330	„ 23 sluice, R.B.	1,500	26	500	One vent of 3′ 6″ × 2′ 6″.
..	..	„ 24 „ L.B.	450	7	400	2′ diameter pipe sluice.
3/2	330	„ 25 „ L.B.	300	4	400	Do.
3/7	330	„ 10 drop of 5′	..	..	1,080	
4/0	330	„ 26 sluice, R.B.	500	8	400	2′ diameter pipe sluice.
..	..	„ 27 „ L.B.	250	4	400	Do.
4/1	330	„ 11 drop of 5′	..	..	1,080	
5/0	330	„ 28 sluice, L.B.	300	4	400	2′ diameter pipe sluice.
..	..	„ 12 drop of 4′	..	..	950	
5/2	330	„ 13 „ of 4′	..	..	930	
..	..	Direct irrigation at tail-end	500	8	..	
		Total ..	5,000	76	12,850	
		B. Branch at sluice No. 17.				
0/3	..	No. 14 drop of 4′	..	..	1,030	Length = 8′.
0/5	..	„ 15 „ of 4′	..	..	1,090	Do.
0/6	..	„ 29 sluice, R.B.	400	6	400	2′ diameter pipe sluice.
..	..	„ 30 „ L.B.	450	7	400	Do.
1/6	..	„ 31 „ R.B.	500	8	400	Do.
..	..	„ 32 „ L.B.	600	9	400	Do.
2	..	„ 16 drop of 4′	..	..	930	Length = 8′.
..	..	Direct irrigation	400	8	..	
		Total ..	2,350	38	4,650	
		No. 4 Distributary.				
0/6	..	No. 1 sluice, R.B.	800	12	480	One vent of 2½′ × 2′.
2	..	„ 2 „ R.B.	250	4	400	2′ diameter pipe sluice.
..	..	„ 3 „ L.B.	300	4	400	Do.
2/6	..	Road culvert No. 1	..	..	1,200	W = 10′ (1 of 10′).
3	..	No. 4 sluice, R.B.	400	6	400	2′ diameter pipe sluice.
4	..	„ 5 „ R.B.	300	4	400	Do.
5	..	„ 6 „ R.B.	250	4	400	Do.
5/6	..	„ 7 „ R.B.	500	8	400	Do.
6/2	..	„ 8 „ R.B.	500	8	400	Do.
7	..	No. 1 drop of 5′	..	..	1,130	Length = 29′.
7/1	..	Road culvert No. 2	..	..	1,200	W = 9′ (1 of 10′).

Details of Masonry works on the Distributary channels of Pattukkóttai channel and Kattar tank—*cont.*

Position. Miles.	Position. Feet.	Description.	Area taken at present for irrigation.	Required discharge.	Cost of masonry.	Remarks.
		KATTAR TANK—*cont.*	ACS.		RS.	
		No. 4 Distributary—cont.				
7/3	..	No. 9 sluice, R.B.	400	6	400	2′ diameter pipe sluice.
..	..	„ 10 „ L.B.	500	6	400	Do.
7/6	..	„ 2 drop (of 2′)	..	..	880	Length = 8′.
8	..	„ 3 „ (of 4′)	..	..	1,030	Do. 7′.
8/1	..	„ 11 sluice, R.B.	350	6	400	2′ diameter pipe sluice.
..	..	Road culvert, No. 3	..	..	1,160	W = 7′ (1 of 8′).
8/2	..	No. 4 drop (of 4′)	..	..	1,030	Length = 7′.
8/3	..	„ 12 sluice, R.B.	550	9	400	2′ diameter pipe sluice.
8/4	330	Road culvert, No. 4	..	..	1,070	W = 5′ (1 of 6′).
..	..	Direct irrigation	900	14	..	
		Total ..	6,000	93	13,580	
		No. 5, Distributary, Main Channel.				
0/1	..	No. 1 sluice, L.B.	250	4	400	2′ diameter pipe sluice.
0/6	..	„ 1 outlet {M = ¾′; D = 40 cubic feet per second.}	..	..	700	One vent of 6′ × 3′.
0/7	..	„ 2 sluice, L.B.	250	4	400	2′ diameter pipe sluice.
0/7	165	Road culvert, No. 1	..	..	1,260	W = 12′ (1 of 12′).
1/1	..	No. 3 sluice, L.B.	650	10	480	One vent of 2½′ × 2′.
..	..	„ 4 „ R.B.	450	7	400	2′ diameter pipe sluice.
1/2	330	„ 5 or A branch sluice	3,450	52	670	One vent of 6′ × 3′.
3	..	„ 6 sluice, L.B.	500	8	400	2′ diameter pipe sluice.
3/6	..	„ 7 „ L.B.	550	8	400	Do.
5	..	„ 8 „ L.B.	600	9	400	Do.
5/6	..	„ 9 „ L.B.	450	7	400	Do.
6/6	..	„ 10 „ L.B.	350	6	400	Do.
7/2	495	Road culvert, No. 2	..	..	1,070	W = 4′ (1 of 6′).
..	..	Direct irrigation	500	8	..	
		Total ..	8,000	123	7,390	
		A. Branch at sluice No. 5.				
1/3	330	No. 11 sluice, R.B.	400	6	400	2′ diameter pipe sluice.
2/3	330	„ 12 „ R.B.	1,500	23	560	One vent of 3½′ × 2½′.
2/5	330	„ 13 „ L.B.	300	5	400	2′ diameter pipe sluice.
3/3	330	„ 14 „ R.B.	400	6	400	Do.
4/3	330	„ 15 „ R.B.	400	6	400	Do.
5	..	Road culvert, No. 3	..	..	1,070	W = 5′ (1 of 6′).
..	..	Direct irrigation	450	7	..	
		Total ..	3,450	53	3,230	
		No. 6 Distributary.				
0/2	..	No. 1 sluice, L.B.	350	6	400	2′ diameter pipe sluice.
0/6	..	Road culvert, No. 1	..	..	1,200	W = 9′ (1 of 10′).
1/2	..	No. 2 sluice L.B.	300	5	400	2′ diameter pipe sluice.
1/6	..	„ 1 outlet {M = A; D = 215 cubic feet}	..	..	2,110	Two vents of 10′ span each.
2/4	..	„ 3 sluice L.B.	350	5	400	2′ diameter pipe sluice.
2/6	330	„ 2 outlet {M = 1½′; D = 8 cubic feet 1 inch.}	..	..	1,390	One vent of 10′ span.
4/1	330	„ 3 „ {M = 10′; D = 538 cubic feet 1 inch}	..	..	3,350	Four vents of 10′ span each.
4/5	..	„ 4 sluice L.B.	300	5	400	2′ diameter pipe sluice.
5/5	..	„ 5 „ L.B.	300	5	400	Do.
6/1	330	„ 4 outlet {M = 6′; D = 323 cubic feet 1 inch}	..	..	2,110	Two vents of 10′ span each.
6/6	..	„ 6 sluice L.B.	200	3	400	2′ diameter pipe sluice.
..	..	Direct irrigation	200	3	..	
		Total ..	2,000	32	12,560	

HYDRAULIC CALCULATIONS.

