

N. 599 & 77 March/80.

Recorded, and
abstract para 2. for-
warded to the Supt
of Works, Godavery for
information.

S_{2/}

10.2.81 No 363 W

S of N. Godavery with District
para 2. - 22/4/81
11/2/81

S. N. C. No 1321.

General
Prop March
From The Superintendent
Madras Harbour Works

1089 W
Dated 2nd March 1881
Rec^d 3rd

No of Enclomies nil

N. 599 W

States that Mr. Robert
Palmer will leave for Don
Caidun in M. S. ship on
30th April 1881.

P. W. C. No. 1100

P. W. D., Madras
Form No. M—.

P. W. DEPARTMENT, MADRAS.

From

THE EXAMINER

OF PUBLIC WORKS ACCOUNTS,

To

THE SECRETARY TO GOVERNMENT,

PUBLIC WORKS DEPARTMENT.

Dated

23rd

Received

24th

February 1881.

No. *81*

Forwards for the orders of the Local Govern-
ment the Provincial Statement of Objectionable
Items in the Accounts of Executive Engineers
for the month of *November* 1880, under
Imperial Funds.

D. H. Davis Major R.

Off. Examiner of P. W. Accounts.

Provincial Statement of Objectionable Items in the Accounts of Executive Engineer for the Month of November 1880,
requiring the orders of Government.

Item No.	Particulars of each Item.	Month in the Accounts of which objectionable expenditure first appeared.	COMPARISON WITH ESTIMATE.			COMPARISON WITH APPROPRIATION OF THE YEAR.			Expenditure during the Month.	Opinion of the Superintending Engineer, with Final Remarks by Examiner.	Sent to Government.
			Amount of Estimate.	Expenditure up to date.	Excess over Estimate.	Amount of Appropriation.	Expenditure of the year.	Excess over Appropriation.			
	Repairing damaged fixtures 12 Estimates.			465	465					The Executive Engineer states that these repairs refer to Board Damages appropriated by the Superintending Engineer. The Ex. Engineer has however been asked to give details of the 12 Estimates.	Sent to Government.
	Account paid at Nagapattanam.			539	539				539	As the appropriation for this work has been given under ~~Engineer~~ the outlay on the work has been transferred to that head from Original Vote by the Executive Engineer in his account for November 1880. Hence a sanctioned estimate is necessary to remove the irregularity.	
										Mr. 376 N. of 20th July 1880 Early steps should be taken by the	
	Manufacturing Lead and Piston Range of the European Branch at Comanathur								1884 1544 1191	The Executive Engineer states that this is a work done in emergency on the authority of G. O. No. 354, dated 16th Feb 1880, but nothing with regard to the want of appropriation has been stated in his Objections Memo. Statement for 11.	Officers concerned to have these items removed.

Provincial Statement of Objectionable Items in the Accounts of Executive Engineer for the Month of November 1880,
requiring the orders of Government.

Item No.	Particulars of each Item.	COMPARISON WITH ESTIMATE.			COMPARISON WITH APPROPRIATION OF THE YEAR.			Expenditure during the Month.	Opinion of the Superintending Engineer, with Final Remarks by Examiner.	Sent to Government.
		Amount of Estimate.	Expenditure up to date.	Excess over Estimate.	Amount of Appropriation.	Expenditure of the year.	Excess over Appropriation.			
	Repairing damaged pictures									
	Repairing and renewing the roof and tiling the Eastern staircase of the Engineer's house at Yam-poy.		2228 2/20	160					The Superintendent of Works, Presidency states that the work completed cost and found with the allotted sum the same expenditure as the estimate. The guarantee in respect of the item will be renewed on receipt of the complete Certificate.	Early steps showed he taken by the officers concerned to have these objections removed.
	Examining and repairing Lightning Conductors	1	1600 1/20						Want of Completion Certificate is brought to notice of local works	
	Timbering Presidency	1	58 56							
		4	746 7/20							

Supd Engineer 1st Circle

Received
February 1881

S. H. Sraie

Major A. H.

Off. Examiner of H. Accounts

9-3-87

7-3-87

ad. 2/2

2 2 1/2

GOVERNMENT OF MADRAS.
PUBLIC WORKS DEPARTMENT.

28th February 1881, No. 546 W.

General.
Account.

Read the following paper :—

IMPERIAL.

IMPLEMENTS.
 Provincial Statement of Objectionable Items in the Accounts of Executive Engineers for the Month of November 1880, requiring the Orders of Government.

Item Number.	Particulars of each Item.	Month in the Accounts of which Objectionable Expenditure first appeared.	COMPARISON WITH ESTIMATE.			COMPARISON WITH APPROPRIATION OF THE YEAR.			Expenditure during the Month.	Opinion of the Superintending Engineer, with Final Remarks by Examiner.	Orders by Government.
			Amount of Estimate.	Expenditure up to date.	Excess over Estimate.	Amount of Appropriation.	Expenditure of the year.	Excess over Appropriation.			
1	<i>Cuddalore.</i> Repairing Barrack fixtures, twelve estimates.	..	Rs. ..	Rs. 465	Rs. 465	Rs. ..	Rs. ..	Rs. ..	..	The Executive Engineer states that there are petty repairs to Barrack damages appropriated by the Superintending Engineer. The Executive Engineer has, however, been written to, to give details of the twelve estimates. As the appropriation for this work has been given under Koppara, the outlay on the work has been transferred to that head from Original Works by the Executive Engineer in his accounts for November 1880. Hence a sanctioned estimate is necessary to remedy the irregularity. The Executive Engineer states that this is a work done on emergency on the authority of G.O., No. 354 W., dated 16th February 1880, but nothing with regard to the want of appropriation has been stated in his Objectionable Items statement for the month current.	ORDER UNDER NO. 24th W. February 1881, No. 546 W.
2	<i>Vizagapatam.</i> Recruits' bails at Vizagapatam..	..	..	539	539	..	..	..	639		
3	<i>Chingleput.</i> Demolishing east and western range of European Barracks at Poonamallee.	..	..	..	..	1,544	1,544	1,101	1,101		
1. Early steps should be taken by the officers concerned to have these items removed.											

ORDEN TYPHOX, 28th
February 1881, No. 546 W.

1. Early steps should be taken by the officers concerned to have these items removed.

requiring the orders of Government.

Provincial Statement of Objectionable Items in the Accounts of Executive Engineer for the Month of November 1880

[Styls]

Provincial Statement of Objectionable Items in the Accounts of Executive Engineers for the Month of November 1880, &c.—cont.

Item Number.	Particulars of each Item.	Month in the Accounts of which Objectionable Expenditure first appeared.	COMPARISON WITH ESTIMATE.			COMPARISON WITH APPROPRIATION OF THE YEAR.			Expenditure during the Month.	Opinion of the Superintending Engineer, with Final Remarks by Examiner.	Orders by Government.
			Amount of Estimate.	Expenditure up to date.	Excess over Estimate.	Amount of Appropriation.	Expenditure of the year.	Excess over Appropriation.			
4	Presidency. Repairing and white-washing family quarter of the European Infantry, Fort.	Nov. 1880.	Rs. ..	Rs. 399	Rs. 309	Rs. ..	Rs. ..	Rs. ..	Rs. 327	The Executive Engineer states that the estimates and the appropriation of funds for the item will be made shortly. The Superintending Engineer states that this amount has since been adjusted. The Superintendent of Works, Presidency, states that this is a completed work, and funds will be allotted to cover the excess expenditure over item will be remedied on receipt of the completion certificate.	
5	Removing earth from the ditch in Fort St. George.	Oct. "	..	320	320	..	..	..	..		
6	Repairing and renewing the roof and tarring the eastern entrance of the Krivona Masjid at Vyasaipady.	"	2,328	2,788	460	..	..	..	766		
7	COMPLETION CERTIFICATES NOT SUBMITTED TO THE EXAMINER. Presidency. Examining and repairing lighting conductors.	1	4,600	1,061	..	..	..	..	..	Want of completion certificates is brought to notice of Local Government.	1. Early steps should be taken by the officers concerned to have these objections removed.
8	Works below Rs. 2,500 each.	1	68	66	..	..	..	..	..		
9	Timenevelly	4	1,746	1,746	..	..	..	..	..		

(True Extract)

(True Extract.)

Major, R.E.,
Under Secy. to Govt., P.W.D.To the Superintending Engineer, First Circle.
" " Second Circle.
" " Third Circle.
" Superintendent of Works, Presidency.
" Examiner of Public Works Accounts.
Ed. S. T. Austin.
Spare Copies

Statement of Objectional Items for the month of November 1880 under Imperial Funds.—Passing orders on the —.

FEBRUARY.

G. O., 28th February 1881, No. 546 W.

Recd. Encl.

Issued.

Dated February, 28th.

cc. ac.

THE SUPERINTENDING ENGINEER,
FIRST CIRCLE.

To

Govt. of (1881) Madras.
PUBLIC WORKS.

GENERAL
ACCOUNT.

Mo. by the
Rep. of the Madras Govt.
Read the following.

GOVERNMENT OF MADRAS.
JUDICIAL DEPARTMENT.

11th February 1881, No. 331.

Assessors.

Read the following paper:—

No. 63. From Lieutenant-Colonel J. BEATTY, R.E., Superintending Engineer, Third Circle, to the Chief Engineer, Public Works Department, dated Pannavelai, 23rd January 1881, No. 891-S.A.

In continuation of my letter, No. 846 S.A., of the 4th instant, I have the honor to forward a letter from the Executive Engineer, South Arcot Division, and to request that, under the circumstances therein stated, Supervisor Veeraragaviah Puntulu may be exempted from serving as Assessor.

2. I take this opportunity of bringing again to notice the desirability of exempting all the members of the Executive Establishment from serving as Assessors.

ENCLOSURE No. 1.

From Captain A. C. SMITH, R.E., Executive Engineer, South Arcot Division, to the Superintending Engineer, Third Circle, dated Camp Kuringepadi, 18th January 1881, No. 41.

In continuation of my No. 873, dated 21st December 1880, regarding selection of certain members of my office establishment as Assessors for the current year, I have the honor to bring to your notice that my Supervisor N. Veeraragaviah Puntulu reports that he is also selected as an Assessor.

2. I need hardly point out the inconvenience that is likely to be caused by the absence of even a single day of the Supervisor from his works, almost all of them being emergent works caused by the recent cyclone. His absence must necessarily retard their speedy progress and prompt measurement of work done and payment to the coolies employed thereon.

3. I do not think it advisable to address again on the matter the Session Judge, the date fixed for reviewing the list of Assessors having expired, and moreover the Judge having, in the case of my office people, stated that the Commissioners had no power to exempt them.

4. Considering the present very limited establishment of the Department of Public Works, and the extensive charge devolving on every member of the same, I would strongly recommend that Government may be moved to exempt, as a rule, all members of the department from serving as Assessors or Jurors. This rule is, I think (under the existing state of the department), necessary in the interests of the service.

No. 222.

Referred to the Judicial Department in continuation of No. 3, dated 7th January 1881.

1st February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secretary to Govt., P.W.D.

No. 64. ORDER THEREON, 11th February 1881, No. 331.

Under the provisions of Section 406 of the Code of Criminal Procedure, and subject to the provisions of the concluding clauses of that section, the Right Honorable the Governor in Council is pleased to exempt all members of the Executive Establishment of the Public Works Department from liability to serve as Jurors or Assessors in Mofussil Courts.

(True Extract.)

J. J. Austin
Chief Secretary.

To all Session Judges.
„ all District Magistrates.
„ the Public Works Department. ✓

No 600 & 77th March/81.
Communicated to the
officers of the Public Works
Department concerned
subject, for
information.

S
10/2

7-1-81 h 3 Ch.
1-2-222~

P.W.C. 1015

Govt. of (1881) Madras.
For March
JUDICIAL.

To
ALL SESSION JUDGES,
&c., &c., &c.

Dated February, 11th.

Issued

Recd.

*Recd. of S.C. —
S. D. N. S. P. S.
17th Feb. 1881*

G.O., 11th February 1881, No. 331.

FEBRUARY.
Nos. 63-64.

Assessors.—All members of the Executive Estab-
lishment of the Public Works Department exempt-
ed from liability to serve as Jurors or Assessors
in Mofussil Courts.

S. Eng^{rs} ✓
Ss. of works ✓ D.D.
9/3/81

Govt. of 1881 Madras.
PUBLIC WORKS.

To

Dated

Issued

Recd.

Encl.

G. O. 28th Feb 1881, No. 545 W.

Nos.

Statement of objectionable
Items for the month
of November 1880 under
Imperial Funds.

Passing orders on
the

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

28th February 1881, No. 545 W.

General.
Account.

Read the following paper:—

PROVINCIAL STATEMENT of Objectionable Items in the Accounts of Executive Engineers for the Month of November 1880, requiring the Orders of Government.

Item Number.	Particulars of each Item.	Month in the Accounts of which Objectionable Expenditure first appeared.	COMPARISON WITH ESTIMATE.			COMPARISON WITH APPROXIMATION OF THE YEAR.			Expenditure during the Month.	Opinion of the Superintending Engineer, with Final Remarks by Examiner.	Orders by Government.
			Amount of Estimate.	Expenditure up to date.	Excess over Estimate.	Amount of Approximation.	Expenditure of the year.	Excess over Approximation.	Rs.		
1	West Coast. Surveying the Mangalore Harbour.	Nov. 1880.	..	204	204	..	..	..	16	The Executive Engineer states that an estimate was submitted to the Superintending Engineer for sanction on the 30th July 1880, and he further states that orders were received to recover from the Marine Department.	ORDER THEREON, 28th February 1881, No. 545 W.
2	Repairs to Bunder Quay, Mangalore.	..	..	465	465	..	..	..	-351	The item has been omitted to be included in the Divisional Objectionable Items Statement for the current month.	1. The Superintending Engineer, Second and Third Circles, will take steps to have these items removed.
3	Constructing Chuttram at Togamalai. Trichinopoly.	..	..	..	..	..	1,631	1,631	890	The Executive Engineer states that funds have been applied for for this item.	
4	Godavari Eastern Delta. Ascertaining the nature of ground at the site of the Proposed Lighthouse to the Port of Cocanada.	..	..	3,847	3,847	..	3,847	3,847	..	In G.O. No. 322 W. dated 6th February 1881, the Accountant-General has been authorized to place Rs. 3,847 at the disposal of the Public Works Department. It is still objectionable for want of estimate.	2. The Superintendent of Works, Godavari, will take steps to have an estimate sanctioned.

Provincial Statement of Objectionable Items in the Accounts of Executive Engineers for the Month of November, 1880, &c.—cont.

