

(1) Number of pages _____

(2) Date of repair _____

(3) Initials of the Referencer _____

MADRAS RECORD OFFICE.**Government of Madras.***Public Works* **DEPARTMENT.**G.O. No. 355 (W)

Press
<u>Mis.</u>

Dated 5-7-1877.

Not to be folded or roughly handled

GOVERNMENT OF MADRAS

PUBLIC WORKS DEPARTMENT

5th July 1877, No 355 W.

Buildings and Roads

Civil Works

Read the following paper —

No 37 From Lieutenant-Colonel H T ROGERS, R E, Principal, Civil Engineering College, to the Chief Engineer, Public Works Department, Buildings and Roads, dated Chepauk, 5th May 1877, No 133 C.

At the request of Mr J. Bradshaw, 1st Assistant Master of the Civil Engineering College, I have the honor to forward herewith a model of a "Surf Catcher" designed by that gentleman together with a printed letter to my address explaining the model

The points of the design which display novelty appear to be these—

1st.—The complete isolation from the shore of the mass of stone on which the breaking waves are to throw themselves thus preventing the deposit of sand between the shore and the work.

2nd.—The diverging pairs of arms providing channels with width decreasing as the waves advance along them, and which therefore raise the level of the unbroken waves and will very materially increase the amount of water supplied by them when they break

2 The work is one which, I think, is well deserving of consideration, but instead of a trough permanently set up, I would suggest an iron trough of plate iron sufficiently stiff to support itself for 50 feet and made in lengths of 100 feet which might rest on rollers fixed on screw-pile piers 50 feet apart and could be easily removed on the approach of a storm, it would then form a kind of tubular draw bridge, and some slight modifications would render it an excellent boat pier accessible in ordinary weather.

From J BRADSHAW, Esq, 1st Assistant Master, Civil Engineering College, to Lieutenant-Colonel H T ROGERS, R E, Principal, Civil Engineering College, dated Madras, 17th April 1877

THE attention of all interested, either in the sanitary condition of Madras, or in the cultivation of salt on our coasts must have been directed to the efforts made,— firstly, to take advantage of the action of the surf in replenishing the Cooum and in keeping open drainage-nullahs, and, secondly, to supply the salt pans opposite the villages of Kattiwauk and Ennore with water by opening the bar inwards at the mouth of the river Cortelliar. The former aims at utilizing the action of waves in the last stage of dissipation, and the latter at raising the level of the Ennore lake to that of mean or high tide. As regards results viewed as an *experiment*, the former has been a success, the latter generally a failure

2. I am deeply impressed with the great value, for purposes of keeping open the mouths of drains and of obtaining pure water for salt cultivation, of the action of the waves, whether in a state of vibration or at any period between the vibratory portion of the water coming in contact with the ground and the last throes of the disorganized surf on the shore

3 Fatal as this coast is said to be to shipping, difficult of access as the roadstead is from the shore, few examples of atomic action are so beautiful and so reliable for many purposes as the waves on the coast of Madras. It would be bootless here to inquire what the various causes of

the surf in Madras are and how far the surf affects the formation of the coast, or the coast the formation of the surf. We see the main facts, and, assuming the constancy of a curve in a contour line taken from the shore on the sand seaward to deep water or water below the lowest wave hollow, the form and action of the wave as it breaks could not only be accounted for but predicted with absolute certainty, and *vice versa*.

4 I shall, however, point to the rough facts, especially as great accuracy would be practically superfluous. It is usual to speak in Madras of the surf as consisting of three breakers. The custom does much to establish a point of great importance, for it may be said to assert the fact that a sharp line is ordinarily observed to be drawn between the water under the influence of regular oscillation and the area of irregular perturbation. If the waves are of purely oceanic origin, commonly called "ground-swell," we frequently have examples of the "league long roller." If the oscillation is of a more complicated character, so that the ridges of the waves make an angle with the coast line, the white foam is formed as it were in *echelon*. This shows that the undulation is interrupted by a bank parallel to the coast line. If the amplitude of the waves is small, what is called the second breaker disappears and fishermen sit on their catamarans between the shore and this bank. If the amplitude is still less, oscillation is not disturbed, and we see the bank through the clear water. Between the bank and the coast line there is frequently ten feet of water, and the bank is sometimes within thirty yards of the shore.