For easy reference, the calculations of discharges of many of the masonry works in the channels are given below:—

(1) Bridge of 4 vents of 35 ft. each—

Bed fall of channel, 2 ft. per mile; sides vertical; depths of water, 6 and 9 feet.

Formula used is Bazin's for rough masonry sides.

$$V = C\sqrt{rs} \text{ and } C = \frac{1}{\sqrt{\dfrac{0{\cdot}00007315\,(r + 0{\cdot}82)}{r}}}.$$

(61) Drop of 2 ft.—

$d = 2\frac{1}{3}$ ft.; D of 1 ft. length $= 5 \times \frac{1}{2} \times \sqrt{2} + 3\cdot5 \times 2^{\frac{3}{2}} = 13\cdot4$ c. ft. per second; $t = 1' 9''$; $T = 3' 2''$.

(62) Drop of $1\frac{1}{2}$ ft.—

$d = 5$ ft.; D of 1 ft. length $= 5 \times 3\frac{1}{2} \times \sqrt{1\cdot5} + 3\cdot5 \times 1\cdot5^{\frac{3}{2}} = 5 \times 3\frac{1}{2} \times 1\cdot225 + 3\cdot5 \times 1\cdot84 = 28$ cubic feet per second; $t = 3' 6''$; $T = 4' 9''$.

(63) Drop of 1 ft.—

$d = 3$ ft; D of 1 ft. length $= 5 \times 2 \times \sqrt{1} + 3\cdot5 \times 1^{\frac{3}{2}} = 10 + 3\cdot5 = 13\frac{1}{2}$ c. ft. per second; $t = 2' 1\frac{1}{2}''$; $T = 2' 10''$.

(64) Irrigation sluices—

Three vents of 15 ft. each—

$d = 4\frac{1}{2}$ ft.; discharge through 1 vent $=$ D; $D = 5 \times 1 \times 15 \times 4\frac{1}{2} \sqrt{\cdot25} = 75 \times 4\frac{1}{2} \times \frac{1}{2} = 169$ c. ft. per second; discharge of 3 vents $= 507$ c. ft. per second; For floods, $d = 5$; $h = 1$ ft.; $D = 5 \times 3 \times 15 \times 5 \times 1 = 1{,}125$ c. ft. per second.

(65) One vent of 10 ft.—

$d = 3\frac{1}{2}$ ft.; $h = 6$ inches; $D = 5 \times 10 \times 3\frac{1}{2} \times \cdot707 = 124$ c. ft. per second; $C = \frac{5}{8}$; $D = 6 \times 10 \times 3\frac{1}{2} \times \cdot707 = 148$ c. ft. per second; $C = \frac{3}{4}$; for floods, $d = 5$ ft.; $D = 5 \times 10 \times 5 \times 1 = 250$ c. ft. per second.

(66) Two vents of $6' \times 3\frac{1}{2}'$ each—

$d = 4\frac{1}{2}$ ft.; $h = 6$ inches; $D = 5 \times 2 \times 6 \times 3\frac{1}{2} \sqrt{\cdot5} = 148$ c. ft. per second.

(67) Three vents of 5 ft. $\times$ $3\frac{1}{2}$ ft. each—

$d = 4\frac{1}{2}$ ft.; $h = 6$ inches; $D = 5 \times 3 \times 5 \times 3\frac{1}{2} \sqrt{\cdot5} = 186$ c. ft. per second.

(68) One vent of 6 ft. $\times$ 3 ft.—

$d = 4\frac{1}{2}$ to 4; $h = \cdot5$; $D = 5 \times 6 \times 3 \times \cdot707 = 64$ c. ft. per second; with $h = \cdot64$; $D = 5 \times 6 \times 3 \times \cdot8 = 72$ c. ft.

(69) One vent of $5' \times 3'$—

$d = 4\frac{1}{2}$ to 4; $h = \cdot5$; $D = 5 \times 5 \times 3 \times \cdot707 = 53$ c. ft. per second.

(70) Sluice of 1 vent $4' \times 3'$—

$a = 4$ feet; $h = \cdot64$; $D = 5 \times 4 \times 3 \times \cdot8 = 48$ c. ft. per second; discharge of 2 vents $= 2 \times 48 = 96$ c. ft. per second.

(71) Sluice of one vent, $3\frac{1}{2}' \times 2\frac{1}{2}'$—

$h = \cdot36$; $D = 5 \times 3\frac{1}{2} \times 2\frac{1}{2} \times \cdot6 = 26$ c. ft. per second.

(72) Sluice of one vent $2\frac{1}{2}' \times 2'$—

$h = \cdot36$; $D = 5 \times 2\frac{1}{2} \times 2 \times \cdot6 = 15$ c. ft. per second.

(73) Pipe sluice, one pipe 2 ft. diameter—

$h = \cdot36$; $D = 5 \times 3\frac{1}{7} \times \cdot6 = 9\cdot4$ c. ft. per second.

Aqueducts.

(74) Aqueduct, 40 ft. wide—

Depth of water, $4\frac{1}{2}$ ft.; to carry 628 c. ft. per second; it will discharge it with a velocity of $3\frac{1}{2}$ ft. per second in the trough.

(75) Aqueduct of 12 ft. wide—

Depth of water, $4\frac{1}{2}$ to $4\frac{1}{2}$ ft.; to carry 123 c. ft. per second; it will discharge it with a velocity in trough of 2·4 ft. per second.

(76) Aqueduct of 10 ft. wide—

Depth of water, $4\frac{1}{2}$ to 4 ft.; to carry 123 c. ft. per second; it will discharge it with a velocity in trough of 2·9 ft. per second.