Item Number.	Particulars of each Item.	Month in the Accounts of which Objectionable Expenditure first appeared.	COMPARISON WITH ESTIMATE.			COMPARISON WITH APPROPRIATION OF THE YEAR.			Expenditure during the Month.	Opinion of the Superintending Engineer, with Final Remarks by Examiner.	Orders by Government.
			Amount of Esti- mate.	Expenditure up to date.	Excess over Esti- mate.	Amount of Ap- propriation.	Expenditure of the year.	Excess over Ap- propriation.			
6	Kistna Eastern Delta. Closing breaches of road from Masulipatam to Chalapally.	Feb. 1880.	Rs. ..	Rs. 774	Rs. 774	Rs. ..	Rs. ..	Rs. ..	Rs. ..	The Executive Engineer states that the estimate has not been received from the Sub-Divisional Officer, although several reminders have been sent to him for it. This is an incomplete work of last year and no outlay appears to have been incurred on it since April 1880; it is not known whether the work has been transferred to the local fund board for completion. The matter has therefore been brought to the special notice of the local Government, as the Executive Engineer up-to-date has failed to furnish this office with the list of works transferred to the local fund board for completion as directed in G.O., No. 1305 W. dated 17th August 1880.	3. The Superintendent of Works, Kistna, and the Superintending Engineer, Third Circle, will take steps to have these objections removed.
6	COMPLETION CERTIFICATE NOT SUBMITTED TO THE EXAMINER. Works below Rs. 2,500. Trichinopoly	1 work	1,940	1,554	..	..	..	..	..		

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Superintending Engineer, First Circle.
" Superintendent of Works, Third Circle.
" Superintendent of Works, Godavari.
" " " Kistna.
" Examiner of Public Works Accounts.

Exd. E. C. Shunker.
Spare Copies

GENERAL.
ACCOUNT.

Gobt. of (1881) Madras.
PUBLIC WORKS.

To
THE SUPERINTENDING ENGINEER,
FIRST CIRCLE,
&c., &c., &c.

Dated February, 28th.

Issued

Recd.

Encl

G. O., 28th February 1881, No. 545 W.

FEBRUARY.

Statement of Objectionable Items for
November 1880 under Local Funds.—Pass-
ing orders on the —.

P. W. C. No. 1159

P. W. D., Madras.
Form No. M.

P. W. DEPARTMENT, MADRAS.

From

THE EXAMINER
OF PUBLIC WORKS ACCOUNTS,

THE SECRETARY TO GOVERNMENT,
PUBLIC WORKS DEPARTMENT.

Dated 16th February 1881
Received 24th February 1881

No. 5D

Forwards for the orders of the Local Govern-
ment the Provincial Statement of Objectionable
Items in the Accounts of Executive Engineers
for the month of November 1880, under
Local Funds.

D. B. Paul
Off. Examiner of P. W. Accounts

All Min. Statements

Office although
several reminders
have been sent to him
that this is an
incomplete work of
last year and no
outlay appears there
has incurred since
since April 1880.

The Supdt of
Works Madras,
and the
Supergr.

1159.

Gt. of (1881) *W. Pras.*
PUBLIC WORKS

To

Dated

Issued

Recd.

Encl.

G. O., 28th July 1881, No. 5454.

Nos.

Unkempt
Objectionable Items
for Rs 700 under
Local Funds.

Passing orders
On the —

436 + 437

No. 3506T.

FROM

THE DIRECTOR GENERAL OF TELEGRAPHS IN INDIA,

TO

THE SECRETARY TO THE GOVERNMENT OF MADRAS.

Calcutta, the 17th of FEBRUARY 1881.

SIR,

I HAVE THE HONOUR TO INVITE YOUR ATTENTION
TO MY NO. 2509, T. OF THE 6TH. DECEMBER LAST.

I HAVE THE HONOUR TO BE,

SIR,

YOUR MOST OBEDIENT SERVANT,

W. Pras.

OFFG. DIRECTOR GENERAL OF TELEGRAPHS

W. Pras.

IN INDIA.

10.79 to 2605W
12-80-2888W

P.W.C. No 1183

Recd. 24th Feby/81

No 544W

P.W.O.
28 Feby/81

do

The Director General of Telegraphs in
India.

Sir

Adverting to your
letter No 3506 T. dated 17th
February, I am directed
to forward herewith a copy
of G.O. No 2888W, dated
15th December 1880, passed
on your former letter of
the 16th December 1880, No 2609T.

Desd with copy
of G.O. No
2888W all
15-12-80-

2-5-81

I have &

(Sd) John Cunningham
Inspector
Under Secy to Govt
P.W.O.

Par. 544W. ^{28 July/8}
~~28 July/8~~

4342435-

FROM MAJOR D.H. TRAIL R.E.

OFFG. EXAMINER P.W. ACCOUNTS,

MADRAS.

TO THE SECRETARY TO GOVERNMENT,

PUBLIC WORKS DEPARTMENT.

NO. 2/2 W

MADRAS, 23rd FEBRUARY 1881.

COPY OF THE FOLLOWING FORWARDED TO THE SECRETARY
TO GOVERNMENT P.W. DEPARTMENT, FOR INFORMATION.

D. H. Trail

MAJOR R.E.
OFFG. EXAMINER P.W. ACCOUNTS.

COPY OF LETTER FROM THE EXAMINER P.W. ACCOUNTS, TO THE
ACCOUNTANT GENERAL P.W. DEPARTMENT, NO. 2/11/81 DATED 22nd
FEBRUARY 1881.

I HAVE THE HONOR TO FORWARD HERewith, FOR YOUR IN-

EXTRACT OF THE EXAMINER'S
OFFICE NOTE NO. 861 OF 8TH. DECEM-
BER 1880 TO THE SECRETARY TO GOVT.
P.W. DEPARTMENT.

DO OF THE SECRETARY TO GOVT'S
P.W. DEPARTMENT OFFICE NOTE NO. 622 N.
DATED 16TH. DECEMBER 1880 TO THE
EXAMINER.

DO OF THE EXAMINER'S OFFICE
NOTE NO. 919 OF 22ND. DECEMBER 1880
TO THE SECRETARY.

COPY OF THE SECRETARY'S OFFICE
NOTE NO. 656 N. DATED 23RD. DECEMBER
1880 TO THE EXAMINER.

COPY OF THE EXAMINER'S OFFICE
NOTE NO. 945 DATED 30TH. DECEMBER
1880 TO THE SECRETARY.

FORMATION AND SUCH
FURTHER ACTION AS YOU
MAY CONSIDER NECESSARY,
COPIES OF THE CORRES-
PONDENCE NOTED IN
THE MARGIN WHICH
HAS PASSED BETWEEN
THIS OFFICE AND THAT
OF THE SECRETARY TO

COPY OF THE SECRETARY'S OFFICE
NOTE NO. 64 DATED 19TH. JANUARY 1881
TO THE EXAMINER.

COPY OF THE EXAMINER'S OFFICE
NOTE NO. 1011 DATED 25TH. JANUARY
1881 TO THE SECRETARY.

COPY OF G.O. NO. 388 W. DATED
11TH. FEBRUARY 1881.

GOVERNMENT P.W. DEPART-
MENT ON THE SUBJECT
OF CERTAIN PROMOTIONS
IN THE ENGINEER ESTAB-
LISHMENT ORDERED BY

THIS GOVERNMENT.

2. IT WILL BE OBSERVED FROM THIS OFFICE NOTE NO. 261
DATED 21TH. DECEMBER 1880, THAT IT WAS POINTED OUT THAT THERE
WERE NOT SUFFICIENT VACANCIES TO ADMIT OF ALL THE PERMA-
NENT PROMOTIONS WHICH WERE NOTIFIED IN THE PORT SAINT
GEORGE GAZETTE OF 7TH. DECEMBER 1880 BEING MADE. THE
SECRETARY TO GOVERNMENT P.W. DEPARTMENT, HOWEVER, MAINTAINS
THAT AS THE CONCESSIONS CONTAINED IN PARA 19 OF G.O. NO.
266 W. DATED 3RD. FEBRUARY 1880 (COPY HEREWITH) ARE INTEND-
ED TO BE APPLIED IN WORKING UP TO THE SCALE SANCTIONED BY
THE GOVERNMENT OF INDIA IN LETTER NO. 1918 G. DATED 4TH.
NOVEMBER 1880, AND THAT THOSE CONCESSIONS AND THE GOVERN-
MENT OF INDIA'S REPLY TO THE LETTER EMBODYING THEM, PERMIT
OF ALL SUPERINTENDING ENGINEERS ABSENT ON FURLOUGH (WHETHER
ORDINARY OR SPECIAL) BEING CONSIDERED AS ENTIRELY SUPER-
NUMERARIES, ADMITTING PERMANENT PROMOTIONS BEING MADE IN
THEIR STEAD, THE PRESENT PROMOTIONS ARE ADMISSIBLE AND
CORRECT.

3. I FAIL TO FIND ANYTHING DEFINITE IN THE ORDERS
REFERRED TO BY THE SECRETARY TO GOVERNMENT P.W. DEPARTMENT
WHICH WARRANT THE CONCLUSIONS HE HAS ARRIVED AT, AND
THEREFORE PENDING RECEIPT OF FURTHER INSTRUCTIONS, THE
ADDITIONAL CHARGES DUE TO THE PROMOTIONS IN QUESTION

WILL

WILL BE PASSED PROVISIONALLY ONLY BY THIS OFFICE.

(TRUE COPY)

W.T. Jackson

SUPT. CORRESPONDENCE BRANCH.

J.W.C. No 1158

A.O. No. $\frac{322}{389}$ W. 11-2-81.

FROM THE EXAMINER P.W. ACCOUNTS,
MADRAS.

TO THE SECRETARY TO GOVERNMENT,
P.W. DEPARTMENT.

NO. 212 W

DATED 23rd FEBRUARY 1881.

RECD. 24th

FORWARDS COPY OF LETTER AD-
DRESSED TO THE ACCOUNTANT GENERAL
P.W. DEPARTMENT REGARDING PROMOTION
IN THE ENGINEER ESTABLISHMENT.

File letter
for promotion

P. H. D.

From the Examiner P.W. Accounts
No. 212 W, dated 23rd February 1881.

Circulated for
information with
remark that a similar
reference has already
been made to the
Government of India
by this Government
in letter No. 389 W dated
11th February 1881.

C. H. Stanley C. H. R. E.
Secretary to Government
P. H. D.

W. H. H. H.

*No. 543 Wd/28th Feb/81
Recorded.*

Drop

432 & 433

Proceedings of the Madras Government, Public Works Department, dated 18th March 1880, No. 698 W.

Read the following paper:—

MINUTE BY HIS GRACE THE GOVERNOR.

THE question of getting access to coal in this Presidency for railway and navigation purposes is a very important one.

2. That coal exists in the Nizam's territory, between the Godáviri and Kistna, is well ascertained, and the quality of that recently obtained and tried, although the results are not yet accurately calculated, show that the coal is of a good, useful description, and reported by the Public Works Workshops as quite equal to the ordinary Indian coal they have in use. It becomes a question of price.

3. Coal is wanted for railway and steam purposes at Madras, for the navigation of the Godáviri and at Cocanada, and will no doubt be also consumed on the canal.

4. It has been ascertained that coal exists on the Godáviri river on the British side, and some coal raised from the dry bed See Map. About one-third of the distance between Bhadrachalam and Rékapalle. of the river has given "good results" in the Godáviri steamers. The quality of

the coal, as tested by boring with small bores, is necessarily uncertain. Some is spoken of as fair, some as inferior; but it is close to the river, and the ground apparently not costly to sink in. If, as estimated by Mr. Vanstavern (who was especially employed upon the coal investigation), the coal seams can be reached by a shaft for an amount of under Rs. 2,000, it would be a matter to be tried at once without doubt; but I would put it higher, and taking the estimate above given, I would make allowance for pumping, ventilating and levelling, say that the trial should be considered as not to be effectually made under a possible Rs. 5,000; say at No. 16 bore, where the coal is within 150 feet from surface and about 18 feet thick, and the shaft only 1 mile from river, but above flood lines.

5. Coal in such a situation ought to be sufficient and economical for all purposes of steam engines on the river and delta and also at Cocanada, as its price must be low from the freight being entirely water and down-stream, so that an extra quantity might be used. How much further it could be carried can only be really known by actual test.

6. The opening of coal at this spot would doubtless stimulate the opening on the Nizam's side.

7. In ordinary times I should not hesitate to recommend the expenditure necessary to reach and test the coal seams, and even in the present times it seems to me desirable to do so. If the coal sufficed only for Godáviri use, the cost would not be wasted.

8. The opening of any coal operation would tend to develop and thus to pacify the country around.

9. The question to be decided then is—

Shall Government endeavour, at a cost which may reach Rs. 5,000, to open the coal already ascertained to exist?

10. If that be agreed then the Chief Engineer should suggest the arrangements, and the co-operation of Mr. Vanstavern should be secured, for his local knowledge and long experience of the district.

11. The working season is from now to June.

5th January 1880.

(Signed) BUCKINGHAM AND CHANDOS.

N.B.—The original maps, sections and memoranda should be returned to Mr. Vanstavern, as they are only lent. I could not trace the copies in Government possession—possibly lost.

ORDER THEREON, No. 698 W., dated 18th March 1880.

THE Revenue Department will arrange to place at the disposal of the Public Works Department the sum of Rs. 5,000 from the accumulated Cattle Trespass Fund for certain experiments on coal-boring operations in the Godáviri district.

2. This amount will be recouped when necessary for the farm purposes later on.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

No. 859.

MEMORANDUM.

HIS GRACE the Governor in Council having decided to make an early commencement with sinking a shaft for working a coal seam, whose existence has been proved at a point midway between Bhadrachalam and Rékapalle on the left bank of the Godáviri, the undersigned is desired to inquire whether His Excellency the Commander-in-Chief thinks that a party consisting of, say, two European Non-Commissioned Officers and a Havildar and Naigue with fourteen Sappers, who are acquainted with mining could conveniently be spared from the Companies of the "Queen's Own" Sappers and Miners which are now attached to the force under the command of Colonel Buck.

2. Their employment in sinking the shaft required might possibly extend to six months.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

15th March 1880.

To the Secretary to Government, Military Department.

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 20th March 1880, No. 213.

With reference to your docket memorandum, No. 1,771, dated 16th March 1880,

* Herewith returned.

I have the honor to inform you that the Officer Commanding, Sappers and Miners

at Dowlaishweram, has been directed to detach two British Non-Commissioned Officers with a Havildar and Naigue and fourteen Sappers for the purpose of sinking a shaft in the Godáviri district.

2. It is of great importance that these men should not be exposed in tents during the hot season, and His Excellency trusts that Government will see the necessity of having thatched huts for the natives, and suitable erections for the shelter of the British Non-Commissioned Officers employed.

No. 1,964.

TRANSFERRED to the Public Works Department, with reference to its memorandum, No. 859, dated 15th March 1880.

(By Order.)

FORT ST. GEORGE,
25th March 1880.

(Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
Acting Secretary to Govt., Mily. Dept.

No. 972.

MEMORANDUM.

THE Chief Engineer has the honor to forward, for the information of the Superintendent of Works, Godáviri, a copy of a Minute by His Grace the Governor regarding coal-boring explorations on the British side of the Godáviri river, with copies of the correspondence that has passed on the subject.

2. On receipt of an intimation from Mr. Vanstavern that he has no objection to the free use of the plans, &c., borings can be commenced. As it is understood that the working season will only last for about two months longer, every exertion should be made.

