

(1) Number of pages. _____

(2) Date of repair. _____

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MADRAS RECORD OFFICE

Government of Madras

Public Works DEPARTMENT

G.O. No.	50	(2)	Press
B.P. No.			~~Mis.~~
Dated	10-1-		1876.

Not to be folded or roughly handled

*Proceedings of the Madras Government, Public Works Department,
10th January 1876.*

No. 99. Read the following letter from Lieutenant-Colonel R. F. OAKES, R.E.,
Superintending Engineer, Tanjore, to Lieutenant-Colonel J. MULLINS, R.E.,
Chief Engineer for Irrigation, dated Tanjore, 17th December 1875,
No. 2,356 :—

I HAVE the honor to inform you that before I proceeded to England on furlough I had had a survey made and levels taken of the heads of the Trimulrajaur and Moodicondaur, which branch from the Codamurty near Paupanassem, about 21½ and 25 miles respectively below the Codamurty regulator, and I had hoped, that by this time the regulation of those rivers would have been completed; but finding that nothing had been done, and that the railway from Tanjore to Combaconum crossed the Codamurty and Trimulrajaur about a mile west of Road No. 5, or between the head of the Trimulrajaur and that of the Moodicondaur rivers, and fearing that the regulation of the supply to the above streams might render it necessary for the Railway Engineers to modify their arrangements for bridging the Codamurty and Trimulrajaur, I proceeded to the spot, to examine the locality and to make observations relative to the discharges of the rivers, on the 2nd instant.

2. I need hardly remark that the more correct the regulation at the head of any branch of a river, the more necessary it becomes to regulate the distribution of the water amongst the minor branches of the stream. It has long been known that the regulation of the Codamurty and its branches has been very defective.

3. Road No. 5 crosses the three streams within a distance of 500 yards; and the bridges on that road to a certain, but very limited, extent may be said to regulate the supply to the three streams. The length of waterway of the bridges is as per margin, or as 4, 2 and 3, while the area dependent upon the streams respectively

Acres.	Per Cent.
46,320 Codamurty	120 44.4
36,477 Moodicondaur	60 22.2
14,662 Trimulrajaur	90 33.3

is as 4 (3.1) and (1.25), and the actual distribution in low floods is as 2, 1 and 5, and in high floods as 3, 1 and 2½; this will appear more clearly on a reference to enclosure A, from which it will be observed that, while the lands under the Trimulrajaur are receiving 1½ of what is termed the theoretical supply, the Moodicondaur receives ¼th

and the Codamurty ⅔ths of their theoretical supply, while the undivided stream is carrying ⅓rd of a theoretical supply, i.e., the water instead of being divided as 47.6 to 37.4 to 15, is divided nearly as 22.2 to 11.1 to 66.6, or the rivers are receiving about ½ — ⅔ and four times the supply they should be receiving. In a moderate flood, when the undivided stream carries about 1⅔ a theoretical supply, the rivers receive ⅓, ½ and four times the theoretical supply, or the water is divided as 35.2 to 15.3 to 49.5, and in high floods as 46.6 to 15.5 to 37.9 when the undivided stream is carrying about 3¼ the theoretical supply.

4. In regulating the supply to the three streams it is desirable to regulate up to about 1½ the theoretical supply, and after that to take advantage of the natural capacity of the rivers to carry off flood waters. The Moodicondaur is a high level stream,

while the Trimulrajenaaur is a low level channel; the capacity of the former is very small as will be observed from the fact that

Section A.

the theoretical supply it can carry only $1\frac{1}{2}$ the theoretical supply, while the Trimulrajenaaur carries $9\frac{1}{2}$ its theoretical supply, and this it is desirable the latter should carry in a high flood, as the Codamurty is then carrying as much as it can carry with safety, viz., about $3\frac{2}{3}$ of the theoretical supply, for the lands dependent upon it.

5. The influence of the north-east monsoon has not been felt to any extent in the interior of the country, and hence the rivers have been very low, and in despair of not being able to make observations of discharges at all this season if I delayed doing so any longer, I proceeded to make my observations on the 2nd instant when, as stated above, about $\frac{1}{3}$ rd of the theoretical supply for the lands dependent upon the undivided stream was passing down the rivers, and then there was so little water in the Moodicondanaur that I fear the calculations made for higher floods from observations made in that river may not be so accurate as those for the other streams, though the quantities in high floods tally remarkably well with the calculations of discharge over the regulator at the Codamurty head.