(77) Aqueduct of 6 ft.—

(1) Depth of water $3\frac{1}{2}$ ft; to carry 52 c. ft. per second; it will discharge it with a velocity in trough of 2·7 ft. per second.

(2) Depth of water, 3 ft.; to carry 44 c. ft. per second; it will discharge it with a velocity in trough of 2·5 ft. per second.

(78) Drainage outlet in distributaries. (The discharges from drainage areas are calculated at 53·8 c. ft per second per square mile corresponding to drawing 2" rainfall in 24 hours)—

Four vents of 10 ft. each—

Depth in front, $4\frac{1}{2}$ ft.; depth in rear, 4 ft.; $h = \cdot5$; $D = 5A \times \sqrt{h} = 560$ c. ft. per second against a required discharge of 538 c. ft.

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(79) Two vents of 10 ft. each—

(1) Depth in front, 4·64 ft.; depth in rear, 4·0 ft.; $h = \cdot64$; discharge $= 320$ c. ft. per second.

(2) Depth in front, 4 ft.; depth in rear, $3\frac{1}{2}$ ft.; $h = \cdot5$; $D = 245$ c. ft. per second.

(80) One vent of 10 ft.—

(1) Front and rear depth, 3 and $2\frac{1}{2}$ ft.; $h = \cdot5$; $D = 88$ c. ft. per second.

(2) Front and rear depth, 4·64 and 4 ft.; $h = \cdot64$; $D = 160$ c. ft. per second.

(81) One vent of $6' \times 3'$—

(1) Front depth, $3\frac{1}{2}'$ to $4'$; rear depth, $3'$ to $3\frac{1}{2}'$; with $h = \cdot5$; $D = 63$ c. ft. per second.

(2) With $h = \cdot25$; $D = 45$ cubic feet per second.

Estimate of Pattukkóttai Project.

Description of work.	Amount of estimate. RS.
Widening Vadavar-Pattukkóttai channel and excavating Pattuk- ...	7,08,000
kóttai channel	4,32,000
Constructing masonry works for the above	10,00,000
Kattar tank—tank-bund and connecting cut of Kattar tank, etc.	1,40,900
Constructing masonry works for the above	97,052
Channel distributary No. 1	4,07,840
" " 2	68,500
" " 3	50,800
" " 4	2,47,830
" " 5	27,210
Kattar tank—Distributary No. 1	1,40,670
" " " 2	1,28,170
" " " 3	53,580
" " " 4	43,610
" " " 5	26,560
" " " 6	39,098
Railway culverts for distributaries	2,40,000
Minor distributaries at Rs. 1-8-0 per acre for 180,000 acres ...	1,48,040
Unforeseen works	9,80,000
Establishment, tools and plant, etc.	
Total ...	49,80,000

The cost of the project, Rs. 49,80,000, is made up as analysed below :—

	RS.
Earthwork	18,25,846
Land compensation	7,77,036
Masonry works	10,09,078
Minor distributaries	2,40,000
Unforeseen work	1,48,040
Establishment charges at $24\frac{1}{2}$ per cent.	9,80,000
Total ...	49,80,000

(23) One vent of 10 ft.—

$d = 4$ ft.; $f = 1\frac{1}{2}$ ft. per mile; $D = \frac{49}{40} \times 82 = 100$ c. ft. per second.

(24) Onevent of 12 ft.—

$d = 4$ ft.; fall $1\frac{1}{2}$ ft. per mile; $A = 48$; $B = 20$; $r = \frac{48}{20} = 2{\cdot}4$; $r + {\cdot}82 = 3{\cdot}22$; $D = 126$ c. ft. per second.

(25) One vent of 8 ft —

$d = 4$ ft.; fall $= 1\frac{1}{2}$ ft. per mile; $A = 8 \times 4 = 32$; $B = 16$; $r = 2{\cdot}0$ $r + {\cdot}82 = 2{\cdot}82$; $D = 75$ c. ft. per second.

(26) One vent of 15 ft.—

$d = 3\frac{1}{2}$ ft.; $f = 1\frac{1}{2}$ ft. per mile; $A = 15 \times 3\frac{1}{2} = 52{\cdot}5$; $B = 22$; $r = \frac{52{\cdot}5}{22} = 2{\cdot}39$; $r + {\cdot}82 = 3{\cdot}21$; $D = 138$ c. ft. per second.

(27) One vent of 12 ft.—

$d = 3\frac{1}{2}$ ft.; $f = 1\frac{1}{2}$ ft. per mile; $A = 12 \times 3\frac{1}{2} = 42$; $B = 19$; $r = \frac{42}{19} = 2{\cdot}21$; $r + {\cdot}82 = 3{\cdot}03$; $D = 105$ c. ft. per second.

(28) One vent of 10 ft.—

$d = 3\frac{1}{2}$ ft.; $f = 1\frac{1}{2}$ ft. per mile; $A = 10 \times 3\frac{1}{2} = 35$; $B = 17$; $r = \frac{35}{17} = 2{\cdot}06$; $r + {\cdot}82 = 2{\cdot}88$; $D = 84$ c. ft. per second.

(29) One vent of 6 ft.—

$d = 3\frac{1}{2}$ ft.; $f = 1\frac{1}{2}$ ft. per mile; $A = 6 \times 3\frac{1}{2} = 21$; $B = 13$; $r = \frac{21}{13} = 1{\cdot}61$; $r + {\cdot}82 = 2{\cdot}43$; $D = 43$ c. ft. per second.

(30) One vent of 10 ft.—

$d = 3\frac{1}{4}$ ft.; $f = 1\frac{1}{2}$ ft. per mile; $A = 10 \times 3\frac{1}{4} = 32{\cdot}5$; $B = 16{\cdot}5$; $r = 1{\cdot}97$; $r + {\cdot}82 = 2{\cdot}79$; $D = 75$ c. ft. per second.

(31) One vent of 10 ft.—

$d = 3$ ft.; $f = 1$ ft. per mile; $A = 30$; $B = 16$; $r = 1{\cdot}88$; $r + {\cdot}82 = 2{\cdot}70$; $D = 55$ c. ft. per second.

(32) One vent of 8 ft.—

$d = 3$ ft.; $f = 1\frac{1}{2}$ ft. per mile; $A = 24$; $B = 14$; $r = 1{\cdot}71$; $r + {\cdot}82 = 2{\cdot}53$; $D = 51$ c. ft. per second.