3. Meanwhile, in accordance with the wishes of His Excellency the Commander-in-Chief, proper shelter for the British Non-Commissioned Officers employed and thatched huts for the natives should at once be provided.

4. Mr. Walch's attention is invited to Lieutenant Baddeley's letter of the 15th March, in case the requisite machinery, &c., cannot be got from the Dowlaishweram shops.

(Signed) R. H. SANKEY, Col., R.E.,
Chief Engineer, P.W.D.

31st March 1880.

To the Superintendent of Works, Godáviri.

Proceedings of the Madras Government, Public Works Department, dated 14th April 1880, No. 960 W.

Read the following paper:—

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 2nd April 1880, No. 250.

In continuation of Adjutant-General's letter, No. 213, dated 20th March 1880,

1 Havildar.
1 Naigue.
14 Privates.

I have the honor, by order, to state that the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram reports that the party, as

per margin, is in readiness to proceed under the orders of the Public Works Department.

2. There are no European Non-Commissioned Officers with the Detachment.

No. 2,117.

TRANSFERRED to the Public Works Department, in continuation of No. 1,964, dated 25th March 1880.

FORT ST. GEORGE,
3rd April 1880.

(Signed)

H. N. D. PRENDERGAST, Colonel, R.E.,
Acting Secretary to Govt., Mily. Dept.

ORDER THEREON, No. 960 W., dated 14th April 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 21st April 1880, No. 996-A W.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 6th April 1880, No. 84.

I HAVE the honor to acknowledge the receipt of your memorandum No. 972, dated 31st ultimo.

One Indent in triplicate.

2. As you will have seen from my letter No. 701, dated 31st March 1880, and its enclosure, I have no officer or upper

subordinate whom I can send for the coal operations, and the Officer Commanding the Detachment of the "Queen's Own" Sappers and Miners here has no European Non-Commissioned Officer.

3. In paragraph 10 of the Minute by His Grace the Governor it is said that "the co-operation of Mr. Vanstavern should be secured," and it seems to me that it would be advisable, as he lives not far from where the operations are to be carried on and has had some experience in such work, to employ him on a salary to superintend the work, but I have no authority to open negotiations officially with him on the subject, or to make him any offer.

4. The steamers cannot now go up the river further than Koide (52 miles), and only boats of very small draft can get from there to where the operations are proposed, some 35 miles further.

5. There are no pumps here at all suited for deep shaft sinking, and I enclose an indent for such a pump and machinery to drive it, which, if approved, please send on to the Government workshops, Madras. If the pump be sent it should be accompanied by a Maistry who understands its working.

6. I think if you will consider all the circumstances of the case you will see that there is no probability of the work being done in the "two months" mentioned in paragraph 2 of your memorandum under notice.

From Lieutenant W. L. C. BADDELEY, R.E., General Superintendent of Public Works Workshops and Stores, Madras, to the Secretary to Government, Public Works Department, dated 15th March 1880.

WE have two deep well pumps in store which would be suitable for working a shaft 80 feet in depth.

2. The five-inch lift pump which we made for the Ooregum Company is a good pattern for deep shafts, and we could make up these very soon if required.

3. One of the Workshop Maistries would be available to look after the pumping machinery, but there is no one here who understands anything about mining.

4. If Dowlaishweram cannot provide the engines, we can spare a 4 horse-power portable or any number of Gwynne's or Nasmyth's 4 and 6 horse-power engines and boilers combined. These also could be made fairly portable by fitting them on a stand with wheels.

5. We have no machinery for working or lifting coal, but probably there would be no difficulty in making up any ordinary appliances.

ORDER THEREON, No. 996-A W., dated 21st April 1880.

THE Superintendent of Works, Presidency, will at once direct the General Superintendent, Public Works Workshops, to despatch one of the deep well pumps mentioned by him as suitable for a shaft 80 feet deep to the Superintendent of Works, Godávári, along with one of the Workshop Maistries for looking after this and such other machinery as it may be found necessary to send for unwatering the coal shaft.

That officer should also be directed to place himself without delay in correspondence with the Superintendent of Works, Godávári, relative to any steam pumping or other machinery that may be deemed necessary for sinking the shaft below 80 feet.

2. The Superintendent of Works, Godávári Division, is authorised to make arrangements with Mr. Vanstavern for directing the operations, preferably fixing a definite sum on the shaft being sunk to the bottom of the seam indicated by the borings, and reporting the terms as soon as possible for the information of Government.

3. The original borings having been executed during the monsoon, His Grace in Council has no reason to suppose that the work need now be subjected to any delay

on account of the season, and as he attaches the greatest importance to the sinking of the shaft, no efforts should be spared to effect that object at the earliest date.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 27th April 1880, No. 1,035 W.

Proceedings of the Madras Government, Military Department, dated 14th April 1880, No. 2,404.

Read the following papers:—

Proceedings of the Madras Government, Public Works Department, dated 7th April 1880, No. 893 W.

Read letter from the Superintendent of Works, Godávári, dated 30th March 1880, No. 701.

I HAVE the honor to enclose copy of a letter received this day from the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram, and to request instructions.

2. I would point out that the district is shorthanded, that just at this season there is a great amount of work in connection with the anicut and head works, canals, &c., which has to be compressed into a very short time; and I trust, therefore, that no one will have to be taken away from such work to carry out the "hutting," &c., referred to by Major Hamilton, and which it appears to me the men might carry out themselves.

3. I do not know where the Kottapalle referred to is.

From the Officer Commanding Detachment "Queen's Own" Sappers and Miners, to the Superintendent of Works, Godávári, dated 29th March 1880, No. 209.

With reference to letter, No. 822, dated 20th March, from the Adjutant-General (copy annexed for your information), I have the honor to report that the party, consisting of one Havildar, one Naigue and fourteen Privates, is in readiness to proceed up the river under your orders. There are no European Non-Commissioned Officers with this detachment.

2. I presume that you will supply all necessary tools.

3. The party will have to be hutted by the Public Works Department.

From the Officiating Adjutant-General, to the Officer Commanding "Queen's Own" Sappers and Miners, Dowlaishweram, dated 20th March 1880, No. 822.

At the request of Government in the Public Works Department the Commander-in-Chief has sanctioned the services of a party of two European Non-Commissioned Officers, a Havildar, Naigue and fourteen Sappers, who are acquainted with mining, from the companies attached to the force under Colonel Buck, for employment in sinking a shaft for working a coal seam between Bhadrachalam and Kottapalle on the left bank of the Godávári, and you are requested to detach the above party for this purpose.

UNDER the circumstances explained in Mr. Walch's letter, the detachment will provide hutting accommodation for themselves, the usual allowances being granted by the Military Department.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secretary to Govt., P.W.D.

To the Military Department,

ORDER,—Communicated to His Excellency the Commander-in-Chief.

2. Under O.G. (Military), No. 356, dated 30th January 1872, all special charges, including cost of hutting, incurred on account of Sappers employed on purely civil works, form a debit against the Public Works Department.

(True Extract.)

(Signed) H. N. D. PRENDERGAST, Col., R.E.,
Ag. Secretary to Government, Mily. Dept.

ORDER THEREON, No. 1,035 W., dated 27th April 1880.
COMMUNICATED to the Examiner of Public Works Accounts.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Military Department, dated 16th June 1880, No. 3,763.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri District, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 27th May 1880, No. 547.

I HAVE the honor to inform you that immediately on receipt of G.O., No. 996-AW., dated 21st April 1880, I put myself in

* No. 444, dated 13th May 1880.
One original letter from Mr. Vanstavern, dated 20th May 1880.

communication with Mr. Vanstavern, and enclose copy of my last letter* to him to which I have received the enclosed reply,

in which I am sorry to say he declines to undertake the superintendence of the coal shaft sinking for the reason which he states in a private letter.

That reason being that he thinks it probable that private affairs may render it necessary for him to leave the country before it would be possible to complete the shaft.

2. I am now at a loss to know how to carry out the wishes of Government as regards the speedy sinking of the shaft. An extra Overseer having come (see my No. 519, of 24th May 1880) I could send him, but he knows nothing of the kind of work, and it is doubtful if the working under him of the Sappers, whom it is proposed to send, would be smooth, and I would recommend that a Non-Commissioned Officer of the Sappers and Miners should be sent for the work.

3. Mr. Vanstavern states that, though borings could be got down during the rains and when the river was high, the difficulties and expense of sinking a shaft would, he is sure from a knowledge of the place, be much greater than in the dry season, as water would be met with at a much higher level and in much greater quantities.

No. 126.

REFERRED to the Military Department, with request that it may be ascertained if the services of any Non-Commissioned Officer of Sappers (European) acquainted with mining or shaft sinking can be placed at the disposal of this department for directing the operations as suggested by Mr. Walch. If such a Non-Commissioned Officer can be found, it is requested that he may be directed to proceed at once to the spot.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.
5th June 1880.

From the Adjutant-General, No. 173, dated 14th June 1880.

In returning Military Department memorandum No. 3,561, of the 7th current, I have the honor, by order, to inform you that the services of Corporal Nicks of the

"Queen's Own" Sappers and Miners are available for the Godáviri coal shaft. He is stated to be zealous and by trade a "Fitter."

ORDER,—Ordered that the Adjutant-General's letter be communicated to the Public Works Department.

2. His Excellency the Commander-in-Chief is requested to cause Corporal Nicks to be detailed at once for the duty.

(True Extract.)

(Signed) J. MICHAEL, Col.,
Secy. to Govt., Mily. Dept.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 28th July 1880, No. 1,164.

WITH reference to our inspection of the proposed site for coal shaft on 22nd instant, I have the honor to forward tracing from plan of survey which I then ordered to be made.

2. I append the orders now issued to the Corporal in charge of the party with reference to this survey.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to Corporal F. NICKS, Golagudiem, dated 28th July 1880, No. 1,163.

WITH reference to the accompanying plan a report ought to have been sent stating whether there are any indications that point E., said to have been shown by villagers as site of bore-hole No. 16, is really the site.

2. If there be not any trustworthy indications that it really is so, the shaft is to be sunk at point A., or should that be in a local depression where trouble will be given by surface drainage, at some convenient point between it and D.

NOTE.

WITH reference to the annexed letter No. 1,164, of the 28th July 1880, from the Superintendent of Works, Godáviri, on the subject of the coal sinkings, I beg to offer the following brief remarks, having lately had the opportunity of inspecting the site of the operations in company with Mr. Martindale and Mr. Walch.

2. Leaving Dowlaishweram on morning of the 21st ultimo, Mr. Walch and I taking the new steam launch, *Arthur Cotton*, were enabled to pass very nearly through the Godáviri gorge before anchoring for the night, although the current was strong, 5-3 feet in depth, passing over the crest of the anicut.

3. Next morning picking up Mr. Martindale at Woodagudiem, we arrived at the site of the coal operations about noon, and spent some five or six hours in inspecting the locality and chiefly in endeavouring to find out the precise position of bore-hole No. 16, at which point, owing to the promising results of the previous borings, it had been decided to sink the shaft.

4. We found Corporal Nicks with his fourteen Sappers encamped at Golagudiem (*Golagaram* of the Indian Atlas), the party were well and sufficiently provided with shelter till the new shed 80 feet x 18 feet now sanctioned (and for which corrugated iron sheets have been brought down from the spare stores at Dumagudiem) has been run up, as it will be immediately.

5. In addition to an ample supply of tools of all kinds there was ready a pump which will, I hope, answer all purposes till a depth of 80 feet has been reached, when

one driven by steam now preparing at the Madras workshops will be sent up for unwatering the shaft at greater depths.

6. Twenty horizontal circular frames of angle iron, sufficient if spaced at 5 feet apart to reach to a depth of 100 feet, were also on the ground. If stiff soil or rock be met with, these may be spaced at greater intervals or omitted altogether and answer for 150 feet in depth, but in any case Mr. Walch can readily send up all that is needed in this respect from Dowlaishweram.

7. Mr. Martindale, who takes a kindly interest in the work, will see that the party have ample and good supplies, and if, as I hope, the men only keep their health, the work should progress favorably, though it is at the same time to be feared that, particularly at this season, water may be met with close to the surface, and difficulties on this account may delay operations.

8. Corporal Nicks had explored nearly all the area of previous operations, but had failed to discover the precise location of bore hole No. 16. Most of the sites of the other bore holes as pointed out by the villagers had been marked by a rough block of red sand stone, but in this particular case no indication could be found and it was thus fortunate that we were able to visit the place at this time.

9. From there not being a single definite point or bearing given on the survey whereby to recognise the old holes, and from these having been mere punctures and easily obliterated, it was necessary to fix the point in question by as many approximations as we could. The result is shown by the tracing now sent up by Mr. Walch. Our approximations led us to decide on the point A., and it would now appear from subsequent information received from the villagers (probably those of Totapilly, who we were informed had been engaged on this particular portion of the old work) that the point E. at no great distance from A. is the true point.

10. I feel assured that in no case will the point selected here be much out, though, of course, it would have been very much more satisfactory to find the exact locality.

Mr. Walch's present decision as conveyed to Corporal Nicks may therefore, I think, be safely accepted.

11. The whole country about is rather undulating, clayey, with bushy jungle here and there, and well raised above the river, but showing from the moisture which lodges in the lower portions, that at this season much water may have to be encountered in sinking the shaft.

12. It would, of course, be premature to say much about the results of these operations, but if Mr. Vanstavern (whom I met at Woodagudiem, but who owing to illness was unable to accompany me to the coal field) is to be credited, the coal is likely to turn out very shaley. The best specimen, he informed me, only yielded 30 per cent. of carbon, and the worst 9 per cent.

13. As regards the proper designation of this coal field, there is some doubt. Totapilly, by which it appears to have been first known, though shown on the atlas, is a very insignificant village and at a distance from our present workings. Tiperpenti (Tipurapentaneed of the tracing) is not shown on the atlas, and is also both insignificant and at some distance. If the field is to be called after any of the neighbouring villages, Golagudiem, where the camp is and which is both shown on the atlas and is on the river bank, would be the most appropriate designation.

14. But to the best of my judgment it would be preferable to call it the Bhadrachalam field, as it is sufficiently near to this, which is certainly the best known and most important place in the neighbourhood.

15. If the Government approve, therefore, I would in all future correspondence designate this the Bhadrachalam coal field.

16. The Superintendent of Works has orders to send up fortnightly progress reports of the work done.

9th August 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Chief Engineer, P.W.D.

No. 318.

MEMORANDUM.

THE accompanying note is forwarded to the Superintendent of Works, Godavari, for information.

2. The decision conveyed in his letter No. 1,164, of the 28th July 1880, with reference to the point at which the shaft is to be sunk is accepted.

3. Fortnightly progress reports should be continued in order that His Grace the Governor may be kept advised of the results.

4. This field will in future be designated the Bhadrachalam field in all official documents.

(Signed) R. H. SANKEY, Colonel, R.E.,
14th August 1880. Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 18th August 1880, No. 1,336.

IN continuation of my letter No. 1,164, of the 28th July 1880, I have the honor to forward, herewith, an extract from letter No. 4, of the 5th August 1880, received from Corporal Nicks stating that he is fully convinced that bore hole No. 16 was at the point E. shown on the survey plan, of which copy was sent with my No. 1,164.