6. The bridges on Road No. 5 have no floors, but they have retaining walls at a low level, that of the Codamurty being covered with 3 feet of sand under three arches, and 18 inches under the 4th arch on the 2nd instant, the calculations were, therefore, made entirely independently of the bridges though the flood levels were obtained from the readings of the gauges on the bridges, and are indicated in Statement A to facilitate a comparison, for the zero of the gauges is on different levels and vary as much as 1.565 feet, while the zero of gauge on Codamurty bridge is 2 feet 1 inch above the top of retaining wall; the levels however are all marked on the accompanying plans.

7. No supply is drawn from the Trimulrajenaaur above the bridge on Road No. 5, and the surplus into the Arsalaur has long been closed, and it was thought before the levels were taken that the Trimulrajenaaur head might be brought down to the Moodicondanaur head, and a regulator for the three streams be built there; but this is out of the question, as the Codamurty has not the capacity to convey the water now carried by the Trimulrajenaaur in high floods from the Trimulrajenaaur to the Moodicondanaur head; the surface level of the water would be raised $3\frac{1}{4}$ feet; as it is the waters of the three streams unite over the Padugay, as there is no bank over the Padugay to divide the Codamurty and Trimulrajenaaur in high floods.

8. A second suggestion which offers itself is to carry the Moodicondanaur head up to *a b* opposite to Paupanassem, and to build the three regulators there in connection with the bridges of the railway feeder from Paupanassem to Kabistalem which will follow the line *a b*. The objection to this is that the Railway Department would have to provide a bridge for the new head of the Moodicondanaur which the line does not now cross, and that the cost of the work would be considerably enhanced, as the sum to be paid for the Padugay only would be about Rupees 60,000.

9. A third suggestion is to regulate the supply to the Codamurty and Trimulrajenaaur only on the line *a b* in connection with the bridges on the railway feeder, and a fourth to place a regulator similar to that built at the Vettaur head at the head of the Trimulrajenaaur.

10. The difference of cost of schemes 3 and 4 would be about Rupees 10,400 in favor of No. 3 to Irrigation, but about Rupees 15,600 to Local Funds if the railway

feeder is to be formed; the line would be about 2 miles, but would be costly, as there

Cauvery.
Arsalaur.

Trimulrajenaaur, and
Codamurty.

are four rivers to be bridged, and, though a convenient line, would not, I think, bring much traffic to the railway, and it is

probable that the Local Fund Board would not be able to provide funds for the road immediately, and perhaps it would be well to undertake the regulator independently of the road.

11. Lest it should be determined that the work is to be built in connection with bridges on the railway feeder, I forward what I consider should be the section of the work, if placed at *a b* the floor of the sluice would be 2 feet above the river bed or floor of the bridge over the Codamurty, and the floor of the bridge over Trimulrajenaaur would be $\frac{1}{2}$ a foot lower, the drop of $2\frac{1}{2}$ feet being broken into two steps if deemed advisable, this would place the floors of the vents about 6 inches below the average bed of the river at the point of bifurcation and would render regulation by the shutters easy; the first fresh or the freshes of the first season would probably raise the level of the beds of the streams to that of the floor of the sluices.

Codamurty, sixteen vents of 10 feet.

Trimulrajenaaur, 10 feet with $4\frac{1}{2}$ feet shutters.

12. The vents provided in the regulators would be as per margin, or nearly in proportion to the quantities now

carried by the two streams during heavy floods.

13. It will be observed from enclosure A, that even in high floods the Moodicondanaur carries only one and a half times the theoretical supply for the lands dependent upon it, and it is believed that the supply to it and the Codamurty may be regulated by alterations to the retaining walls, and by providing a floor to the Codamurty bridge, or perhaps by dam stones under the bridge when a lower apron would probably be necessary, and this might be done without materially affecting the supply the Moodicondanaur would receive during high freshes, and hence no regulating work at its head would be necessary, this question has not been worked out because, as stated in paragraph 5, there are some doubts relative to the accuracy of the discharges by the Moodicondanaur. This regulation for the present is of minor importance; the great requirement of the moment is to regulate the distribution between the Trimulrajenaaur and Codamurty; the set is now completely on the head of the former, and the stream itself has become considerably enlarged during the last two years; what can be done by planting up the bend on the south above the head and by putting up temporary groynes to throw the head of the Trimulrajenaaur into back-water, as it were, has already been ordered, but at first the temporary remedies proposed will not be very effective.