(33) One vent of 6 ft.—

$d = 3$ ft.; $f = 1\frac{1}{2}$ ft. per mile; $A = 18$; $B = 12$; $r = \frac{18}{12} = 1{\cdot}5$; $r + {\cdot}82 = 2{\cdot}32$; $D = 35$ c. ft. per second.

(34) One vent of 6 ft.—

$d = 3$ ft.; $f = 1$ ft. per mile; $D = \frac{40}{49} \times 35 = 28$ c. ft. per second. For drop walls, thickness at top and below has been calculated by formula $W = \frac{d}{\sqrt{5}}$ where W = thickness of walls, d = depth of water, and S = specific gravity of brick in mortar which is taken as 2·0 in these cases. Width of rear floor has been calculated by formula $W = 6\sqrt{d}$, where W = the width of floor, and d = depth of water. Top thickness is called t; bottom thickness is called; the discharge of 1 ft. length of drops will be given below.

(35) (Fvie feet drops).—

Drop of 5 ft.; $d = 4\frac{1}{2}$ ft.; discharge of 1 ft. length $= 3{\cdot}5 \times 4\frac{1}{2}^{\frac{3}{2}} = 3{\cdot}5 \times 9{\cdot}54 = 33$ cubic ft. per second; $t = 3'\,2''$; $T = 6'\,7\frac{1}{2}''$.

(36) Drop of 5 ft.—

$d = 3\frac{1}{2}$ft.; D of 1 ft. length $= 3{\cdot}5 \times 3{\cdot}5^{\frac{3}{2}} = 3{\cdot}5 \times 6{\cdot}55 = 23$ c. ft. per second; $t = 2'\,6''$; $T = 6'$.

(37) Drop of 5 ft.—

$d = 3\frac{1}{4}$ft.; D of 1 ft. length $= 3{\cdot}5 \times 3\frac{1}{4}^{\frac{3}{2}} = 3{\cdot}5 \times 5{\cdot}85 = 20$ c. ft per second; $t = 2'\,3''$; $T = 5'\,10''$.

(38) Drop of 5 ft.—

$d = 3$ ft.; D of 1 ft. length $= 3{\cdot}5 \times 3^{\frac{3}{2}} = 18$ c. ft. per second; $t = 2'\,1\frac{1}{2}''$; $T = 5'\,8''$.

(39) Drop of $4\frac{1}{4}$ ft.—

$d = 3$ ft. D of 1 ft. length $= 3{\cdot}5 \times 3^{\frac{3}{2}} = 18$ c. ft. per second; $t = 2'\,1\frac{1}{2}''$; $T = 5'\,6''$.

(40) Drop of 4·63ft.—

$d = 3\frac{1}{2}$ ft.; D of 1 ft. length $= 3{\cdot}5 \times 3\frac{1}{2}^{\frac{3}{2}} = 23$ c. ft. per second; $t = 2'\,6''$; $T = 5'\,9''$.

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(41) Drop of $4\frac{1}{4}$ ft.—

$d = 3\frac{1}{2}$ ft; D of 1 ft. length $= 3{\cdot}5 \times 3\frac{1}{2}^{\frac{3}{2}} = 23$ c. ft. per second; $t = 2'\,6''$; $T = 5'\,8''$.

(42) Drop of $4\frac{1}{2}$ ft.—

$d = 3\frac{1}{2}$ ft.; D of 1 ft. length $= 3{\cdot}5 \times 3^{\frac{3}{2}} = 18$ c. ft. per second; $t = 2'\,1\frac{1}{2}''$; $T = 5'\,4''$.

(43) Drop of $4\frac{1}{2}$ ft.—

$d = 3\frac{1}{2}$ ft.; D of 1 ft. length $= 3{\cdot}5 \times 3\frac{1}{2}^{\frac{3}{2}} = 23$ c. ft. per second; $t = 2'\,6''$; $T = 5'\,6''$;

(44) Drop of 4 ft.—

$d = 4\frac{1}{2}$ ft.; D of 1 ft. length $= 5 \times \frac{1}{2} \times \sqrt{4} + 3{\cdot}5 \times 4\frac{1}{2}^{\frac{3}{2}} = 5 + 33 = 38$ c. ft. per second; $t = 3'\,2''$; $T = 6'$.

(45) Drop of 4 ft.—

$d = 4\frac{1}{4}$ ft.; D of 1 ft. length $= 5 \times \frac{1}{4} \times \sqrt{4} + 3{\cdot}5 \times 4{\cdot}25^{\frac{3}{2}} = 2{\cdot}5 + 30{\cdot}66 = 33$ c. ft. per second; $t = 3$ ft.; $T = 5'\,10''$.

(46) Drop of 4 ft.—

$d = 4$ ft.; D of 1 ft. length $= 3{\cdot}5 \times 4^{\frac{3}{2}} = 8 \times 3{\cdot}5 = 28$ c. ft. per second; $t = 2'\,10''$; $T = 5'\,8''$.

(47) Drop of 4 ft.—

$d = 3\frac{3}{4}$ ft.; D of 1 ft. length $= 3{\cdot}5 \times 3\frac{3}{4}^{\frac{3}{2}} = 3{\cdot}5 \times 7{\cdot}33 = 26$ c. ft. per second; $t = 2'\,8''$; $T = 5'\,6''$.

(48) Drop of 4 tt.—

$d = 3\frac{1}{2}$ ft. D of 1 ft. length $= 3{\cdot}5 \times 3\frac{1}{2}^{\frac{3}{2}} = 23$ c. ft. per second; $t = 2'\,6''$; $T = 5'\,4''$.

(49) Drop of 4 ft.—

$d = 3\frac{1}{4}$ ft.; D of 1 ft. length $= 3{\cdot}5 \times 3{\cdot}25^{\frac{3}{2}} = 3{\cdot}5 \times 5{\cdot}85 = 20$ c. ft. per second; $t = 2'\,3''$; $T = 5'\,1\frac{1}{2}''$.

(50) Drop of 4 ft.—

$d = 3$ ft.; D of 1 ft. length $= 3{\cdot}5 \times 3^{\frac{3}{2}} = 18$ c. ft. per second; $t = 2'\,1\frac{1}{2}''$; $T = 4'\,11''$.