Extract of a letter from Corporal F. NICKS, R.E., in charge of Coal Shaft Sinking, to G. T. WALCH, Esq., Superintendent of Works, Godavari, dated 5th August 1880, No. 4.

WITH reference to your docket No. 1,163, dated 28th July 1880, regarding point E as shown by villagers, I am fully convinced it is the actual site of bore hole No. 16. In the first place I was taken to the spot E by two villagers who stated they were employed at the boring. I examined the surface soil and found indications that boring had been done there. I found two different soils, viz., light colored clay and sand stone in layers, the same as would come from an auger after boring.

2. On the 3rd instant I made inquiries at the village of Tipurapentaneed and found a man who was employed from the commencement to the finishing of the borings under Mr. Vanstavern; he also took me to the exact spot marked E as shown on plan and showed me the above soil as mentioned, and states that was what came up with the auger; he also pointed to a tree where they cooked their meals, which is only 10 yards from the spot. I intend to sink the shaft at the place pointed. I have already commenced getting stores on the spot to commence work.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 23rd August 1880, No. 1,434.

Report No. 1 on progress of work at Bhadrachalam coal fields to 14th August 1880.

THE sheds having been erected and necessary machinery moved up to site for shaft, actual sinking was commenced on 12th August, and up to 14th depth gone down to was 4 feet 6 inches.

No. 393, dated 3rd September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 3rd September 1880, No. 1,587.

Report No. 2 on progress of work at Bhadrachalam coal fields from 15th to 28th August 1880.

SHAFT sunk from 4 feet 6 inches to 15 feet; soil passed through chiefly "blue and yellow clay" with kunkur; sand stone just reached; some trouble given by water after heavy storms. Party apparently not working quite satisfactorily. Will be visited soon.

No. 450, dated 17th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 16th September 1880, No. 1,721.

Report No. 3 on progress of work at Bhadrachalam coal fields from 28th August to 15th September 1880.

SHAFT sunk from 15 to 34 feet; soil passed through chiefly yellow sand stone compact *in situ*, but breaking up easily when dug out. Pump arrangements fixed.

No. 490, dated 30th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 22nd September 1880, No. 1,722.

I HAVE the honor to inform you that I have on 15th, 20th and 21st instant inspected the work at the Bhadrachalam coal fields, and I find that, though going on slowly, it is being well done.

2. The shaft has now been sunk to a depth of 39 feet and water has just been reached.

3. The first 5 feet passed through was ordinary alluvial and vegetable soil; then came for 10 feet yellow clay, about the lower 5 feet of which was mixed with kunkur; then for 14 feet 6 inches yellow sand stone compact and hard *in situ*, but disintegrating when removed to the surface; and below this to the 39 feet depth a light blue clay chiefly "pipe clay" with at 38 feet a stratum of a few inches of sand stone.

4. Through this last thin stratum of sand stone water has commenced to come in slowly. At 4 P.M. on 20th I saw the bottom of the shaft practically cleared of water, and at 6 A.M. (21st) 1 foot 8 inches in depth had accumulated.

5. The Abyssinian pump sent from Madras has been fixed and works well, clearing such water as is now coming in with perfect ease.

6. The party is well housed and has kept in fair health. Corporal Nicks and some of the men have had rheumatism, one or two have had slight fever, and the Naigue who went up with the party has been sent back to Dowlaishweram with bad ulcers on his feet, and he has been replaced by another man.

7. There have been no accidents, and I am quite satisfied with the care taken by Corporal Nicks, who is in immediate charge of the operations. I cannot say I am quite satisfied with the rate at which the work has been carried on, but native Sappers, it appears to me, do not generally work rapidly.

No. 506, dated 5th October 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 5th October 1880, No. 1,843.

Report No. 4 on progress of work at Bhadrachalam coal fields from 15th to 30th September 1880.

SHAFT sunk from 34 to 44 feet; soil passed through, sand stone, with layers of light blue clay, chiefly pipe clay; water coming in quickly. Pump, "Abyssinian," has now to be worked night and day.

2. The Corporal in charge reports that his detachment is working unsatisfactorily, and that "if the sepoy are required to work in the shaft or at the winch they report themselves sick."

3. It seems likely that these men are behaving as they are with the object of being sent back to their Company, which they think may soon be sent to Bangalore; it would, I think, be well to let them know for certain that they will not be sent away from the work till it is finished, and that if they are sick they will have to go into hospital at Rajahmundry and when discharged return to the work. Eight coolies are now employed to assist the detachment.

No. 2,331.

THE Chief Engineer concurs with the Superintendent of Works that it will be advisable to let the Sappers distinctly understand that they will not, by malingering, be enabled to desert the work which they have been sent up to carry out.

2. When sick they may be sent to the hospital at Rajahmundry as proposed.

(By Order.)

(Signed) J. PENNYCUICK, Major, R.E.,
Deputy Chief Engineer, P.W.D.

18th October 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Yernagudem, 20th October 1880, No. 2,006.

Report No. 5 on progress of work at Bhadrachalam coal fields from 1st to 15th October 1880.

SHAFT sunk from 44 to 50 feet; soil passed through, sand stone, said to be hard, with thin layers of clay.

2. Slow progress due to large quantities of water to be dealt with, and the Corporal reports that the Abyssinian pump can no longer keep the water down, and no further sinking can go on till the steam pump is at work. This is expected daily.

No. 2,422, dated 2nd November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th November 1880, No. 2,641 W.

Proceedings of the Madras Government, Military Department, dated 13th November 1880, No. 7,102.

Telegram from the Superintendent of Works, Godáviri, to the Public Works Department, Madras, dated 26th October 1880.

"Another Non-Commissioned Officer to help Corporal Nicks, often ill, and Dresser for coal party much wanted."

TRANSFERRED to the Military Department, with a request that it may be stated whether any Non-Commissioned Officer can be sent from the "Queen's Own" Sappers and Miners for the purpose.

OOTACAMUND,
29th October 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From the Adjutant-General, dated 10th November 1880, No. 499.

WITH reference to a telegram from the Superintendent of Works, Rajahmundry, dated 26th October 1880, transferred to the Military Department under Public Works Department No. 601 of 26th ultimo, and referred to His Excellency the Commander-in-Chief under Government endorsement memorandum No. 6,887 of 30th idem, herewith returned as requested, I have the honor, by order, to state that there is no objection to the services of Corporal B. Fuller, R.E., being placed at the disposal of Government in the Public Works Department for employment at Rajahmundry.

ORDER.—The Adjutant-General's letter communicated to the Public Works Department.

(True Extract.)

(Signed) J. MICHAEL, Colonel,
Secretary to Government, Mil. Dept.

ORDER THEREON, No. 2,641 W., dated 18th November 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

2. It is requested that the services of Corporal Fuller may be made available as early as possible.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 30th November 1880, No. 2,674.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 4th November 1880, No. 2,254.

Report No. 6 on progress of work at Bhadrachalam coal fields from 16th to 31st October 1880.

SHAFT sunk from 50 feet to 55½ feet; sand stone passed through to 55 feet, then a layer of clay. Below this it has been impossible to go with the Abyssinian pump and the steam* pump must be awaited.

* Arrived at Dowlaishweram, 2nd Nov. 1880.
Despatched by steamer to Golagudiem, 4th November 1880.

Firewood is being collected for the engine.

The Corporal in charge of the party has been suffering from dysentery and fever, and it appears that without his personal presence on the work it does not go on properly; another Non-Commissioned Officer is therefore very necessary, especially as pumping will have to be kept up at night. The unhealthiness of the place at this time of the year and the possibility of accidents make it also highly advisable that a Dresser should be attached to the party. Telegram of 26th October asking for another Non-Commissioned Officer and a Dresser was therefore sent.

Telegram from the Secretary to Government, Public Works Department, Madras, to the Superintendent of Works, Godáviri, Rajahmundry, dated 16th November 1880.

"Does further experience show that a Dresser for the coal party is still essential."

Telegram from Superintendent of Works, Godáviri, Rajahmundry, to the Secretary to Government, Public Works Department, Madras, dated 17th November 1880.

"HEALTH of coal party better, since rain stopped. May do without Dresser."

ORDER THEREON, No. 2,674 W., dated 30th November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd December 1880, No. 2,708.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 18th November 1880, No. 2,401.

Report No. 7 on progress of work at Bhadrachalam coal fields from 1st to 13th November 1880.

THE steam pump arrived at Golagudiem on 6th, and since then the party have been fully occupied in taking it, and the engine to work it, to the shaft and setting it up; the Corporal in charge reports that "the work is proceeding in a satisfactory manner."

2. Lieutenant Gale, R.E., visited the party on the 6th and 7th, and the Corporal in charge reports that since that visit and the change of Havildars which was then made the detachment has been working better than it had been working for some time previously.

3. The health of the party is better than it was, and it is thought that now it may get on without a Dresser, though of course it would be safer to have one on the spot, and another Non-Commissioned Officer to assist Corporal Nicks is very necessary as mentioned in the last report.

ORDER THEREON, No. 2,780, dated 3rd December 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd December 1880, No. 2,934 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 2nd December 1880, No. 2,554.

Report No. 8 on the progress of work at the Bhadrachalam Coal-field.—13th to 30th November 1880.

THE party have been engaged in keeping water down in the shaft with the Abyssinian pump and setting up the steam-pump and its engine. No further sinking has been possible in the period under notice.

2. The Corporal in charge again reports, "there is a great deal of sickness among the detachment. Fever is very prevalent."

ORDER THEREON, No. 2,934 W., dated 22nd December 1880.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 10th January 1881, No. 38 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Wuddigudem, 16th December 1880, No. 2,751.

Report No. 9 on the progress of work at the Bhadrachalam Coal-field.—1st to 15th December 1880.

THE steam-pump was set to work on the 8th. There were then "18 feet of water in the shaft," and "it took 2 hours 35 minutes to pump dry;" owing, however, to extra framing, &c., being found necessary, actual work of excavation was not recommenced till 13th.

2. On the 15th the undersigned inspected the work. The shaft was down 56 feet, it was in good order and the pump going dead slow was keeping it clear of water. A layer of clay (chiefly pipe-clay) had just been reached through which water was coming in freely.

The water has for some time past been sensibly affected by variations in the level of the river, which is now low, though not so low as it will be. It is impossible to say whether the one pump will be able to deal with the water which will be met with in the next 100 feet, and it will probably be advisable to have another ready; it could be driven by the same engine and driving machinery.

3. The huts were being moved up to near the shaft.
4. Ninety cubic yards of firewood for the engine have been cut.
5. The health of the party is not good, there are generally one-third or so of the sepoys down with fever, but it does not appear to be of a virulent type.
6. Corporal Fuller, R.E., has now (on 15th) joined the work.
7. No steamer will be able after this to get to Gollagudem, and probably not even to Wuddigudem till next June or July.

ORDER THEREON, No. 38 W., dated 10th January 1881.

THE Government consider that the additional pumping power referred to in paragraph 3 of the foregoing letter should be provided. The Superintendent of Works, Godáviri, will arrange accordingly.

2. The work being unhealthy should be pushed on as rapidly as possible.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 14th January 1881, No. 96 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 7th January 1881, No. 2,927.

Report No. 10 on the progress of work at the Bhadrachalam Coal-field.—16th to 31st December 1880.

- (1.) Shaft deepened by 8 feet to 64 feet.
- (2.) Soil passed through "different kinds of clay."
- (3.) Removal of huts to site of shaft finished.

ORDER THEREON, No. 96 W., dated 14th January 1881.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 25th January 1881, No. 195 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 10th January 1881, No. 2,966.

I HAVE the honor to send herewith a letter from Corporal Nicks, R.E., in charge of the coal operations near Bhadrachalam, reporting the inrush of a large volume of water into the shaft.

2. Till this occurred all seemed to be going on well, though slowly.

3. I have told Corporal Nicks to again rig up the Abyssinian pump and see if with it he cannot get the water down low enough to get at the steam-pump box and again set it going, and then if the two will keep the water down sufficiently low it is possible that by putting in specially prepared cylinders we may be able to get through the treacherous stratum which has led to the present mishap; but if water with our present appliances cannot be kept so low, another pump more powerful than the present one, with machinery and engine to drive it, must be sent up.

4. Such machinery and engine however could not be got to the place before the next season of freshes in the river, say next July, and should it be found quite impossible to deal with the water with the present appliances I would request instructions as to what in the interval is to be done with the Sapper coal party.

From Corporal F. NICKS, R.E., to the Superintendent of Works, Godáviri, Dowlaishweram, dated Gollagudem, 5th January 1881, No. 118.

On Tuesday evening we were deep enough for 9th ring, and on Wednesday morning myself and Corporal Fuller started putting in same, as the soil was very treacherous it not being safe to trust sepoys; we had a slip of earth from the north side of shaft at about 11 A.M. We started then to plank that portion, as we had put in on (4) four plining (sic) planks and placed ring, we worked on and had placed four planks in the north quarter; we then noticed the water gradually rise, and the pump would not keep it down. I then sent Corporal Fuller up to ascertain if the engine was under proper steam, he informed me as he was coming down in bucket that steam gauge indicated 25 lb. As I was in the act of guiding the bucket down the water burst in from the south-west side, bringing with it a large quantity of "clay," about one-quarter yard, which knocked me down. Corporal Fuller said to me we had better take all tools up with us, but before he could get out of the bucket the water rose to my waist. I then said, never mind the tools we must get above the water in case the rings in upper work give way, as I had put my arm in where water was rushing from and found a large hole about 6 inches by 2 feet, so the clay could not be more than 1 foot 6 inches thick in front of the hole we had previously left, a berm of 6 inches in other work and considering this work was very dangerous we left a berm of 1 foot 3 inches.

We then cleared out of shaft as soon as possible with the water rising at the rate of 1 foot per minute, leaving all tools at bottom as we could not get at them for the water. I also kept engine at work till 10-25 P.M. making 25 strokes per minute, but the water still kept rising.

Rise of water	4-10 P.M.	No water more than ordinary.	5th January 1881.
Burst in at	4-15 P.M.		
7 feet	4-25 "		
21 feet 3 inches	5-50 "		
26 feet 8 inches	7-50 "		

Whilst taking measurement at 10 P.M. the pump gone out depth of water at the above time 29 feet 4 inches. I then gave orders to engine driver to draw fire, I then emptied boiler as I had been under steam near 400 hours.

At present we cannot get pump clear as working box is under water, the only remedy will be to get another set of top gear pipes and pump rods; if it is the Godáviri which is broke in upon us, which I think it is, it will be useless. 11-30 P.M.

I took measurements at 11-35 and found 33 feet 4 inches and at 7 A.M., the 6th, and found 38 feet 8 inches.

Please give me further instruction in answer to this.

ORDER THEREON, No. 195 W., 25th January 1881.

THE Superintendent of Works, Godáviri, has already been authorised* to arrange
* G.O., No. 38 W., dated 10th January 1881. for the provision of additional pumping power.

2. The Government await a further report before passing orders on the subject of paragraph 4 of the letter above read.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Yanam, 19th January 1881, No. 3,073.