14. The case appears to be of sufficient importance to apply as a special case for the commencement of the regulator during the approaching working season; if this may be done, and intimation is afforded as to what arrangements are approved, the estimate might be submitted in three weeks.

15. If the work cannot be commenced till 1877 the estimate may be sent in later in the year, as there are other works requiring immediate attention, such as the Arsalaur and Veerasholen dams, which must be modified to meet the changes in area of cultivation now found to be dependent upon the streams, and the changes in the regime of the bed of the rivers below the works which have in some respects vitiated the original calculations relative to the works.

Proceedings of the Madras Government, Public Works Department,
10th January 1876.

A.

Statement showing the quantities of Water passing down the Codamurty, Trimulrajenaaur, and Moodicondanaur under various conditions of the floods in 1875, and the proportions these quantities bear to the theoretical supply required for the lands dependent upon the streams.

1875.	TRIMULRAJENAU.			MOODICONDANAUR.			CODAMURTY.			THREE RIVERS.			Corresponding readings on Cauvery gauge at Upper Amicut.
	Acreage, 14,663. Supply required. { 330 cubic feet per 1".			Acreage, 36,477. Supply required. { 821 cubic feet per 1".			Acreage, 46,320. Supply required. { 1,042 cubic feet per 1".			Acreage, 97,459. Supply required. { 2,193 cubic feet per 1".			
Months and Date	Gauge reading on bridge on Road No. 5.	Quantity in cubic feet per second.	Proportion of theoretical supply.	Gauge reading on bridge on Road No. 5.	Quantity in cubic feet per second.	Proportion of theoretical supply.	Gauge reading on bridge on Road No. 5.	Quantity in cubic feet per second.	Proportion of theoretical supply.	Sum of Columns 8, 9, 10.	Proportion of supply to lands under all three Rivers.		
1.	2	3	4	5	6	7	8	9	10	11	12	13	
2nd December...	43-02	453	1-37	43-09	95	0-116	43-065	183	0-176	721	0-338	FT. IN. 3 7	
21st November.	44-126	799	2-42	44-5	239	0-221	44-405	504	0-484	1,542	0-7	4 6	
6th „ ...	45-72	1,339	4-06	5-756	414	0-504	45-57	955	0-916	2,708	1-23	5 0	
4th „ ...	46-476	1,642	4-93	46-673	546	0-665	46-488	1,372	1-317	3,560	1-63	5 7	
2nd „ ...	47-476	2,077	6-3	47-84	719	0-876	47-655	1,970	1-9	4,766	2-17	6 4	
31st July ...	48-39	2,496	7-56	49-09	941	1-146	48-905	2,690	2-58	6,127	2-8	7 8	
25th „ ...	49-64	3,094	9-39	50-673	1,265	1-54	50-655	3,799	3-646	8,158	3-72	10 6	

TANJORE,
17th December 1875.

(Signed) R. F. OAKES, Lieut.-Colonel, R.E.,
Superintending Engineer, Tanjore.

No. 100. ORDER THEREON, 10th January 1876, No. 50.

IRRIGATION, No. 7-B.

LIEUTENANT-COLONEL OAKES' report and its accompaniments demonstrate very clearly the necessity for bringing the water-supply of the Codamurty and of its branches, the Trimulrajenaaur and Moodicondanaur, under effective regulation. Statement A shows that with a total supply in the three rivers of 1-23 times the water required, the

Trimulrajenaaur takes four times the quantity needed ;
Moodicondanaur gets only half its requirements, and the
Codamurty obtains a little less than its proper supply.

2. Under the circumstances stated by the Superintending Engineer, His Excellency the Governor in Council is of opinion that the regulation of these rivers should be carried out independently of any railway feeders or works which may probably be undertaken.

3. It will not be practicable to provide funds for these regulating works either during the current year or by an entry in the Budget of 1876-77 ; but after the approval of the plans and estimates and of the sanction of the entry of the latter in the Budget

Proceedings of the Madras Government, Public Works Department,
10th January 1876.

of 1877-78, if possible, an allotment will be made to allow of the putting in of the foundations of the Trimulrajenaaur regulator during the working season after the north-east monsoon of 1876.