(51) Drop of 4 ft.—

$d = 2\frac{1}{2}$ ft.; D of 1 ft. length $= 3\frac{1}{2} \times 2\frac{1}{2}^{\frac{3}{2}} = 3\frac{1}{2} \times 3{\cdot}95 = 14$ c. ft. per second; $t = 1'\,9''$; $T = 4'\,9''$.

(52) Drop of $3\frac{1}{2}$ ft.—

$d = 3\frac{1}{2}$ ft.; D of 1 ft. length $= 3{\cdot}5 \times 3\frac{1}{2}^{\frac{3}{2}} = 3{\cdot}5 \times 6{\cdot}55 = 23$ c. ft. per second; $t = 2'\,6''$; $T = 4'\,11''$.

(53) Drop of $3\frac{1}{2}$ ft.—

$d = 3$ ft.; D of 1 ft. length $= 3{\cdot}5 \times 3^{\frac{3}{2}} = 3{\cdot}5 \times 5{\cdot}19 = 18$ c. ft. per second; $t = 2'\,1\frac{1}{2}''$; $T = 4'\,9''$.

(54) Drop of 3 ft.—

$d = 4$ ft.; D of 1 ft. length $= 5 \times 1 \times \sqrt{3} + 3{\cdot}5 \times 3^{\frac{3}{2}} = 5 \times 1{\cdot}732 + 3{\cdot}5 \times 5{\cdot}19 = 27$ c. ft. per second.

(55) Drop of 3 ft.—

$d = 3\frac{1}{2}$ ft.; D of 1 ft. length $= 5 \times \frac{1}{2} \times \sqrt{3} + 3{\cdot}5 \times 3^{\frac{3}{2}} = \frac{5}{2} \times 1{\cdot}732 + 18 = 22$ c. ft. per second.

(56) Drop of 3 ft.—

$d = 3\frac{1}{4}$ ft.; D of 1 ft. length $= 5 \times \frac{1}{4} \sqrt{3} + 3{\cdot}5 \times 3^{\frac{3}{2}} = 20$ c. ft. per second; $t = 2'\,3''$; $T = 4'\,5''$.

(57) Drop of 3 ft.—

$d = 3$ ft.; D of 1 ft. length $= 3{\cdot}5 \times 3^{\frac{3}{2}} = 18$ c. ft. per second; $t = 2'\,1\frac{1}{2}''$; $T = 4'\,3''$.

(58) Drop of 2 ft.—

$d = 4\frac{1}{2}$ ft.; D of 1 ft. length $= 5 \times 2\frac{1}{2} \times \sqrt{2} + 3{\cdot}5 \times 2^{\frac{3}{2}} = 12{\cdot}5 \times 1{\cdot}414 + 3{\cdot}5 \times 2{\cdot}83 = 27{\cdot}5$ c. ft. per second; $t = 3'\,2''$; $T = 4'\,9''$.

(59) Drop of 2 ft.—

$d = 4$ ft.; D of 1 ft. length $= 5 \times 2\sqrt{2} + 3{\cdot}5 \times 2^{\frac{3}{2}} = 14{\cdot}14 + 9{\cdot}90 = 24{\cdot}04$ c. ft. per second; $t = 2'\,10''$; $T = 4'\,5''$.

(60) Drop of 2 ft.—

$d = 3\frac{1}{2}$ ft.; D of 1 ft. length $= 5 \times 1\frac{1}{2} \sqrt{2} + 3{\cdot}5 \times 2^{\frac{3}{2}} = 20{\cdot}5$ c. ft. per second; $t = 2'\,6''$; $T = 3'\,11''$.

DATA.

Data for 100 cubic feet of concrete in surki mortar.

	RS.	A.	P.
1,500 bricks ($8'' \times 4'' \times 1\frac{3}{4}''$) at Rs. 4–8–0 per 1,000	6	12	0
6 parahs of chunam at As. 8 per parah	3	0	0
$7\frac{1}{2}$ parahs of sand at 6 pies per parah	0	3	9
$4\frac{1}{2}$ parahs of surki at As. 8 „	2	4	0
6 men coolies for breaking and ramming at As. 4 each	1	8	0
12 women coolies at As. 2 each	1	8	0
Contingencies	0	12	3
Total for 100 cubic feet ...	16	0	0

Note.—These rates have been used in the Vadavar-Pattukkóttai channel and distributaries. In places where brick and lime can be manufactured at the spot, a rate of Rs. 14 is allowed (*i.e.*) in the course of Vadavar.

Data for 100 cubic feet of ground-moulded brick in surki mortar.

	RS.	A.	P.
1,500 bricks (ground moulded) at Rs. 7–4–0 per 1,000	10	14	0
5 parahs of lime at As. 8 per parah	2	8	0
$6\frac{1}{4}$ parahs of sand at 6 pies per parah	0	3	$1\frac{1}{2}$
$3\frac{3}{4}$ parahs of surki at As. 8 per parah	1	14	0
2 bricklayers at As. 6 each	0	12	0
2 bricklayers at „ 5 „	0	10	0
2 men coolies at „ 3 „	0	6	0
4 women coolies at As. 2 each	0	8	0
3 boys at As. $1\frac{1}{2}$ each	0	4	6
Total for 100 cubic feet ...	17	15	$7\frac{1}{2}$
Or say ...	18	0	0

Note.—These rates have been used in the Vadavar-Pattukkóttai channel and distributaries. In places where bricks and lime can be manufactured at the spot, a rate of Rs. 16 is allowed (*i.e.*) in the course of Vadavar.

Data for 100 cubic feet of table-moulded brick in surki mortar ($9'' \times 4\frac{3}{8}'' \times 2\frac{3}{4}''$).

	RS.	A.	P.
1,500 bricks (table moulded) at Rs. 9–12–0 per 1,000	14	10	0
5 parahs of lime at As. 8 per parah	2	8	0
$6\frac{1}{4}$ parahs of sand at 6 pies per parah	0	3	$1\frac{1}{2}$
$3\frac{3}{4}$ parahs of surki at As. 8 per parah	1	14	0
2 bricklayers at As. 7 each	0	14	0
2 bricklayers at „ 6 „	0	12	0
2 men coolies at „ 3 „	0	6	0
4 women coolies at As. 2 each	0	8	0
3 boys at As. $1\frac{1}{2}$ each	0	4	6
Total for 100 cubic feet ...	21	15	$7\frac{1}{2}$
Or say ...	22	0	0

Note.—These rates have been used in the Vadavar-Pattukkóttai channel and distributaries. In places where bricks and lime can be manufactured at the spot, a rate of Rs. 20 is allowed (*i.e.*) in the course of Vadavar.