In continuation of my No. 2,966, dated 10th instant, I have the honor to state that Corporal Nicks reports that in spite of all efforts it has been found impossible to raise the pump to get at the upper box and working barrel, and that at noon on the 6th the water had attained the "height of 40 feet" since which it has not varied.

2. It is evident, therefore, that another and more powerful pump must be provided if the work is to be persevered with.

Telegram to the Superintendent of Works, Godáviri, Rajahmundry, dated 27th January 1881, No. 193.

MORE powerful pump for coal workings sanctioned. Arrange for one at once.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd February 1881, No. 308 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 28th January 1881, No. 3,185.

Report No. 11 on the progress of work at the Bhadrachalam Coal-fields.—1st to 15th January 1881.

Work progressed steadily till 5th, when the shaft was down 69 feet, water in large quantities then came in and overpowered the pump (see letters Nos. 2,966, 10th January 1881, and 3,073, 19th January 1881, to the Chief Engineer), and on the 15th there were 40 feet 4 inches depth of water in the shaft.

2. The Abyssinian pump which had been taken away and put on the barge was again taken to the shaft, and its placing commenced with the hope (a faint one) that with it the water can be so lowered that it may prove possible to get at the steam-pump boxes and set it going again. (See paragraph 3 of letter No. 2,966, 10th January 1881, to Chief Engineer.)

ORDER THEREON, No. 308 W., dated 3rd February 1881.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd February 1881, No. 493 W.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 31st January 1881, No. 3,225.

With reference to your telegram of 27th I have the honor to report that I have no means of here arranging for a more powerful pump for the coal shaft, and can only suggest that one may be supplied from the workshops at Madras or obtained from England.

2. Having had no experience in the work for which the pump is required, and having no one here who has had such experience, I cannot state with any certainty what is the nature and power of the pump required, and it seems therefore that it is best for me to explain the conditions of the case and from them possibly some Mining Engineer or manufacturer of mining machinery will be able to decide what is wanted. The conditions are these—

3. (a)—The shaft is 6 feet 3 inches diameter.
- (b)—It is sunk at about 1 mile from the edge of the Godáviri.
- (c)—The substrata already passed through (to 69 feet depth) have been almost entirely yellow sandstone, alternating with bands of yellowish and greyish clay, chiefly pipe-clay, and the boring shows that the general character of the strata to be yet passed through will be similar, but with fewer bands of clay, down to about 120 feet, when shale and coal will be met with.

(d)—Down to 55 feet there was but little water, but at that depth the Abyssinian pump could no longer deal with it, and the steam-pump sent up from the Madras Workshops was put up; whilst doing this (it occupied some days) the water rose 18 feet, this the pump when set to work cleared out in 2 hours 35 minutes.

(e)—This pump, driven by an old 8 horse-power engine, kept the water down easily enough till the shaft had reached a depth of 69 feet, when there was a sudden inrush through

For the first 7 feet came in at the rate of about 630 gallons a minute. a stratum of pipe-clay and the water rose 29 feet 4 inches in 5½ hours against the pump going 22 strokes a minute. The pump then got choked and

See copy of letter from Corporal Nicks, No. 118, 5th January 1881, herewith. the water rose another 10 feet 8 inches, that is 40 feet

in all (or to 29 below top of shaft) in another 14 hours and at that level it has stood.

(f)—The shaft has to go down to a total depth of about 150 feet.

(g)—The river—the variations in level of which have been noted to affect the water in the shaft—rises in the season of floods (from June to October) from 15 feet to 20 feet or so above its present level, or approximately to from about 10 feet to 15 feet below level of top of shaft.

(h)—As most of the soil to be passed through is sandstone, much sharp sand comes up with the water, and it has been found to rapidly wear away any leather it comes in contact with, such as "buckets," valves, &c.

4. As already stated in my No. 2,966, 10th January 1881, paragraph 4, machinery or apparatus of any kind, weighing more than could be carried by two coolies, could not be got to the shaft till next July, because it could not be taken by water much if at all beyond Koide, some 34 miles below Gollagudem, and between the two places there is no road, only a jungle track, which in places passes over rocky slopes of hills.

P.S.—As all pumps occasionally get out of order and all engines require to be stopped now and then, it will be highly advisable, if not necessary, to have two pumps and two engines, and it is of course of great convenience that the working parts of the pump should be easily raised or got at.

From the same officer, dated 6th February 1881, No. 3,294.

Report No. 12 on the progress of work at the Bhadrachalam Coal-field.—16th to 31st January 1881.

The Abyssinian pump (see paragraph 2 of last report) was fully rigged up by 19th, and pumping then commenced with it; by 24th the water had been reduced 11 feet, or to 29 feet in depth, and then the working part of the steam-pump was got at.

2. The leather "buckets" which had worn out (they are constantly wearing out owing to the action of the gritty sand, see paragraph 3, (g.), No. 3,225, 31st January 1881), were renewed and the pump was started again on 25th; by the evening of 27th it had reduced the water by 8 feet, or to 21 feet, in depth, below which it could not reduce it, and the leathers having again worn out it had to be stopped for a time, when the water immediately rose against the Abyssinian pump to 30 feet 7 inches depth.

3. It is quite evident that with the present pumping power it will be impossible to recommence sinking operations.

4. There can be little doubt that the water in the shaft is in communication through some permeable stratum with the water in the river, and that enormously powerful machinery and a very great expenditure will be necessary to enable the shaft to be sunk to where it will reach the shale and inferior coal which borings and geological researches have established to exist in small quantities in the locality.

ORDER THEREON, No. 493 W., dated 22nd February 1881.

THE Right Honorable the Governor in Council considers that before any further expenditure is incurred the opinion of an expert in mining matters should be obtained. The Chief Engineer has, it is understood, written to Calcutta to inquire whether the services of any qualified person can be secured.

Meanwhile the work should be suspended.

2. Orders have already been issued to the Superintendent of Works, directing the Sappers to return to their Company.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 542 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 11th February 1881, No. 3,370.

FURTHER information has shown me that I was wrong in supposing that when water burst into the coal shaft at Bhadrachalam it came in at the rate of "630 gallons a minute," as stated in the margin, paragraph 3, clause (e) of my No. 3,225, 31st January 1881; it came in at the rate approximately of 200 gallons a minute.

2. I would take this opportunity of asking for early orders on paragraph 4 of my No. 2,966, 10th January 1881.

ORDER THEREON, No. 541 W., dated 28th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 541 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 17th February 1881, No. 3,463.

Report No. 13 on Bhadrachalam Coal-field work.—1st to 15th February 1881.

As stated in last report it is quite impossible to proceed with the work, and it therefore has been at a complete stand-still during the last fifteen days.

ORDER THEREON, No. 542 W., dated 28th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

B

54.2 W dated
28th July 1871.

Proceedings of the Madras Government, Public Works Department, dated 18th March 1880, No. 698 W.

Read the following paper:—

MINUTE BY HIS GRACE THE GOVERNOR.

THE question of getting access to coal in this Presidency for railway and navigation purposes is a very important one.

2. That coal exists in the Nizam's territory, between the Godáviri and Kistna, is well ascertained, and the quality of that recently obtained and tried, although the results are not yet accurately calculated, show that the coal is of a good, useful description, and reported by the Public Works Workshops as quite equal to the ordinary Indian coal they have in use. It becomes a question of price.

3. Coal is wanted for railway and steam purposes at Madras, for the navigation of the Godáviri and at Cocanada, and will no doubt be also consumed on the canal.

4. It has been ascertained that coal exists on the Godáviri river on the British side, and some coal raised from the dry bed See Map. About one-third of the distance between Bhadrachalam and Rékapalle. of the river has given "good results" in the Godáviri steamers. The quality of the coal, as tested by boring with small bores, is necessarily uncertain. Some is spoken of as fair, some as inferior; but it is close to the river, and the ground apparently not costly to sink in. If, as estimated by Mr. Vanstavern (who was especially employed upon the coal investigation), the coal seams can be reached by a shaft for an amount of under Rs. 2,000, it would be a matter to be tried at once without doubt; but I would put it higher, and taking the estimate above given, I would make allowance for pumping, ventilating and levelling, say that the trial should be considered as not to be effectually made under a possible Rs. 5,000; say at No. 16 bore, where the coal is within 150 feet from surface and about 18 feet thick, and the shaft only 1 mile from river, but above flood lines.

5. Coal in such a situation ought to be sufficient and economical for all purposes of steam engines on the river and delta and also at Cocanada, as its price must be low from the freight being entirely water and down-stream, so that an extra quantity might be used. How much further it could be carried can only be really known by actual test.

6. The opening of coal at this spot would doubtless stimulate the opening on the Nizam's side.

7. In ordinary times I should not hesitate to recommend the expenditure necessary to reach and test the coal seams, and even in the present times it seems to me desirable to do so. If the coal sufficed only for Godáviri use, the cost would not be wasted.

8. The opening of any coal operation would tend to develop and thus to pacify the country around.

9. The question to be decided then is—

Shall Government endeavour, at a cost which may reach Rs. 5,000, to open the coal already ascertained to exist?

10. If that be agreed then the Chief Engineer should suggest the arrangements, and the co-operation of Mr. Vanstavern should be secured, for his local knowledge and long experience of the district.

11. The working season is from now to June.

5th January 1880.

(Signed) BUCKINGHAM AND CHANDOS.

N.B.—The original maps, sections and memoranda should be returned to Mr. Vanstavern, as they are only lent. I could not trace the copies in Government possession—possibly lost.

ORDER THEREON, No. 698 W., dated 18th March 1880.

THE Revenue Department will arrange to place at the disposal of the Public Works Department the sum of Rs. 5,000 from the accumulated Cattle Trespass Fund for certain experiments on coal-boring operations in the Godáviri district.

2. This amount will be recouped when necessary for the farm purposes later on.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

No. 859.

MEMORANDUM.

HIS GRACE the Governor in Council having decided to make an early commencement with sinking a shaft for working a coal seam, whose existence has been proved at a point midway between Bhadrachalam and Rékapalle on the left bank of the Godáviri, the undersigned is desired to inquire whether His Excellency the Commander-in-Chief thinks that a party consisting of, say, two European Non-Commissioned Officers and a Havildar and Naigue with fourteen Sappers, who are acquainted with mining could conveniently be spared from the Companies of the "Queen's Own" Sappers and Miners which are now attached to the force under the command of Colonel Buck.

2. Their employment in sinking the shaft required might possibly extend to six months.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

15th March 1880.

To the Secretary to Government, Military Department.

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 20th March 1880, No. 213.

WITH reference to your docket memorandum, No. 1,771, dated 16th March 1880,

* Herewith returned.

I have the honor to inform you that the Officer Commanding, Sappers and Miners at Dowlaiswaram, has been directed to detach two British Non-Commissioned Officers with a Havildar and Naigue and fourteen Sappers for the purpose of sinking a shaft in the Godáviri district.

2. It is of great importance that these men should not be exposed in tents during the hot season, and His Excellency trusts that Government will see the necessity of having thatched huts for the natives, and suitable erections for the shelter of the British Non-Commissioned Officers employed.

No. 1,964.

TRANSFERRED to the Public Works Department, with reference to its memorandum, No. 859, dated 15th March 1880.

(By Order.)

FORT ST. GEORGE, (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
25th March 1880. Acting Secretary to Govt., Mily. Dept.

No. 972.

MEMORANDUM.

THE Chief Engineer has the honor to forward, for the information of the Superintendent of Works, Godáviri, a copy of a Minute by His Grace the Governor regarding coal-boring explorations on the British side of the Godáviri river, with copies of the correspondence that has passed on the subject.

2. On receipt of an intimation from Mr. Vanstavern that he has no objection to the free use of the plans, &c., borings can be commenced. As it is understood that the working season will only last for about two months longer, every exertion should be made.

3. Meanwhile, in accordance with the wishes of His Excellency the Commander-in-Chief, proper shelter for the British Non-Commissioned Officers employed and thatched huts for the natives should at once be provided.

4. Mr. Walch's attention is invited to Lieutenant Baddeley's letter of the 15th March, in case the requisite machinery, &c., cannot be got from the Dowlaiswaram shops.

(Signed) R. H. SANKEY, Col., R.E.,
Chief Engineer, P.W.D.

31st March 1880.

To the Superintendent of Works, Godáviri.

Proceedings of the Madras Government, Public Works Department, dated 14th April 1880, No. 960 W.

Read the following paper :—

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 2nd April 1880, No. 250.

IN continuation of Adjutant-General's letter, No. 213, dated 20th March 1880,

1 Havildar.
1 Naigue.
14 Privates.

I have the honor, by order, to state that the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaiswaram reports that the party, as

per margin, is in readiness to proceed under the orders of the Public Works Department.

2. There are no European Non-Commissioned Officers with the Detachment.

No. 2,117.

TRANSFERRED to the Public Works Department, in continuation of No. 1,964, dated 25th March 1880.

FORT ST. GEORGE, (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
3rd April 1880. Acting Secretary to Govt., Mily. Dept.

ORDER THEREON, No. 960 W., dated 14th April 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 21st April 1880, No. 996-A W.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 6th April 1880, No. 84.

I HAVE the honor to acknowledge the receipt of your memorandum No. 972, dated 31st ultimo.

One Indent in triplicate.

2. As you will have seen from my letter No. 701, dated 31st March 1880, and its enclosure, I have no officer or upper

subordinate whom I can send for the coal operations, and the Officer Commanding the Detachment of the "Queen's Own" Sappers and Miners here has no European Non-Commissioned Officer.

3. In paragraph 10 of the Minute by His Grace the Governor it is said that "the co-operation of Mr. Vanstavern should be secured," and it seems to me that it would be advisable, as he lives not far from where the operations are to be carried on and has had some experience in such work, to employ him on a salary to superintend the work, but I have no authority to open negotiations officially with him on the subject, or to make him any offer.

4. The steamers cannot now go up the river further than Koide (52 miles), and only boats of very small draft can get from there to where the operations are proposed, some 35 miles further.

5. There are no pumps here at all suited for deep shaft sinking, and I enclose an indent for such a pump and machinery to drive it, which, if approved, please send on to the Government workshops, Madras. If the pump be sent it should be accompanied by a Maistry who understands its working.

6. I think if you will consider all the circumstances of the case you will see that there is no probability of the work being done in the "two months" mentioned in paragraph 2 of your memorandum under notice.

From Lieutenant W. L. C. BADDELEY, R.E., General Superintendent of Public Works Workshops and Stores, Madras, to the Secretary to Government, Public Works Department, dated 15th March 1880.

We have two deep well pumps in store which would be suitable for working a shaft 80 feet in depth.

2. The five-inch lift pump which we made for the Ooregum Company is a good pattern for deep shafts, and we could make up these very soon if required.

3. One of the Workshop Maistries would be available to look after the pumping machinery, but there is no one here who understands anything about mining.

4. If Dowlaishweram cannot provide the engines, we can spare a 4 horse-power portable or any number of Gwynne's or Nasmyth's 4 and 6 horse-power engines and boilers combined. These also could be made fairly portable by fitting them on a stand with wheels.

5. We have no machinery for working or lifting coal, but probably there would be no difficulty in making up any ordinary appliances.