4. If the distribution of water between the Codamurty and the Moodicondanaur can be effected by alterations of, or additions to, the bridges on the road a short distance below the head of the latter river, this arrangement may be adopted, but it is considered that the regulation should be effected otherwise than by dam stones, which would be a much less perfect method than is desirable.

5. The levels are noted as being plotted from " datum 32-42," but what this datum is does not appear, and mean sea level should be the datum referred to in all cases.

(True Extract.)

Major-General, R.E.,
Secretary to Government.

To the Superintending Engineer, Tanjore.
" Chief Engineer for Irrigation:
" Revenue Department.

Exd. S. T. Austin.
Spare Copies

N^o 2356

Superintending Engineer's Office

Yankee 17th December 1845.

To
From,

Lieut. Colonel R. S. Cakes

Superintending Engineer
Yankee

To
From,

Lieut. Colonel J. Mullins R.E.

Chief Engineer for Irrigation
Madras

Sir,

I have the honor to inform
you that before I proceeded to England
one furlough I had had a survey
made and levels taken of the heads of
the Verumulrajin and Madicendav which
branch from the Codamoorthi near Paup
nassem about 21½ and 25 miles
respectively below the Codamoorthi

Regulator

Regulator and I had hoped that by this time the Regulation of these Rivers would have been completed, but finding that nothing had been done and that the Railway from Yajore to Combaconum crossed the Codamoorly and Yirumulrajins about a mile west of Road N:5 or between the head of the Yirumulrajins and that of the Moodicondara Rivers and fearing that the Regulation of the supply to the above streams might render it necessary for the Railway Engineers to modify their arrangements for bridging the Codamoorly and Yirumulrajins I proceeded to the spot to examine the locality and to make observations relative to the discharges of the Rivers on the 2nd Instant.

2. I need hardly remark that the more correct the regulation at the head of any branch of a River, the more necessary it becomes to regulate the distribution of the water amongst the minor branches of the stream. It has long been known that the Regulation of the Codamoorly and its branches has been very defective.

3. Road N:5 crosses the 3 streams within a distance of 500 yards and the Bridges on that Road to a certain but very limited extent may be said to regulate the supply to the 3 streams. The length of waterway of the Bridges is as per margin or as 1, 2 and 3 while the area dependent upon the streams respectively is

is as 4-(3.1) & (1.25) and the actual
distribution in low floods is as 2, 1, 5
and in high floods as 3, 1, 2
this will appear more clearly on a
reference to Enclosure A. from which it
will be observed that while the lands
under the Yumultrajero are receiving $1\frac{1}{2}$
of what is termed the theoretical supply

the Mooccondanant

receives $\frac{1}{2}$ and the
Codamcorth $\frac{2}{3}$ of their theoretical supply
while the undivided stream is carrying
 $\frac{3}{4}$ of a theoretical supply i.e. the water
instead of being divided as 47.6 to 37.4
to 15 is divided nearly as 22.2 to 11.1
to 16.6 or the Rivers are receiving about
 $\frac{1}{2}$ - $\frac{2}{3}$ and 4 times the supply they
should be receiving. On a moderate
flood where the undivided stream carries
about

about $1\frac{2}{3}$ a theoretical supply the Rivers
receive $\frac{9}{10}$ $\frac{1}{2}$ and 4 times the theoretical
supply or the water is divided as
as 35.2 to 15.3 to 49.5 and in high floods
as 46.6 to 15.5 to 37.9 where the un-
divided stream is carrying about $3\frac{3}{4}$
the theoretical supply.

In regulating the supply
to the three streams it is desirable to
regulate up to about $1\frac{1}{2}$ the theoretical
supply and after that to take advantage
of the natural capacity of the Rivers
to carry off flood waters. The Mooc-
condan is a high level stream while
the Yumultrajero is a low level channel
the capacity of the former is very
small as will be observed from the
fact that even where the undivided
streams

Stream carries $3\frac{3}{4}$ the theoretical supply
it can carry only $1\frac{1}{2}$ the theoretical supply
while the *Simulrasin* carries $9\frac{2}{5}$ its
theoretical supply and this it is desirable
the latter should carry in a high flood,
as the *Codamoor* is then carrying
as much as it can carry with safety
vizt about $3\frac{2}{3}$ of the theoretical supply
for the lands dependent upon it.