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Data for 100 cubic feet of cement concrete with river gravel.

	RS.	A.	P.
100 cubic feet of river gravel at Rs. 1–9–0 per cubic foot ...	10	15	0
11 „ of cement at Rs. 2–15–10 per cubic foot ...	32	14	2
33 „ of sand at 5 pies per cubic foot	0	13	9
Labour, etc.	3	5	1
Total for 100 cubic feet ...	48	0	0

Data for 100 cubic feet of gravel backing.

	RS.	A.	P.
100 cubic feet of gravel, quarrying or digging, etc.	1	3	0
Laying charge, etc.	1	0	0
Cart-hire for a distance of 18 miles at As. $1\frac{1}{2}$ per cart-load per mile allowing five cart-loads for 100 cubic feet	11	13	0
Total for 100 cubic feet ...	14	0	0

Data for 100 cubic feet of laterite stones from Manganur, etc., near Gandarvakóttai to tank site.

	RS.	A.	P.
100 cubic feet or $3\frac{3}{4}$ cubic yards, at site	2	0	0
Packing charges	2	0	0
Cart-hire for a distance of 22 miles at As. 1–9 per cart-load per mile allowing 9 cart-loads for 100 cubic feet	21	10	0
Excess charge for packing in deep portions	1	6	0
Total for 100 cubic feet ...	27	0	0

Data for 100 cubic feet, arch work.

	RS.	A.	P.
1,500 bricks (table moulded) at Rs. 9–12–0 per 1,000	14	10	0
5 parahs of lime at As. 8 per parah	2	8	0
$6\frac{1}{4}$ parahs of sand at 6 pies per parah	0	3	$1\frac{1}{2}$
$3\frac{3}{4}$ parahs of surki at As. 8 „	1	14	0
3 bricklayers at As. 10 each	1	14	0
2 bricklayers at „ 6 „	0	12	0
2 men coolies at „ 3 „	0	6	0
4 women coolies at As. 2 each	0	8	0
3 boys at As. $1\frac{1}{2}$ each	0	4	6
Centering of arch contingent work	1	0	$4\frac{1}{2}$
Total ...	24	0	

List of Bench Marks.

	Description.	Value above M.S.L.
1	Bench mark on platform of Calingarayen channel head-sluice ...	544·40
2	,, on stone by the side of store-room at Calingarayen channel head	548·10
	,, No. 1, Public Works Department stones	558·08
	,, ,, 2 ,, ...	551·56
	,, ,, 3 ,, ...	557·40
	,, ,, 4 ,, ...	552·32
	,, ,, 5 ,, ...	620·80
	,, ,, 6 ,, ...	618·90
	,, ,, 7 ,, ...	598·01
	,, ,, 8 ,, ...	594·32
	,, ,, 9 ,, ...	593·33
	,, ,, 10 ,, ...	555·99
	,, ,, 11 ,, ...	611·06
	,, ,, 12 ,, ...	599·61
	,, ,, 13 ,, ...	598·75
	,, ,, 14 ,, ...	609·03
	,, ,, 15 ,, ...	611·47
	,, ,, 16 ,, ...	613·56
	,, ,, 17 ,, ...	618·97
	,, ,, 18 ,, ...	616·98
	,, ,, 19 ,, ...	631·20
	,, ,, 20 ,, ...	632·44
	,, ,, 21 ,, ...	640·07

CAUVERY PROJECT.

West Side Channel.

Bench mark No.		Description.	Value above M.S.L.
1	Bench mark	on P.W. stone No. 21 on road from Bhavani to Koneripuram	640·07
2	,,	on B stone in forest line	659·64
3	,,	on rock chiselled	665·37
4	,,	on ,, ...	...
5	,,	on stone placed at the top of face wall of a well, east of line	649·20
6	,,	on rock chiselled	649·58
7	,,	on ,, ...	646·93
8	,,	on ,, ...	666·65
9	,,	on 8th mile 4th furlong stone on Ammapet-Andiyur road	652·19
10	,,	on 6th mile 4th furlong on Ammapet-Andiyur road	646·06
11	,,	on crest of weir of Punachiri tank	659·15
12	,,	on boundary stone	652·06
13	,,	on kandam stone	651·97
14	,,	on rock chiselled	637·10
15	,,	at the eastern corner of Devastanam platform in front of Perumal Koil at Kalianur	643·71
16	,,	on 5th mile 1st furlong on Paravachy road ...	643·86
17	,,	on demarcation stone east of Chinnavadumupalayem	645·00
18	,,	demarcation stone, on boundary line between Punachi and Jambai	644·13
19	,,	on demarcation stone, ...	642·12
20	,,	on ,, south of Vellamathur ...	626·58
21	,,	on Kandam stone, north of Appakadal ...	628·89
22	,,	on rock chiselled	630·82
23	,,	on demarcation stone, west of Osapathy on left margin of the stream	612·60
24	,,	on 11th mile 6th furlong stone	620·58

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CAUVERY PROJECT.—*cont.*

East Side Channel.