ORDER THEREON, No. 996-A W., dated 21st April 1880.

THE Superintendent of Works, Presidency, will at once direct the General Superintendent, Public Works Workshops, to despatch one of the deep well pumps mentioned by him as suitable for a shaft 80 feet deep to the Superintendent of Works, Godáviri, along with one of the Workshop Maistries for looking after this and such other machinery as it may be found necessary to send for unwatering the coal shaft.

That officer should also be directed to place himself without delay in correspondence with the Superintendent of Works, Godáviri, relative to any steam pumping or other machinery that may be deemed necessary for sinking the shaft below 80 feet.

2. The Superintendent of Works, Godáviri Division, is authorised to make arrangements with Mr. Vanstavern for directing the operations, preferably fixing a definite sum on the shaft being sunk to the bottom of the seam indicated by the borings, and reporting the terms as soon as possible for the information of Government.

3. The original borings having been executed during the monsoon, His Grace in Council has no reason to suppose that the work need now be subjected to any delay

on account of the season, and as he attaches the greatest importance to the sinking of the shaft, no efforts should be spared to effect that object at the earliest date.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 27th April 1880, No. 1,035 W.

Proceedings of the Madras Government, Military Department, dated 14th April 1880, No. 2,404.

Read the following papers:—

Proceedings of the Madras Government, Public Works Department, dated 7th April 1880, No. 893 W.

Read letter from the Superintendent of Works, Godáviri, dated 30th March 1880, No. 701.

I HAVE the honor to enclose copy of a letter received this day from the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram, and to request instructions.

2. I would point out that the district is shorthanded, that just at this season there is a great amount of work in connection with the anicut and head works, canals, &c., which has to be compressed into a very short time; and I trust, therefore, that no one will have to be taken away from such work to carry out the "hutting," &c., referred to by Major Hamilton, and which it appears to me the men might carry out themselves.

3. I do not know where the Kottapalle referred to is.

From the Officer Commanding Detachment "Queen's Own" Sappers and Miners, to the Superintendent of Works, Godáviri, dated 29th March 1880, No. 209.

WITH reference to letter, No. 822, dated 20th March, from the Adjutant-General (copy annexed for your information), I have the honor to report that the party, consisting of one Havildar, one Naigue and fourteen Privates, is in readiness to proceed up the river under your orders. There are no European Non-Commissioned Officers with this detachment.

2. I presume that you will supply all necessary tools.

3. The party will have to be hutted by the Public Works Department.

From the Officiating Adjutant-General, to the Officer Commanding "Queen's Own" Sappers and Miners, Dowlaishweram, dated 20th March 1880, No. 822.

AT the request of Government in the Public Works Department the Commander-in-Chief has sanctioned the services of a party of two European Non-Commissioned Officers, a Havildar, Naigue and fourteen Sappers, who are acquainted with mining, from the companies attached to the force under Colonel Buck, for employment in sinking a shaft for working a coal seam between Bhadrachalam and Kottapalle on the left bank of the Godáviri, and you are requested to detach the above party for this purpose.

UNDER the circumstances explained in Mr. Walch's letter, the detachment will provide hutting accommodation for themselves, the usual allowances being granted by the Military Department.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secretary to Govt., P.W.D.

To the Military Department.

ORDER,—Communicated to His Excellency the Commander-in-Chief.

2. Under O.G. (Military), No. 356, dated 30th January 1872, all special charges, including cost of hutting, incurred on account of Sappers employed on purely civil works, form a debit against the Public Works Department.

(True Extract.)

(Signed) H. N. D. PRENDERGAST, Col., R.E.,
Ag. Secretary to Government, Milly. Dept.

ORDER THEREON, No. 1,035 W., dated 27th April 1880.
COMMUNICATED to the Examiner of Public Works Accounts.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Military Department, dated 16th June 1880, No. 3,763.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri District, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 27th May 1880, No. 547.

I HAVE the honor to inform you that immediately on receipt of G.O., No. 996-AW., dated 21st April 1880, I put myself in communication with Mr. Vanstavern, and enclose copy of my last letter* to him to which I have received the enclosed reply, in which I am sorry to say he declines to undertake the superintendence of the coal shaft sinking for the reason which he states in a private letter.

That reason being that he thinks it probable that private affairs may render it necessary for him to leave the country before it would be possible to complete the shaft.

2. I am now at a loss to know how to carry out the wishes of Government as regards the speedy sinking of the shaft. An extra Overseer having come (see my No. 519, of 24th May 1880) I could send him, but he knows nothing of the kind of work, and it is doubtful if the working under him of the Sappers, whom it is proposed to send, would be smooth, and I would recommend that a Non-Commissioned Officer of the Sappers and Miners should be sent for the work.

3. Mr. Vanstavern states that, though borings could be got down during the rains and when the river was high, the difficulties and expense of sinking a shaft would, he is sure from a knowledge of the place, be much greater than in the dry season, as water would be met with at a much higher level and in much greater quantities.

No. 126.

REFERRED to the Military Department, with request that it may be ascertained if the services of any Non-Commissioned Officer of Sappers (European) acquainted with mining or shaft sinking can be placed at the disposal of this department for directing the operations as suggested by Mr. Walch. If such a Non-Commissioned Officer can be found, it is requested that he may be directed to proceed at once to the spot.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.
5th June 1880.

From the Adjutant-General, No. 173, dated 14th June 1880.

In returning Military Department memorandum No. 3,561, of the 7th current, I have the honor, by order, to inform you that the services of Corporal Nicks of the

"Queen's Own" Sappers and Miners are available for the Godáviri coal shaft. He is stated to be zealous and by trade a "Fitter."

ORDER,—Ordered that the Adjutant-General's letter be communicated to the Public Works Department.

2. His Excellency the Commander-in-Chief is requested to cause Corporal Nicks to be detailed at once for the duty.

(True Extract.)

(Signed) J. MICHAEL, Col.,
Secy. to Govt., Milly. Dept.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 28th July 1880, No. 1,164.

WITH reference to our inspection of the proposed site for coal shaft on 22nd instant, I have the honor to forward tracing from plan of survey which I then ordered to be made.

2. I append the orders now issued to the Corporal in charge of the party with reference to this survey.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to Corporal F. NICKS, Golagudiem, dated 28th July 1880, No. 1,163.

WITH reference to the accompanying plan a report ought to have been sent stating whether there are any indications that point E., said to have been shown by villagers as site of bore-hole No. 16, is really the site.

2. If there be not any trustworthy indications that it really is so, the shaft is to be sunk at point A., or should that be in a local depression where trouble will be given by surface drainage, at some convenient point between it and D.

NOTE.

WITH reference to the annexed letter No. 1,164, of the 28th July 1880, from the Superintendent of Works, Godáviri, on the subject of the coal sinkings, I beg to offer the following brief remarks, having lately had the opportunity of inspecting the site of the operations in company with Mr. Martindale and Mr. Walch.

2. Leaving Dowlaishweram on morning of the 21st ultimo, Mr. Walch and I taking the new steam launch, *Arthur Cotton*, were enabled to pass very nearly through the Godáviri gorge before anchoring for the night, although the current was strong, 5-3 feet in depth, passing over the crest of the anicut.

3. Next morning picking up Mr. Martindale at Woodagudiem, we arrived at the site of the coal operations about noon, and spent some five or six hours in inspecting the locality and chiefly in endeavouring to find out the precise position of bore-hole No. 16, at which point, owing to the promising results of the previous borings, it had been decided to sink the shaft.

4. We found Corporal Nicks with his fourteen Sappers encamped at Golagudiem (*Golagaram* of the Indian Atlas), the party were well and sufficiently provided with shelter till the new shed 80 feet x 18 feet now sanctioned (and for which corrugated iron sheets have been brought down from the spare stores at Dumagudiem) has been run up, as it will be immediately.

5. In addition to an ample supply of tools of all kinds there was ready a pump which will, I hope, answer all purposes till a depth of 80 feet has been reached, when

one driven by steam now preparing at the Madras workshops will be sent up for unwatering the shaft at greater depths.

6. Twenty horizontal circular frames of angle iron, sufficient if spaced at 5 feet apart to reach to a depth of 100 feet, were also on the ground. If stiff soil or rock be met with, these may be spaced at greater intervals or omitted altogether and answer for 150 feet in depth, but in any case Mr. Walch can readily send up all that is needed in this respect from Dowlaishweram.

7. Mr. Martindale, who takes a kindly interest in the work, will see that the party have ample and good supplies, and if, as I hope, the men only keep their health, the work should progress favorably, though it is at the same time to be feared that, particularly at this season, water may be met with close to the surface, and difficulties on this account may delay operations.

8. Corporal Nicks had explored nearly all the area of previous operations, but had failed to discover the precise location of bore hole No. 16. Most of the sites of the other bore holes as pointed out by the villagers had been marked by a rough block of red sand stone, but in this particular case no indication could be found and it was thus fortunate that we were able to visit the place at this time.

9. From there not being a single definite point or bearing given on the survey whereby to recognise the old holes, and from these having been mere punctures and easily obliterated, it was necessary to fix the point in question by as many approximations as we could. The result is shown by the tracing now sent up by Mr. Walch. Our approximations led us to decide on the point A., and it would now appear from subsequent information received from the villagers (probably those of Totapilly, who we were informed had been engaged on this particular portion of the old work) that the point E. at no great distance from A. is the true point.

10. I feel assured that in no case will the point selected here be much out, though, of course, it would have been very much more satisfactory to find the exact locality.

Mr. Walch's present decision as conveyed to Corporal Nicks may therefore, I think, be safely accepted.

11. The whole country about is rather undulating, clayey, with bushy jungle here and there, and well raised above the river, but showing from the moisture which lodges in the lower portions, that at this season much water may have to be encountered in sinking the shaft.

12. It would, of course, be premature to say much about the results of these operations, but if Mr. Vanstavern (whom I met at Woodagudiem, but who owing to illness was unable to accompany me to the coal field) is to be credited, the coal is likely to turn out very shaley. The best specimen, he informed me, only yielded 30 per cent. of carbon, and the worst 9 per cent.

13. As regards the proper designation of this coal field, there is some doubt. Totapilly, by which it appears to have been first known, though shown on the atlas, is a very insignificant village and at a distance from our present workings. Tiperpenti (Tipurapentaneed of the tracing) is not shown on the atlas, and is also both insignificant and at some distance. If the field is to be called after any of the neighbouring villages, Golagudiem, where the camp is and which is both shown on the atlas and is on the river bank, would be the most appropriate designation.

14. But to the best of my judgment it would be preferable to call it the Bhadrachalam field, as it is sufficiently near to this, which is certainly the best known and most important place in the neighbourhood.

15. If the Government approve, therefore, I would in all future correspondence designate this the Bhadrachalam coal field.

16. The Superintendent of Works has orders to send up fortnightly progress reports of the work done.

(Signed) R. H. SANKEY, Colonel, R.E.,
Chief Engineer, P.W.D.

9th August 1880.

No. 318.

MEMORANDUM.

The accompanying note is forwarded to the Superintendent of Works, Godavari, for information.

2. The decision conveyed in his letter No. 1,164, of the 28th July 1880, with reference to the point at which the shaft is to be sunk is accepted.

3. Fortnightly progress reports should be continued in order that His Grace the Governor may be kept advised of the results.

4. This field will in future be designated the Bhadrachalam field in all official documents.

(Signed) R. H. SANKEY, Colonel, R.E.,
14th August 1880. Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 18th August 1880, No. 1,336.

In continuation of my letter No. 1,164, of the 28th July 1880, I have the honor to forward, herewith, an extract from letter No. 4, of the 5th August 1880, received from Corporal Nicks stating that he is fully convinced that bore hole No. 16 was at the point E. shown on the survey plan, of which copy was sent with my No. 1,164.

Extract of a letter from Corporal F. NICKS, R.E., in charge of Coal Shaft Sinking, to G. T. WALCH, Esq., Superintendent of Works, Godavari, dated 5th August 1880, No. 4.

With reference to your docket No. 1,163, dated 28th July 1880, regarding point E as shown by villagers, I am fully convinced it is the actual site of bore hole No. 16. In the first place I was taken to the spot E by two villagers who stated they were employed at the boring. I examined the surface soil and found indications that boring had been done there. I found two different soils, viz., light colored clay and sand stone in layers, the same as would come from an auger after boring.

2. On the 3rd instant I made inquiries at the village of Tipurapentaneed and found a man who was employed from the commencement to the finishing of the borings under Mr. Vanstavern; he also took me to the exact spot marked E as shown on plan and showed me the above soil as mentioned, and states that was what came up with the auger; he also pointed to a tree where they cooked their meals, which is only 10 yards from the spot. I intend to sink the shaft at the place pointed. I have already commenced getting stores on the spot to commence work.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 23rd August 1880, No. 1,434.

Report No. 1 on progress of work at Bhadrachalam coal fields to 14th August 1880.

The sheds having been erected and necessary machinery moved up to site for shaft, actual sinking was commenced on 12th August, and up to 14th depth gone down to was 4 feet 6 inches.

No. 393, dated 3rd September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 3rd September 1880, No. 1,587.

Report No. 2 on progress of work at Bhadrachalam coal fields from 15th to 28th August 1880.

SHAFT sunk from 4 feet 6 inches to 15 feet; soil passed through chiefly "blue and yellow clay" with kunkur; sand stone just reached; some trouble given by water after heavy storms. Party apparently not working quite satisfactorily. Will be visited soon.

No. 450, dated 17th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 16th September 1880, No. 1,721.

Report No. 3 on progress of work at Bhadrachalam coal fields from 28th August to 15th September 1880.

SHAFT sunk from 15 to 34 feet; soil passed through chiefly yellow sand stone compact *in situ*, but breaking up easily when dug out. Pump arrangements fixed.

No. 490, dated 30th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 22nd September 1880, No. 1,722.

I HAVE the honor to inform you that I have on 15th, 20th and 21st instant inspected the work at the Bhadrachalam coal fields, and I find that, though going on slowly, it is being well done.

2. The shaft has now been sunk to a depth of 39 feet and water has just been reached.

3. The first 5 feet passed through was ordinary alluvial and vegetable soil; then came for 10 feet yellow clay, about the lower 5 feet of which was mixed with kunkur; then for 14 feet 6 inches yellow sand stone compact and hard *in situ*, but disintegrating when removed to the surface; and below this to the 39 feet depth a light blue clay chiefly "pipe clay" with at 38 feet a stratum of a few inches of sand stone.

4. Through this last thin stratum of sand stone water has commenced to come in slowly. At 4 P.M. on 20th I saw the bottom of the shaft practically cleared of water, and at 6 A.M. (21st) 1 foot 8 inches in depth had accumulated.

5. The Abyssinian pump sent from Madras has been fixed and works well, clearing such water as is now coming in with perfect ease.

6. The party is well housed and has kept in fair health. Corporal Nicks and some of the men have had rheumatism, one or two have had slight fever, and the Naigue who went up with the party has been sent back to Dowlaishweram with bad ulcers on his feet, and he has been replaced by another man.