5 Although the description I have given is somewhat vague and wanting in the definiteness with which a contour of the bed of an English sea can be laid down, still a fair idea of the normal condition of the bed of perturbed water can be gathered. But, with reference to any bench mark, neither bank nor internal basin nor shore line is permanent. All of these advance and retreat periodically, without maintaining even their relative positions, the waves having a tendency to deposit sand on the beach, and then, by causing the lower deposit to act as a wedge, raise the higher, while, on the other hand, the currents have generally an abrading effect.

6 Some of the surf passing along the shore contains as much sand as water, and thus the bank may be said to have, in part, a littoral motion. If this motion is opposed by the interposition of a heavy body connected with the shore, the sand accumulates on one side of that body, and the bank disappears for some distance from the other. The effect therefore of a heavy body being placed athwart the north and south currents must ultimately be to accumulate sand on both sides within limits not yet determined, but varying in practical effect, in some unknown relationship inversely as the length of the obstruction.

7 Now the difficulty of raising the level of the E more lake is one with the difficulty of keeping open the mouths of drainage nullahs. It is not water that the Engineer has to deal with but mud or minute sand and water. The sand, once inland for the most part remains there, and some of it is intercepted at the "bar," so that a considerably less weight seeks an outlet than that which entered.

8 This would lead to the consideration of how purer water can be obtained economically for the required purposes. There is no doubt that, until a wave becomes dissipated by contact with the sand, no sand is held in suspension. The component parts of the wave again have only vertical motion, and, unless attacked by severe gusts of wind, this vertical vibration continues until the ground is struck. The re-action of the bank causes the wave to stagger back a little, but the vertical motion of its later phases raises its crest higher, and pushes it forward, while the re-actionary force of the bank brings the whole down. If it falls upon a portion of water not greatly disturbed, this merely forms a cushion along which the fallen water runs some distance without commingling.

9. It is between the time of first striking and amalgamation with the previously disturbed water, corresponding to a distance frequently of fifty yards, that I propose to deal with the water action. I propose to meet it with structures of which I forward the models. The dimensions, which are merely suggestive, are placed upon the models which are made on the scale of an inch to a foot. The horse shoe portion I would place seaward. It will meet the waves somewhere in the stage before described, and it is unnecessary to say that, unless they are abnormally small, they must rise up the slopes the more rapidly on account of the constraint they are subjected to, and discharge themselves into the trough prepared for them. The smaller waves would enter the gap and break inside, sometimes throwing water into the trough and sometimes recoiling for want of energy. The volume of water thus obtained would be dependent upon the height and period of the waves, and upon the magnitude and perfection of the structure made to receive them. But I imagine that past experience will lead to the conclusion that nature will do her part though it may be irregularly. The magnitude will also, I think, be more of a question to be considered than any points relating to mere form, as the waves present themselves in different phases and from different directions. A form that would exactly suit one wave or one breaker would not suit another.

10 I have, therefore, proposed rectilinear dimensions as being simpler than any other, and I propose to take advantage not only of the roller from the sea but of more errant undulations, which, otherwise, could only expend themselves on the side of the proposed structure.

11 For those purposes I have projected four small spurs. A wave coming between any two adjacent ones will have its action contracted and intensified until it reaches the vortex of the angle formed by them, when it will expend itself in taking a bound into the receptacle prepared for it. To prevent any rapid silting up I would interfere as little with the coast line as possible, bringing the water from the first receptacle through a wooden channel or iron or earthenware pipes on piles, so that the currents might pass between the receiving trough and the shore.