Bench Mark No.		Description.	Value above M.S.L.
1	Bench mark	on Public Works Department stone No. 3 ...	666·57
2	,,	on Public Works Department stone No. 1 ...	630·03
3	,,	on demarcation stone	650·00
4	,,	on rock	654·42
5	,,	,, ...	653·05
6	,,	,, ...	650·85
7	,,	,, ...	663·66
8	,,	,, ...	641·39
9	,,	,, ...	647·43
10	,,	,, ...	643·51
11	,,	,, ...	660·73
12	,,	on demarcation stone	647·53
13	,,	on boundary stone close to road	647·31
14	,,	on demarcation stone	639·02
15	,,	,, ...	637·40
16	,,	on plug hole of sluice	623·06
17	,,	on crest of escape	645·34
18	,,	on rock	638·04
19	,,	on demarcation stone	631·59
20	,,	on crest of Chittar dam	639·61
21	,,	on parapet of sluice in rear	637·64
22	,,	on rock	629·18
23	,,	on crest escape of supply channel	634·10
24	,,	on crest of surplus weir	630·51
25	,,	on rock	634·73
26	,,	on demarcation stone	621·26
27	,,	on rock	634·28
28	,,	,, ...	632·77
29	,,	,, ...	627·46
30	,,	,, ...	636·25
31	,,	on demarcation stone	613·27
32	,,	on rock	606·61
33	,,	on demarcation stone	626·89
34	,,	on rock	623·95
35	,,	,, ...	626·75
36	,,	on rock in the weir of tank	632·91
37	,,	on rock	620·14
38	,,	,, ...	620·64
[illegible]	,,	,, ...	611·99
[illegible]	,,	on rock	609·99
[illegible]	,,	on demarcation stone	616·18
42	,,	on rock	642·31
43	,,	,, ...	613·50
44	,,	on tar mark on rock	613·43
45	,,	on rock.	604·41
46	,,	on top front rail culvert	605·99
47	,,	on the 3rd furlongs stone after 5th mile on the road to Thiruchangod from Pallipoliam ...	608·51
48	,,	on rock left of line	600·20
49	,,	do.	609·43
50	,,	on rock east of Pallamanaiken palayam	607·57
51	,,	on top of demarcation stone	600·70
52	,,	in front of Balipudam of Mariammankoil in Kailasapalayam village	608·34
53	,,	on rock	609·05
54	,,	on gomuki stone of the Mariammankoil, south-east of Pannikuttipalayam	597·84
55	,,	on boundary stone between Bommakurichi and mittas	597·68
56	,,	on north-east corner of Garudasthambam platform in front of Perumaulkoil in Permakurichi village	596·27
57	,,	on rock	585·24
58	,,	W.E. Sulipalayam...	590·11
59	,,	on Garudasthambam in front of Veknaswami temple, east of Kondarasampalayam	586·44
60	,,	on boundary stone	643·59

VADAVAR-PATTUKKÓTTAI PROJECT.

Bench Mark List.

Bench Mark No.	Description.	Value above M.S.L.
	Up to brifurcation—	
1	Bench mark on platform of Vadavar head sluice, G.T.S. ...	148·645
2	„ on western corner of guide stone of the second sluice of Vadagal	137·22
3	Bench mark on 35th mile stone	142·03
4	„ on 36th „	137·89
5	„ on 37th „	136·32
6	„ on 38th „	133·40
7	„ on 39th „	129·25
8	„ on crest of weir of Maravanapattu surplus ...	130·07
9	„ on concrete of rear parapet of Valambui channel	131·61
10	Bench mark on springing of and (northern abutment) of bridge on road from Tanjore to Tiruvadi (western road) ...	126·68
11	Bench mark on crest of weir of Puliampallam surplus (eastern-most corner)	122·83
12	Bench mark on top of coping of north abutment (western side).	131·90
13	„ on top of guide stone of Kadakadappy channel sluice	121·50
14	Bench mark on front parapet of Alangudi channel sluice ...	125·40
15	„ on front parapet of sluice just after 47th mile ...	125·18
16	„ on parapet north-east wing return, Saliamangalam bridge	126·07
17	Bench mark on north-west corner of swamy mound (Arasamaram mound) south of Vadavar, Alangudi pathway ...	123·68
18	Bench mark on front parapet of sluice commencing at 49¼ mile	125·15
19	Bench mark on front parapet of Pundi birdge of three arches on the top of parapet of wings return	126·07
20	Bench mark on springing of arch (east abutment) of Saliamangalam Railway bridge of Vadavar	116·26
21	Bench mark on front of parapet of Puliakudi channel ...	114·52
	Portion below bifurcation of Vadavar—	
1	Bench mark on sill of Kambayanatham tank channel sluice...	105·65
2	„ on plinth (3rd Step) of syphon sluice, 54¼ mile	[illegible]
3	Bench mark, Kambayanatham sluice sill	[illegible]
4	„ Surakotti sluice sill	[illegible]
5	„ on top of left wing of Sathanur dam	93·09
6	„ „ „ crest	88·00
	Pattukkóttai new channel—	
1	Bench mark on Public Works Department stone on the right bank opposite to starting point	113·57
2	Bench mark on Kandam stone common boundary of Thirubuvanam, Kambayanatham, Raghava Ammalpuram ...	112·46
3	Bench mark on top of Kandam stone	121·43
4	„ on the crest of weir of Vari	105·95
5	„ on the centre of front parapet of road bridge near $\frac{1}{2}$1 mile stone in Tanjore-Mannárgudi road	108·78
6	Bench mark on $\frac{1}{2}$1 mile stone	105·92
7	„ on theodalite boundary stone of Kulamangalam, Ponnapur Kilpadi and Ponnapur Melpadi	105·44
8	Bench mark on boundary stone of Ponnapur Kilpadi, Kannandangudi Kilpadi and Kannandangudi Melpadi ...	114·71
9	Bench mark on demarcation stone east of Malaiyeri Ammankoil	106·30
10	Bench mark on top of step just below door way of Siva temple, west of Chettikulam	113·10
11	Bench mark on parapet of culvert No. 34 on Tanjore-Pattukóttai road	101·50
12	Bench mark on crest of Vallanakudi tank weir	93·60

APPENDIX A.

From R. BRUCE-FOOTE, Esq., F.G.S., F.M.U., late Superintendent, Geological Survey of India, to the Chief Engineer for Irrigation, dated Yercaud, 30th June 1903.

In compliance with G.O., No. 539 I. of the 19th May 1903, I proceeded to join Mr. Moss at Erode on hearing from him that the trial pits connected with the dam sites on the Cauvery and Bhaváni rivers were ready for inspection. We travelled as expeditiously as possible to his camp near Nerinjipet on the 12th instant and devoted the two following days to examining all the rocks exposed in both banks in the trial pits and in the bed of the river. The opinion I then formed as to the nature and suitability of the rocks I have embodied in the annexed memorandum No. I.

On completion of the examination of the Seccanur dam site, we returned to Erode and proceeded by rail to Karaimadai station and marched thence to Mr. Moss's camp at Valiangadu on the 16th. On the 17th we visited the Bhaváni valley and the site of the projected reservoir at Thonday.

Our visit was well-timed and a very fine day allowed of the inspection of the dam site being [illegible] the river not being in flood. This was the more fortunate, as on the following morning [illegible] set in for many hours.

My opinion of the nature and fitness of the rocks at the proposed site is given in memorandum No. II herewith annexed.