5 The influence of the NE.
monsoon has not been felt to any extent
in the interior of the Country and hence
the Rivers have been very low and in
despair of not being able to make observa:
tions of discharges at all this season if
I delay doing so any longer I proceeded
to make my observations on the *D. Instant*
where, as stated above, about $\frac{1}{3}$ of the
theoretical

theoretical supply for the lands dependent
upon the indicated stream was passing
down the River and then there was so
little water in the *Moodicondara* that
I fear the calculations made for higher
floods from observations made in that
River may not be so accurate as those
for the other streams, though the quantities
in high floods tally remarkably well
with the calculations of discharge
over the Regulator at the *Codamoor*
head.

6. The Bridges on Road
No 5 have no floors but they have
retaining walls at a low level that of
the *Codamoor* being covered with 3 feet
of sand under 3 arches and 18 inches
under the 4th arch on the *D. Instant*,
the

the calculations were therefore made entirely independently of the Bridges though the flood levels were obtained from the readings of the Gauges on the Bridges and are indicated in Paragraph A to facilitate a comparison, for the zero of the gauges is on different levels and vary as much as 1.565 feet while the zero of Gauge on Codamoorly Bridge is 2' 1" above the top of retaining wall: the levels however are all marked on the accompanying Plans. —

7. No supply is drawn from the Perumutrayan above the Bridge on Road No. 5 and the surplus into the Arsalair has long been closed and it was thought before the levels were taken that the Perumutrayan head might be

5
be brought down to the Moodicondore head and a Regulator for the 3 streams be built there; but this is out of the question as the Codamoorly has not the capacity to convey the water now carried by the Perumutrayan in high floods from the Perumutrayan to the Moodicondore head: the surface level of the water would be raised $3\frac{1}{2}$ feet, as it is, the waters of the 3 streams unite over the padugai as there is no bank over the padugai to divide the Codamoorly and Perumutrayan in high floods. —

8. A second suggestion which offers itself is to carry the Moodicondore head up to a. b. opposite to Pausanassery and

and to build the 3 Regulators there in
connection with the Bridges of the Railway
Feeder from Pampasasseru to Rabistalam
which will follow the line a.b. The
objection to this is that the Railway Dept.
would have to provide a Bridge for the
new head of the Maddicondaram which the
line does not now cross and that the cost
of the work would be considerably en-
hanced as the sum to be paid for the
Padugay only would be about Rs 60000. -

9. A 3rd suggestion is to
regulate the supply to the Codamoor
and Virumulrajem only on the line
a.b. in connection with the Bridges
on the Railway feeder and a 4th to
place a Regulator similar to that
built

6
built at the Vellur head at the head
of the Virumulrajem. -

10. The difference of cost of
exchanges 3 and 4 would be about Rs
10,500 in favor of No 3. Irrigators
but about Rs 15,000 to Local funds if
the Railway Feeder is to be formed;
the line would be about 2 miles but
would be costly as there are four

Rivers to be
bridged, and
though a convenient
line would not I think bring much
traffic to the Railway and it is probable
that the Local Board would
not be able to provide funds for the
Acab immediately and perhaps it
would.

would be well to undertake the Regulation independently of the Road.

11. Let it should be determined that the work is to be built in connection with Bridges on the Railway under the forwards which I consider should be the Section of the work is placed at a. b. the floor of the sluice would be 2' above the River bed or floor of the Bridge over the Codamoor and the floor of the Bridge over the Simulrajans would be $\frac{1}{2}$ a foot lower. The drop of $2\frac{1}{2}$ feet being broken into 2 steps, if deemed advisable, this would place the floors of the vents about 6" below the average bed of the River at the point of bifurcation and would.

would render regulation by the shutters easy. The first fresh or the fresher of the 1st Season would probably raise the level of the beds of the streams to that of the floor of the sluices.

12. The vents provided in the Regulators would be as per margins or nearly in proportion to the quantities now carried by the 2 Streams during heavy floods.