7. There have been no accidents, and I am quite satisfied with the care taken by Corporal Nicks, who is in immediate charge of the operations. I cannot say I am quite satisfied with the rate at which the work has been carried on, but native Sappers, it appears to me, do not generally work rapidly.

No. 506, dated 5th October 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 5th October 1880, No. 1,843.

Report No. 4 on progress of work at Bhadrachalam coal fields from 15th to 30th September 1880.

SHAFT sunk from 34 to 44 feet; soil passed through, sand stone, with layers of light blue clay, chiefly pipe clay; water coming in quickly. Pump, "Abyssinian," has now to be worked night and day.

2. The Corporal in charge reports that his detachment is working unsatisfactorily, and that "if the sepoy are required to work in the shaft or at the winch they report themselves sick."

3. It seems likely that these men are behaving as they are with the object of being sent back to their Company, which they think may soon be sent to Bangalore; it would, I think, be well to let them know for certain that they will not be sent away from the work till it is finished, and that if they are sick they will have to go into hospital at Rajahmundry and when discharged return to the work. Eight coolies are now employed to assist the detachment.

No. 2,331.

THE Chief Engineer concurs with the Superintendent of Works that it will be advisable to let the Sappers distinctly understand that they will not, by malingering, be enabled to desert the work which they have been sent up to carry out.

2. When sick they may be sent to the hospital at Rajahmundry as proposed.

(By Order.)

(Signed) J. PENNYCUICK, Major, R.E.,
Deputy Chief Engineer, P.W.D.

18th October 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Yernagudem, 20th October 1880, No. 2,006.

Report No. 5 on progress of work at Bhadrachalam coal fields from 1st to 15th October 1880.

SHAFT sunk from 44 to 50 feet; soil passed through, sand stone, said to be hard, with thin layers of clay.

2. Slow progress due to large quantities of water to be dealt with, and the Corporal reports that the Abyssinian pump can no longer keep the water down, and no further sinking can go on till the steam pump is at work. This is expected daily.

No. 2,422, dated 2nd November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th November 1880, No. 2,641 W.

Proceedings of the Madras Government, Military Department, dated 13th November 1880, No. 7,102.

Telegram from the Superintendent of Works, Godavari, to the Public Works Department, Madras, dated 26th October 1880.

"Another Non-Commissioned Officer to help Corporal Nicks, often ill, and Dresser for coal party much wanted."

TRANSFERRED to the Military Department, with a request that it may be stated whether any Non-Commissioned Officer can be sent from the "Queen's Own" Sappers and Miners for the purpose.

OOTACAMUND,
29th October 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From the Adjutant-General, dated 10th November 1880, No. 499.

With reference to a telegram from the Superintendent of Works, Rajahmundry, dated 26th October 1880, transferred to the Military Department under Public Works Department No. 601 of 26th ultimo, and referred to His Excellency the Commander-in-Chief under Government endorsement memorandum No. 6,887 of 30th idem, herewith returned as requested, I have the honor, by order, to state that there is no objection to the services of Corporal B. Fuller, R.E., being placed at the disposal of Government in the Public Works Department for employment at Rajahmundry.

ORDER.—The Adjutant-General's letter communicated to the Public Works Department.

(True Extract.)

(Signed) J. MICHAEL, Colonel,
Secretary to Government, Mily. Dept.

ORDER THEREON, No. 2,641 W., dated 18th November 1880.

COMMUNICATED to the Superintendent of Works, Godavari.

2. It is requested that the services of Corporal Fuller may be made available as early as possible.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 30th November 1880, No. 2,674.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 4th November 1880, No. 2,254.

Report No. 6 on progress of work at Bhadrachalam coal fields from 16th to 31st October 1880.

SHAFT sunk from 50 feet to 55½ feet; sand stone passed through to 55 feet, then a layer of clay. Below this it has been impossible to go with the Abyssinian pump and the steam* pump must be awaited.

* Arrived at Dowlaishweram, 2nd Nov. 1880.
Despatched by steamer to Golagudiem, 4th November 1880.

Firewood is being collected for the engine.

The Corporal in charge of the party has been suffering from dysentery and fever, and it appears that without his personal presence on the work it does not go on properly; another Non-Commissioned Officer is therefore very necessary, especially as pumping will have to be kept up at night. The unhealthiness of the place at this time of the year and the possibility of accidents make it also highly advisable that a Dresser should be attached to the party. Telegram of 26th October asking for another Non-Commissioned Officer and a Dresser was therefore sent.

Telegram from the Secretary to Government, Public Works Department, Madras, to the Superintendent of Works, Godavari, Rajahmundry, dated 16th November 1880.

"Does further experience show that a Dresser for the coal party is still essential."

Telegram from Superintendent of Works, Godavari, Rajahmundry, to the Secretary to Government, Public Works Department, Madras, dated 17th November 1880.

"HEALTH of coal party better, since rain stopped. May do without Dresser."

ORDER THEREON, No. 2,674 W., dated 30th November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd December 1880, No. 2,708.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 18th November 1880, No. 2,401.

Report No. 7 on progress of work at Bhadrachalam coal fields from 1st to 13th November 1880.

The steam pump arrived at Golagudiem on 6th, and since then the party have been fully occupied in taking it, and the engine to work it, to the shaft and setting it up; the Corporal in charge reports that "the work is proceeding in a satisfactory manner."

2. Lieutenant Gale, R.E., visited the party on the 6th and 7th, and the Corporal in charge reports that since that visit and the change of Havildars which was then made the detachment has been working better than it had been working for some time previously.

3. The health of the party is better than it was, and it is thought that now it may get on without a Dresser, though of course it would be safer to have one on the spot, and another Non-Commissioned Officer to assist Corporal Nicks is very necessary as mentioned in the last report.

ORDER THEREON, No. 2,780, dated 3rd December 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd December 1880, No. 2,934 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 2nd December 1880, No. 2,554.

Report No. 8 on the progress of work at the Bhadrachalam Coal-field.—13th to 30th November 1880.

THE party have been engaged in keeping water down in the shaft with the Abyssinian pump and setting up the steam-pump and its engine.

No further sinking has been possible in the period under notice.

2. The Corporal in charge again reports, "there is a great deal of sickness among the detachment. Fever is very prevalent."

ORDER THEREON, No. 2,934 W., dated 22nd December 1880.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 10th January 1881, No. 38 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Wuddigudem, 16th December 1880, No. 2,751.

Report No. 9 on the progress of work at the Bhadrachalam Coal-field.—1st to 15th December 1880.

THE steam-pump was set to work on the 8th. There were then "18 feet of water in the shaft," and "it took 2 hours 35 minutes to pump dry;" owing, however, to extra framing, &c., being found necessary, actual work of excavation was not recommenced till 13th.

2. On the 15th the undersigned inspected the work. The shaft was down 56 feet, it was in good order and the pump going dead slow was keeping it clear of water.

A layer of clay (chiefly pipe-clay) had just been reached through which water was coming in freely.

The water has for some time past been sensibly affected by variations in the level of the river, which is now low, though not so low as it will be. It is impossible to say whether the one pump will be able to deal with the water which will be met with in the next 100 feet, and it will probably be advisable to have another ready; it could be driven by the same engine and driving machinery.

3. The huts were being moved up to near the shaft.
4. Ninety cubic yards of firewood for the engine have been cut.
5. The health of the party is not good, there are generally one-third or so of the sepoys down with fever, but it does not appear to be of a virulent type.
6. Corporal Fuller, R.E., has now (on 15th) joined the work.
7. No steamer will be able after this to get to Gollagudem, and probably not even to Wuddigudem till next June or July.

ORDER THEREON, No. 38 W., dated 10th January 1881.

THE Government consider that the additional pumping power referred to in paragraph 3 of the foregoing letter should be provided. The Superintendent of Works, Godáviri, will arrange accordingly.

2. The work being unhealthy should be pushed on as rapidly as possible.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 14th January 1881, No. 96 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaisweram, 7th January 1881, No. 2,927.

Report No. 10 on the progress of works at the Bhadrachalam Coal-field.—16th to 31st December 1880.

- (1.) Shaft deepened by 8 feet to 64 feet.
- (2.) Soil passed through "different kinds of clay."
- (3.) Removal of huts to site of shaft finished.

ORDER THEREON, No. 96 W., dated 14th January 1881.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 25th January 1881, No. 195 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaisweram, 10th January 1881, No. 2,966.

I HAVE the honor to send herewith a letter from Corporal Nicks, R.E., in charge of the coal operations near Bhadrachalam, reporting the inrush of a large volume of water into the shaft.

2. Till this occurred all seemed to be going on well, though slowly.

3. I have told Corporal Nicks to again rig up the Abyssinian pump and see if with it he cannot get the water down low enough to get at the steam-pump box and again set it going, and then if the two will keep the water down sufficiently low it is possible that by putting in specially prepared cylinders we may be able to get through the treacherous stratum which has led to the present mishap; but if water with our present appliances cannot be kept so low, another pump more powerful than the present one, with machinery and engine to drive it, must be sent up.

4. Such machinery and engine however could not be got to the place before the next season of freshes in the river, say next July, and should it be found quite impossible to deal with the water with the present appliances I would request instructions as to what in the interval is to be done with the Sapper coal party.

From Corporal F. NICKS, R.E., to the Superintendent of Works, Godávári, Dowlaishweram, dated Gollagudem, 5th January 1881, No. 118.

On Tuesday evening we were deep enough for 9th ring, and on Wednesday morning myself and Corporal Fuller started putting in same, as the soil was very treacherous it not being safe to trust sepoys; we had a slip of earth from the north side of shaft at about 11 A.M. We started then to plank that portion, as we had put in on (4) four plining (*sic*) planks and placed ring, we worked on and had placed four planks in the north quarter; we then noticed the water gradually rise, and the pump would not keep it down. I then sent Corporal Fuller up to ascertain if the engine was under proper steam, he informed me as he was coming down in *bucket* that steam gauge indicated 25 lb. ☐ As I was in the act of guiding the bucket down the water burst in from the south-west side, bringing with it a large quantity of "clay," about one-quarter yard, which knocked me down. Corporal Fuller said to me we had better take all tools up with us, but before he could get out of the bucket the water rose to my waist. I then said, never mind the tools we must get above the water in case the rings in upper work give way, as I had put my arm in where water was rushing from and found a large hole about 6 inches by 2 feet, so the clay could not be more than 1 foot 6 inches thick in front of the hole we had previously left, a berm of 6 inches in other work and considering this work was very dangerous we left a berm of 1 foot 3 inches.

We then cleared out of shaft as soon as possible with the water rising at the rate of 1 foot per minute, leaving all tools at bottom as we could not get at them for the water. I also kept engine at work till 10-25 P.M. making 25 strokes per minute, but the water still kept rising.

Rise of water	4-10 P.M.	No water more than ordinary.	5th January 1881.
Burst in at	4-15 P.M.		
7 feet	4-25 "		
21 feet 3 inches	5-50 "		
26 feet 8 inches	7-50 "		

Whilst taking measurement at 10 P.M. the pump gone out depth of water at the above time 29 feet 4 inches. I then gave orders to engine driver to draw fire, I then emptied boiler as I had been under steam near 400 hours.

At present we cannot get pump clear as working box is under water, the only remedy will be to get another set of top gear pipes and pump rods; if it is the Godávári which is broke in upon us, which I think it is, it will be useless. 11-30 P.M.

I took measurements at 11-35 and found 33 feet 4 inches and at 7 A.M., the 6th, and found 38 feet 8 inches.

Please give me further instruction in answer to this.

ORDER THEREON, No. 195 W., 25th January 1881.

THE Superintendent of Works, Godávári, has already been authorised* to arrange
* G.O., No. 38 W., dated 10th January 1881. for the provision of additional pumping power.

2. The Government await a further report before passing orders on the subject of paragraph 4 of the letter above read.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Yanam, 19th January 1881, No. 3,073.

In continuation of my No. 2,966, dated 10th instant, I have the honor to state that Corporal Nicks reports that in spite of all efforts it has been found impossible to raise the pump to get at the upper box and working barrel, and that at noon on the 6th the water had attained the "height of 40 feet" since which it has not varied.

2. It is evident, therefore, that another and more powerful pump must be provided if the work is to be persevered with.

Telegram to the Superintendent of Works, Godávári, Rajahmundry, dated 27th January 1881, No. 193.

MORE powerful pump for coal workings sanctioned. Arrange for one at once.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd February 1881, No. 308 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated 28th January 1881, No. 3,185.

Report No. 11 on the progress of work at the Bhadrachalam Coal-fields.—1st to 15th January 1881.

Work progressed steadily till 5th, when the shaft was down 69 feet, water in large quantities then came in and overpowered the pump (see letters Nos. 2,966, 10th January 1881, and 3,073, 19th January 1881, to the Chief Engineer), and on the 15th there were 40 feet 4 inches depth of water in the shaft.

2. The Abyssinian pump which had been taken away and put on the barge was again taken to the shaft, and its placing commenced with the hope (a faint one) that with it the water can be so lowered that it may prove possible to get at the steam-pump boxes and set it going again. (See paragraph 3 of letter No. 2,966, 10th January 1881, to Chief Engineer.)

ORDER THEREON, No. 308 W., dated 3rd February 1881.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd February 1881, No. 493 W.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 31st January 1881, No. 3,225.

With reference to your telegram of 27th I have the honor to report that I have no means of here arranging for a more powerful pump for the coal shaft, and can only suggest that one may be supplied from the workshops at Madras or obtained from England.

2. Having had no experience in the work for which the pump is required, and having no one here who has had such experience, I cannot state with any certainty what is the nature and power of the pump required, and it seems therefore that it is best for me to explain the conditions of the case and from them possibly some Mining Engineer or manufacturer of mining machinery will be able to decide what is wanted. The conditions are these—

3. (a)—The shaft is 6 feet 3 inches diameter.
- (b)—It is sunk at about 1 mile from the edge of the Godávári.
- (c)—The substrata already passed through (to 69 feet depth) have been almost entirely yellow sandstone, alternating with bands of yellowish and greyish clay, chiefly pipe-clay, and the boring shows that the general character of the strata to be yet passed through will be similar, but with fewer bands of clay, down to about 120 feet, when shale and coal will be met with.

(d)—Down to 55 feet there was but little water, but at that depth the Abyssinian pump could no longer deal with it, and the steam-pump sent up from the Madras Workshops was put up; whilst doing this (it occupied some days) the water rose 18 feet, this the pump when set to work cleared out in 2 hours 35 minutes.

(e)—This pump, driven by an old 8 horse-power engine, kept the water down easily enough till the shaft had reached a depth of 69 feet, when there

• For the first 7 feet came in at the rate of about 630 gallons a minute.

inches in $5\frac{3}{4}$ hours against the pump going 22 strokes a minute. The

See copy of letter from Corporal Nicks, No. 118, 5th January 1881, herewith.

in all (or to 29 below top of shaft) in another 14 hours and at that level it has stood.

(f)—The shaft has to go down to a total depth of about 150 feet.

(g)—The river—the variations in level of which have been noted to affect the water in the shaft—rises in the season of floods (from June to October) from 15 feet to 20 feet or so above its present level, or approximately to from about 10 feet to 15 feet below level of top of shaft.