12 With regard to the depths of the receiving trough and discharge channel it is sufficient that the former should always contain water to receive the water bounding into it as on a cushion. It is quite feasible to have this so placed that it would be well supplied at, say, four feet above ordinary high tides. The incoming water, in the case of the Cooum, for instance, could then be led along the bank and discharged into the river near the boat house or wherever it might be deemed desirable.

13 If this proposition were put forward upon peculiarly theoretical grounds, it would, I think, be deserving of all consideration. But its value may be said to be based on practical observation. I have seen tons of water vault over the rocks on the beach at Mahablipooram and Covelong inviting the Engineer to catch them and lead them into salt pans. When the waves used to break against what was called Colonel deHaviland's wall, the road was frequently covered with water. Since the shore has advanced seawards, contact with the groynes has caused the water to be thrown up to heights much greater than is necessary for the successful carrying out of my proposal. I would point also to the Harbour Wall at Royapooram, and to the wall to the north of the drain at the same place, as affording instances decisive of the power of obstructions to raise the surf water in large volumes.

14 In speaking of the material of the proposed surf catcher, I can merely suggest as, if the question is seriously considered, as I hope it will be, the decision will be left to gentlemen thoroughly conversant with the subject. It has occurred to me, however, that piles might be placed at intervals of, say, four feet, and that the trough which I have proposed might be made of wood and fastened to them. In order that it may receive deposits of sand I propose that this trough be deeper than the artificial discharge channel. The rest of the structure I would have of stone from Palaveram or Mahablipooram. One objection to this surf catcher is that it will require repairs, but such an objection, if valid here, would be condemnatory of all marine works, and it is certain that all repairs, including possible extension seaward, would be an improvement, as far as stability is concerned, on the original work. As the piles would be one with the whole, I do not think they would require driving to any great depth. They might be subjected to a constant vertical pressure for a time as some piles driven by the Railway Company in soft material have been.

15 Instead of the woodwork that I have suggested, a ship's water tank (or more of them) such as now lies on the beach might be used with the top taken off and one of the sides partially cut down.

16 I have thus considered the want of salt water, a mode of obtaining it, and how to avoid silt accumulating about the structure. The want is severely felt now, and will be until the great Pulicat lake is filled. There is nearly always a want of it for the drainage nullahs. The mode of obtaining it suggested by me is artificially to contract the waves or rolling surf, according to the position for the time being of the outer bank, and thus raise the water in them. I propose to avoid an advance of the shore or a rapid accumulation of sand by making the principal structure an island.

I have now the honor to ask you kindly to consider the scheme with a view to your sending it to Government with the advantage of your criticism.

No. 38. ORDER THEREON, 5th July 1877, No. 355 W.

RECORDED, and resolved that Mr. Bradshaw be thanked for the design he has submitted.

(True Extract)

Colonel, R.E.,

Secretary to Government, P.W.D.

To the Principal of the Civil Engineering College.

„ Revenue Department

For E.C. Shunker

Spare Copies

Ch. College
 5 May 77.
 My dear Lord
 Herewith the model
 of "Bradshaw's surf catcher"
 If possible there will be
 no time for you to take
 up such a question as this
 but I think
 just now -
 Bradshaw might have
 a letter of thanks for
 his "ingenious & novel" design
 the general principle of
 which will no doubt

From

JAMES BRADSHAW, Esq.,

First Assistant Master, Civil Engineering College,

To

Lieut-Colonel H T ROGERS, R E,

Principal, Civil Engineering College

SIR,

The attention of all interested either in the sanitary condition of Madras, or in the cultivation of salt on our coasts must have been directed to the efforts made,—
 Firstly, to take advantage of the action of the surf in replenishing the Cooum and in keeping open drainage-nullahs, and, Secondly, to supply the salt pans opposite the villages of Kattiwauk and Ennore with water by opening the bar inwards at the mouth of the river Cortelliar. The former aims at utilising the action of waves in the last stage of dissipation, and the latter at raising the level of the Ennore lake to that of mean or high tide. As regards results, viewed as an *experiment*, the former has been a success, the latter generally a failure.