I returned here on the 19th and a few days later received from Mr. Moss the set of rock specimens from the Seccanur site that Mr. Middlemiss had examined, and after very careful examination of them and comparison with the specimens procured during my visit, formed the opinion I have given in memorandum No. I.

P.S.—It would be very wrong of me if I were to omit my warm thanks to Mr. Moss for the great assistance he gave most courteously.

I.—Memorandum on the rocks of the Seccanur Dam site.

Careful inspection was made of the rocks on both sides of the Cauvery at the site at which Mr. Moss would, for engineering reasons, build the dam of the great projected reservoir.

The rocks on the right (western) bank are massive charnockites, or hypersthene granites, than which nothing better could be desired as foundations. The examination of the left bank, however, showed that there was some ground for Mr. Middlemiss' objection that the gneisses which form the mass of the rocks on the Salem side of the river are not equal in quality to the harder and denser granites just referred to, which form the right bank, and occur in the bed of the river [illegible] its middle. I do not think, however, that it will be necessary for that [illegible] selected by Mr. Moss, though the foundations of the dam will undoubt[illegible] laid deeper on the left or eastern side so as to reach rock which is quite sound and unweathered. In most places the gneiss in question would be held to be good and durable rock though not the equal to the charnockite. The specimen No. 7 which Mr. Middlemiss condemns so strongly is not a fairly representative one being greatly weathered; a newer one from the same pit (No. 7) but taken from a greater depth is very different. It is quite unweathered, hard and compact and shows no puckering of the foliation and no shearing on microscopic examination. It is a stronger rock than the epidiorite No. 6. No. 8 pit yielded from a greater depth a grey rather than pink gneiss of hard and tough character not at all fissile under the hammer, like the weathered specimen upon which Mr. Middlemiss formed his opinion as to its inferiority.

The rocks in the river bed appear to be hard gneisses with a band of hard black Trappoid close into the left bank. They form well marked reefs across the river at the dam site which would not be the case were they soft untrustworthy rocks. Had they been such, they would have been entirely cut away and a pool would have been formed there instead of a very appreciable rapid.

Should, however, further testing of the softer bands of the left bank Nos. 6, 7 and 8 (Mr. Middlemiss' epidiorite and gneiss) show them to be perfectly unreliable, a result I do not at all anticipate, Mr. Moss' lower site below Pudur appears to offer good foundation rocks in shape of strong beds of hard gneiss which cross the river diagonally.

The band of massive charnockite of the right bank crosses the bed of the Cauvery diagonally some distance above the Seccanur site and rises into the hill ridge at Totylapatti, but a dam in that position would, as Mr. Moss pointed out, offer many fewer engineering advantages.

(Signed) R. BRUCE-FOOTE, F.G.S., F.M.U.

II.—Memorandum on the rocks of the Thonday Dam site.

The rocks exposed in the bed of the Bhaváni and on the slopes of the valley and partly exposed in the trial pits sunk on either side of the river consist mostly of micaceous gneisses forming part of a great series running parallel with the general axis of the river valley and seemingly parallel also with the gneissic beds forming the south-easterly slope of the Nilgiris.

The beds exposed on the slopes and in the several trial pits are dark gneisses of ordinary character, but the rock exposed in the bed of the river is a pale fine-grained slightly micaceous gneiss, much crumpled in parts, but notwithstanding this, a strong well-compacted stone, capable of bearing great pressure and very fit to form the foundation of the central and most important section of the great dam here projected. The edges of this band of rock are not exposed in the bed of the river nor does it appear in the adjoining trial pits, so its exact width is not known; but it is greater than the width of the river bed. The darker gneisses exposed in the trial pits on either side dip downwards at high angles approaching to vertical. All the specimens I saw that had been obtained from a depth below that to which weather action had penetrated were good, strong, durable rock fully equal to any weight likely to be put upon them and for that reason, I think that the site generally will be found to be a well-selected one. Its topographical fitness for the construction of a great reservoir is very obvious.

(Signed) R. BRUCE-FOOTE, F.G.S., F.M.U.

Addendum.

From BRUCE-FOOTE, Esq., F.G.S., F.M.U., late Superintendent, Geological Survey of India, to the Chief Engineer for Irrigation, dated Yercaud, 20th July 1903, No. 2.

With reference to the question you put to me in your note * of the 17th instant, I should like to strengthen the opinion I expressed in my memorandum of the Seccanur dam site with regard to the supposed weakness of the rock exposed in pit No. 7, which rock Mr. Middlemiss condemned on the evidence of a specimen procured from too small a depth below the surface and therefore considerably weathered. The rock examined by me and procured from a greater depth in the same pit was a good, hard, compact material and unweathered, not showing puckering of the foliation or signs of shearing.

* Demi-official letter from the Chief Engineer for Irrigation.

Similarly the gneiss obtained by me from No. 8 pit was a good sound tough rock far from fissile under the hammer.

I am distinctly of opinion that by excavating the rocks to a sufficient depth thoroughly good and safe foundations will be obtained.

Order—No. 740 I., dated 4th August 1903.

Communicated to the officers concerned for information in continuation of [illegible] I., dated 19th May 1903.

(True Extract.)

(Signed) J. P. DAVIDSON,
Ag. Joint Secretary to Government,
Irrigation Branch.

CAUVERY RESERVOIR PROJECT.

Report on rock specimens from foundations of proposed dam, by C. S. Middlemiss, B.A., F.G.S., Superintendent, Geological Survey of India.

The specimens from pits Nos. 1—4 on the Coimbatore side (right bank of the river) are all charnockite (hypersthene-bearing gneisses); Nos. 1, 3 and 4 being massive varieties and No. 2 a fine-grained variety—probably a vein. All are good, strong, sound rocks.

Those from pits Nos. 5—8 on the Salem side (left bank) are various representatives of the mixed gneisses (gneiss complex) of the Salem and Coimbatore plains. No. 5 is a good strong, coarsely-banded gneiss, the quartzo-felspathic and ferro-magnesian layers being about one inch across. There is no fault to find with it and it is probably as satisfactory as the charnockites. No. 6 is a fine-grained pale greenish grey horn-blende schist, finely foliated and sheared. It probably occurs as a local band in No. 5, and was probably once a dyke or intrusive sheet, now altered by intense crushing to an epidiorite. It is not so satisfactory a rock as any of the others hitherto described, and probably the edges of this band are much less so, where they