13. It will be observed from Enclosure A. that even in high floods the Moodicondara carries only $\frac{1}{2}$ the theoretical supply for the lands dependent upon it and it is believed that the supply to it and the Codamoor may

may be regulated by alterations to the retaining walls and by providing a floor to the Codamoorly Bridge or perhaps by Dam stones under the Bridge where a lower apron would probably be necessary and this might be done without materially affecting the supply the Moodicondane would receive during high freshes and hence no regulating work at its head would be necessary - This question has not been worked out because as stated in para 5 there are some doubts relative to the accuracy of the discharges by the Moodicondane. This regulation for the present is of minor importance the great requirement of the moment is to regulate the distribution between.

8
between the Perumthraiy and Codamoorly the set is now completely on the head of the former and the stream itself has become considerably enlarged during the last 2 years: what can be done by planting up the bank on the south above the head and by putting up temporary groynes to throw the head of the Perumthraiy into backwaters, as it were, has already been ordered, but at first the temporary remedies proposed will not be very effective. -
14. The case appears to be of sufficient importance to apply as a special case for the commencement of the Regulation during the approaching working season; if this may be done

done and information is afforded as to what arrangements are approved the Estimate might be submitted in 3 weeks. —

15. If the work cannot be commenced till 1844 the Estimate may be sent in later in the year as there are other works requiring immediate attention such as the Arsalaur and Verasholen Dams which must be modified to meet the changes in area of cultivation now found to be dependent upon the streams and the changes in the Regime of the bed of the Rivers below the works which have in some respects vitiated the original.

original calculations relative to the works. —

I have the honor to be
Sir,
Your Most Obedt^l

H. F. Gates Lieut. Col. R. G.
Superintending Engineer
Yankee

water

No 50

Mr. Dept

Proceedings of the Madras Government
10th Jan 76
Read the following-

From
The Supt^g Supt^g Tanjore (R. No 23569/14 Decr 1875)

Lieut^{nt} Colonel Oakley's
report and its accompa-
niments demonstrate very
clearly the necessity for
bringing the water supply
of the Godamurty and of
its branches, the Trimul-
rajenaur and Moodi-
condanaur, under effective
regulation. Statement
it shows that with an
total supply in the 3
rivers of 1.23 times the
water

P. P. P. D. 1876. 23569/14
from
The Supt^g Supt^g Tanjore

To
The Chief Engineer
for Irrigation

No 2356

Dated 17th December 75
Received 21st do

Price 5

Report of the
Commissioner of the
at the Tiruchirappalli and
Moodi condanaur
with a view of providing
regulation to these rivers
& proposing certain schemes
for carrying out the
same.

80 No 50. 10.1.76.

6-1-76.

99

water required, the

Trimulrajen takes 4 times
the quantity needed
Moodicondanaur gets only
half its requirements
and the Godamurty obtains
a little less than its
proper supply.-

2 Under the circum-
stances stated by the
Superintending Engineer,
His Excellency the Gover-
nor in Council is of
opinion that the regu-
lation of these rivers
should be carried out
independently of any
Railway feeders or works
which may probably
be undertaken.-

3 It will not be practi-
cable to provide funds
for

for these regulating works
either during the current
year or by an entry in
the Budget of 1876-77, but
after the approval of
the plans and estimates
and of the sanction of
the entry of the latter
in the Budget of 1877-78,
if possible, an allotment
will be made to allow
of the putting in of the
foundations of the
Trimulrajenaur regulator
during the working
season after the North
East Monsoon of 1876.

4 If the distribution
of water between the
Godamurty and the
Moodicondanaur can
be effected by alterations
of

of or additions to the bridges
on the road a short dis-
tance below the head
of the latter river, this
arrangement may be
adopted, but it is con-
sidered that the regula-
tion should be effected
otherwise than by dam
stones, which would be
a much less perfect
method than is desirable.

5 The levels are noted
as being plotted from
"datum 32.42", but what
this datum is does not
appear, and mean sea
level should be the datum
referred to in all cases.

4/11

C.M.W.

99-100

To The Suptg Engr. Bangalore

— Chief Engineer for Supt.

Rev Capt

+ Nith 5 Enclosures

Dispd: 19-1-76

24
1
NO. 112763
PUBLIC WORKS.

To
Supg. ~~Eng.~~ Supts.

Drawn
For
Red. B.C.

G. O. 10 Jan 1860 No. 51.
No. 99-100

Supts. Enr.
Codnamity & its branches
Passing orders on the report
submitted by the Supts. Enr.
regarding the regulation of the
water supply of the —