2 I am deeply impressed with the great value, for purposes of keeping open the mouths of drains and of obtaining pure water for salt-cultivation, of the action of the waves, whether in a state of vibration or at any period between the vibratory portion of the water coming in contact with the ground and the last throes of the disorganised surf on the shore.

3 Fatal as this coast is said to be to shipping, difficult of access as the roadstead is from the shore, few examples of atomic action are so beautiful and so reliable for many purposes as the waves on the coast of Madras. It would be bootless here to enquire what the various causes of the surf in Madras are, and how far the surf affects the formation of the coast, or the coast the formation of the surf. We see the main facts, and, assuming the constancy of a curve in a contour line taken from the shore on the sand seaward into deep water or water below the lowest wave-hollow, the form and action of the wave as it breaks could not only be accounted for but predicted with absolute certainty, and *vice versa*.

4 I shall, however, point to the rough facts, especially as great accuracy would be practically superfluous. It is usual to speak in Madras of the surf as consisting of three breakers. The custom does much to establish a point of great importance, for it may be said to assert the fact that a sharp line is ordinarily observed to be drawn between the water under the influence of regular oscillation and the area of irregular perturbation. If the waves are of purely oceanic origin, commonly called "ground-swell," we frequently have examples of the "league long roller." If the oscillation is of a more complicated character, so that the ridges of the waves make an angle with the coast line, the white foam is

W.D.
7 JUN 77
6335

4

to me, however, that piles might be placed at intervals of, say, four feet, and that the trough which I have proposed might be made of wood and fastened to them. In order that it may receive deposits of sand I propose that this trough be deeper than the artificial discharge channel. The rest of the structure I would have of stone from Palaveram or Mahablipooram. One objection to this surf-catcher is that it will require repairs, but such an objection if valid here, would be condemnatory of all marine works, and it is certain that all repairs, including possible extension seaward, would be an improvement, as far as stability is concerned, on the original work. As the piles would be one with the whole, I do not think they would require driving to any great depth. They might be subjected to a constant vertical pressure for a time as some piles driven by the Railway Company in soft material have been.

15 Instead of the woodwork that I have suggested, a ship's water tank (or more of them) such as now lies on the beach might be used with the top taken off and one of the sides partially cut down.

16 I have thus considered the want of salt water, a mode of obtaining it, and how to avoid silt accumulating about the structure. The want is severely felt now, and will be until the great Pulicat lake is filled. There is nearly always a want of it for the drainage nullahs. The mode of obtaining it suggested by me is artificially to contract the waves or rolling surf, according to the position for the time being of the outer bank, and thus raise the water in them. I propose to avoid an advance of the shore or a rapid accumulation of sand by making the principal structure an island.

I have now the honor to ask you kindly to consider the scheme with a view to your sending it to Government with the advantage of your criticism.

I have the honor to be,

Sir,

Your most obedient Servant,

W. Bradshaw

Madras
17th April 1877

405 July/77 No. 37

No 355 W Public Works Department

PROCEEDINGS OF THE MADRAS GOVERNMENT.

UNDER date the

Read the following

From the Principal, C. C. College (H. E. No 133, dated 5th May 1877)

Recorded, and re-

solved that Mr Bradshaw
be thanked for the design
he has submitted.

GA7 20/6

*Let
show the design
in (m) in (b)*

Printed by C. E. M. with Mr del
de-
re-
re-

Sept - 14-7-77

W. Bradshaw

W 3335

Govt. of {1877} Madras

PUBLIC WORKS

To

Dated

Issued

Recd

Encl

7/7-7

G O. 5. July 1877, No 353 W

Nos. 37-38

"Surf Catcher" Papers
regarding a model of a —
designed by Mr Bradshaw
1st Asst Master, C. C. College
Recorded and Mr Bradshaw
thanked for the design sub-
mitted

Entered in Register
16-7-77