(h)—As most of the soil to be passed through is sandstone, much sharp sand comes up with the water, and it has been found to rapidly wear away any leather it comes in contact with, such as "buckets," valves, &c.

4. As already stated in my No. 2,966, 10th January 1881, paragraph 4, machinery or apparatus of any kind, weighing more than could be carried by two coolies, could not be got to the shaft till next July, because it could not be taken by water much if at all beyond Koide, some 34 miles below Gollagudem, and between the two places there is no road, only a jungle track, which in places passes over rocky slopes of hills.

P.S.—As all pumps occasionally get out of order and all engines require to be stopped now and then, it will be highly advisable, if not necessary, to have two pumps and two engines, and it is of course of great convenience that the working parts of the pump should be easily raised or got at.

From the same officer, dated 6th February 1881, No. 3,294.

Report No. 12 on the progress of work at the Bhadrachalam Coal-field.—16th to 31st January 1881.

The Abyssinian pump (see paragraph 2 of last report) was fully rigged up by 19th, and pumping then commenced with it; by 24th the water had been reduced 11 feet, or to 29 feet in depth, and then the working part of the steam-pump was got at.

2. The leather "buckets" which had worn out (they are constantly wearing out owing to the action of the gritty sand, see paragraph 3, (g.), No. 3,225, 31st January 1881), were renewed and the pump was started again on 25th; by the evening of 27th it had reduced the water by 8 feet, or to 21 feet, in depth, below which it could not reduce it, and the leathers having again worn out it had to be stopped for a time, when the water immediately rose against the Abyssinian pump to 30 feet 7 inches depth.

3. It is quite evident that with the present pumping power it will be impossible to recommence sinking operations.

4. There can be little doubt that the water in the shaft is in communication through some permeable stratum with the water in the river, and that enormously powerful machinery and a very great expenditure will be necessary to enable the shaft to be sunk to where it will reach the shale and inferior coal which borings and geological researches have established to exist in small quantities in the locality.

ORDER THEREON, No. 493 W., dated 22nd February 1881.

THE Right Honorable the Governor in Council considers that before any further expenditure is incurred the opinion of an expert in mining matters should be obtained. The Chief Engineer has, it is understood, written to Calcutta to inquire whether the services of any qualified person can be secured.

Meanwhile the work should be suspended.

2. Orders have already been issued to the Superintendent of Works, directing the Sappers to return to their Company.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 542 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 11th February 1881, No. 3,370.

FURTHER information has shown me that I was wrong in supposing that when water burst into the coal shaft at Bhadrachalam it came in at the rate of "630 gallons a minute," as stated in the margin, paragraph 3, clause (e) of my No. 3,225, 31st January 1881, it came in at the rate approximately of 200 gallons a minute.

2. I would take this opportunity of asking for early orders on paragraph 4 of my No. 2,966, 10th January 1881.

ORDER THEREON, No. 541 W., dated 23rd February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 541 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 17th February 1881, No. 3,463.

Report No. 13 on Bhadrachalam Coal-field work.—1st to 15th February 1881.

As stated in last report it is quite impossible to proceed with the work, and it therefore has been at a complete stand-still during the last fifteen days.

ORDER THEREON, No. 542 W., dated 23rd February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

102

542 W-28-2-87

9.0 Pub Works see

Proceedings of the Madras Government, Public Works Department, dated 18th March 1880, No. 698 W.

Read the following paper:—

MINUTE BY HIS GRACE THE GOVERNOR.

THE question of getting access to coal in this Presidency for railway and navigation purposes is a very important one.

2. That coal exists in the Nizam's territory, between the Godáviri and Kistna, is well ascertained, and the quality of that recently obtained and tried, although the results are not yet accurately calculated, show that the coal is of a good, useful description, and reported by the Public Works Workshops as quite equal to the ordinary Indian coal they have in use. It becomes a question of price.

3. Coal is wanted for railway and steam purposes at Madras, for the navigation of the Godáviri and at Cocanada, and will no doubt be also consumed on the canal.

4. It has been ascertained that coal exists on the Godáviri river on the British side, and some coal raised from the dry bed See Map. About one-third of the distance of the river has given "good results" in between Bhadrachalam and Rékapalle. the Godáviri steamers. The quality of the coal, as tested by boring with small bores, is necessarily uncertain. Some is spoken of as fair, some as inferior; but it is close to the river, and the ground apparently not costly to sink in. If, as estimated by Mr. Vanstavern (who was especially employed upon the coal investigation), the coal seams can be reached by a shaft for an amount of under Rs. 2,000, it would be a matter to be tried at once without doubt; but I would put it higher, and taking the estimate above given, I would make allowance for pumping, ventilating and levelling, say that the trial should be considered as not to be effectually made under a possible Rs. 5,000; say at No. 16 bore, where the coal is within 150 feet from surface and about 18 feet thick, and the shaft only 1 mile from river, but above flood lines.

5. Coal in such a situation ought to be sufficient and economical for all purposes of steam engines on the river and delta and also at Cocanada, as its price must be low from the freight being entirely water and down-stream, so that an extra quantity might be used. How much further it could be carried can only be really known by actual test.

6. The opening of coal at this spot would doubtless stimulate the opening on the Nizam's side.

7. In ordinary times I should not hesitate to recommend the expenditure necessary to reach and test the coal seams, and even in the present times it seems to me desirable to do so. If the coal sufficed only for Godáviri use, the cost would not be wasted.

8. The opening of any coal operation would tend to develop and thus to pacify the country around.

9. The question to be decided then is—

Shall Government endeavour, at a cost which may reach Rs. 5,000, to open the coal already ascertained to exist?

10. If that be agreed then the Chief Engineer should suggest the arrangements, and the co-operation of Mr. Vanstavern should be secured, for his local knowledge and long experience of the district.

11. The working season is from now to June.

5th January 1880.

(Signed) BUCKINGHAM AND CHANDOS.

N.B.—The original maps, sections and memoranda should be returned to Mr. Vanstavern, as they are only lent. I could not trace the copies in Government possession—possibly lost.

ORDER THEREON, No. 698 W., dated 18th March 1880:

THE Revenue Department will arrange to place at the disposal of the Public Works Department the sum of Rs. 5,000 from the accumulated Cattle Trespass Fund for certain experiments on coal-boring operations in the Godáviri district.

2. This amount will be recouped when necessary for the farm purposes later on.

(Signed) R. H. SANKEY, Colonel, R.E.,

Secretary to Government, P.W.D.

No. 859.

MEMORANDUM.

HIS GRACE the Governor in Council having decided to make an early commencement with sinking a shaft for working a coal seam, whose existence has been proved at a point midway between Bhadrachalam and Rékapalle on the left bank of the Godáviri, the undersigned is desired to inquire whether His Excellency the Commander-in-Chief thinks that a party consisting of, say, two European Non-Commissioned Officers and a Havildar and Naigue with fourteen Sappers, who are acquainted with mining could conveniently be spared from the Companies of the "Queen's Own" Sappers and Miners which are now attached to the force under the command of Colonel Buck.

2. Their employment in sinking the shaft required might possibly extend to six months.

(Signed) R. H. SANKEY, Colonel, R.E.,

Secretary to Government, P.W.D.

15th March 1880.

To the Secretary to Government, Military Department.

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 20th March 1880, No. 213.

WITH reference to your docket memorandum,* No. 1,771, dated 16th March 1880,

* Herewith returned.

I have the honor to inform you that the

Officer Commanding, Sappers and Miners

at Dowlaishweram, has been directed to detach two British Non-Commissioned Officers with a Havildar and Naigue and fourteen Sappers for the purpose of sinking a shaft in the Godáviri district.

2. It is of great importance that these men should not be exposed in tents during the hot season, and His Excellency trusts that Government will see the necessity of having thatched huts for the natives, and suitable erections for the shelter of the British Non-Commissioned Officers employed.

No. 1,964.

TRANSFERRED to the Public Works Department, with reference to its memorandum, No. 859, dated 15th March 1880.

(By Order.)

FORT ST. GEORGE,
25th March 1880.

(Signed)

H. N. D. PRENDERGAST, Colonel, R.E.,

Acting Secretary to Govt., Mily. Dept.

No. 972.

MEMORANDUM.

THE Chief Engineer has the honor to forward, for the information of the Superintendent of Works, Godáviri, a copy of a Minute by His Grace the Governor regarding coal-boring explorations on the British side of the Godáviri river, with copies of the correspondence that has passed on the subject.

2. On receipt of an intimation from Mr. Vanstavern that he has no objection to the free use of the plans, &c., borings can be commenced. As it is understood that the working season will only last for about two months longer, every exertion should be made.

3. Meanwhile, in accordance with the wishes of His Excellency the Commander-in-Chief, proper shelter for the British Non-Commissioned Officers employed and thatched huts for the natives should at once be provided.

4. Mr. Walch's attention is invited to Lieutenant Baddeley's letter of the 15th March, in case the requisite machinery, &c., cannot be got from the Dowlaishweram shops.

(Signed) R. H. SANKEY, Col., R.E.,

Chief Engineer, P.W.D.

31st March 1880.

To the Superintendent of Works, Godáviri.

Proceedings of the Madras Government, Public Works Department, dated 14th April 1880, No. 960 W.

Read the following paper :—

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 2nd April 1880, No. 250.

In continuation of Adjutant-General's letter, No. 213, dated 20th March 1880,

1 Havildar.

1 Naigue.

14 Privates.

I have the honor, by order, to state that

the Officer Commanding Detachment

"Queen's Own" Sappers and Miners at

Dowlaishweram reports that the party, as

per margin, is in readiness to proceed under the orders of the Public Works Department.

2. There are no European Non-Commissioned Officers with the Detachment.

No. 2,117.

TRANSFERRED to the Public Works Department, in continuation of No. 1,964, dated 25th March 1880.

FORT ST. GEORGE,
3rd April 1880.

(Signed)

H. N. D. PRENDERGAST, Colonel, R.E.,

Acting Secretary to Govt., Mily. Dept.

ORDER THEREON, No. 960 W., dated 14th April 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,

Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 21st April 1880, No. 996-A W.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 6th April 1880, No. 84.

I HAVE the honor to acknowledge the receipt of your memorandum No. 972, dated 31st ultimo.

One Indent in triplicate.

2. As you will have seen from my letter No. 701, dated 31st March 1880, and its enclosure, I have no officer or upper

subordinate whom I can send for the coal operations, and the Officer Commanding the Detachment of the "Queen's Own" Sappers and Miners here has no European Non-Commissioned Officer.

3. In paragraph 10 of the Minute by His Grace the Governor it is said that "the co-operation of Mr. Vanstavern should be secured," and it seems to me that it would be advisable, as he lives not far from where the operations are to be carried on and has had some experience in such work, to employ him on a salary to superintend the work, but I have no authority to open negotiations officially with him on the subject, or to make him any offer.

4. The steamers cannot now go up the river further than Koide (52 miles), and only boats of very small draft can get from there to where the operations are proposed, some 35 miles further.

5. There are no pumps here at all suited for deep shaft sinking, and I enclose an indent for such a pump and machinery to drive it, which, if approved, please send on to the Government workshops, Madras. If the pump be sent it should be accompanied by a Maistry who understands its working.

6. I think if you will consider all the circumstances of the case you will see that there is no probability of the work being done in the "two months" mentioned in paragraph 2 of your memorandum under notice.

From Lieutenant W. L. C. BADDELEY, R.E., General Superintendent of Public Works Workshops and Stores, Madras, to the Secretary to Government, Public Works Department, dated 15th March 1880.

We have two deep well pumps in store which would be suitable for working a shaft 80 feet in depth.

2. The five-inch lift pump which we made for the Ooregum Company is a good pattern for deep shafts, and we could make up these very soon if required.

3. One of the Workshop Maistries would be available to look after the pumping machinery, but there is no one here who understands anything about mining.

4. If Dowlaisweram cannot provide the engines, we can spare a 4 horse-power portable or any number of Gwynne's or Nasmyth's 4 and 6 horse-power engines and boilers combined. These also could be made fairly portable by fitting them on a stand with wheels.

5. We have no machinery for working or lifting coal, but probably there would be no difficulty in making up any ordinary appliances.

ORDER THEREON, No. 996-A W., dated 21st April 1880.

THE Superintendent of Works, Presidency, will at once direct the General Superintendent, Public Works Workshops, to despatch one of the deep well pumps mentioned by him as suitable for a shaft 80 feet deep to the Superintendent of Works, Godáviri, along with one of the Workshop Maistries for looking after this and such other machinery as it may be found necessary to send for unwatering the coal shaft.

That officer should also be directed to place himself without delay in correspondence with the Superintendent of Works, Godáviri, relative to any steam pumping or other machinery that may be deemed necessary for sinking the shaft below 80 feet.

2. The Superintendent of Works, Godáviri Division, is authorised to make arrangements with Mr. Vanstavern for directing the operations, preferably fixing a definite sum on the shaft being sunk to the bottom of the seam indicated by the borings, and reporting the terms as soon as possible for the information of Government.

3. The original borings having been executed during the monsoon, His Grace in Council has no reason to suppose that the work need now be subjected to any delay

on account of the season, and as he attaches the greatest importance to the sinking of the shaft, no efforts should be spared to effect that object at the earliest date.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 27th April 1880, No. 1,035 W.

Proceedings of the Madras Government, Military Department, dated 14th April 1880, No. 2,404.

Read the following papers:—

Proceedings of the Madras Government, Public Works Department, dated 7th April 1880, No. 893 W.

Read letter from the Superintendent of Works, Godáviri, dated 30th March 1880, No. 701.

I HAVE the honor to enclose copy of a letter received this day from the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaisweram, and to request instructions.

2. I would point out that the district is shorthanded, that just at this season there is a great amount of work in connection with the anicut and head works, canals, &c., which has to be compressed into a very short time; and I trust, therefore, that no one will have to be taken away from such work to carry out the "hutting," &c., referred to by Major Hamilton, and which it appears to me the men might carry out themselves.

3. I do not know where the Kottapalle referred to is.

From the Officer Commanding Detachment "Queen's Own" Sappers and Miners, to the Superintendent of Works, Godáviri, dated 29th March 1880, No. 209.

WITH reference to letter, No. 822, dated 20th March, from the Adjutant-General (copy annexed for your information), I have the honor to report that the party, consisting of one Havildar, one Naigue and fourteen Privates, is in readiness to proceed up the river under your orders. There are no European Non-Commissioned Officers with this detachment.

2. I presume that you will supply all necessary tools.

3. The party will have to be hutted by the Public Works Department.

From the Officiating Adjutant-General, to the Officer Commanding "Queen's Own" Sappers and Miners, Dowlaisweram, dated 20th March 1880, No. 822.

At the request of Government in the Public Works Department the Commander-in-Chief has sanctioned the services of a party of two European Non-Commissioned Officers, a Havildar, Naigue and fourteen Sappers, who are acquainted with mining, from the companies attached to the force under Colonel Buck, for employment in sinking a shaft for working a coal seam between Bhadrachalam and Kottapalle on the left bank of the Godáviri, and you are requested to detach the above party for this purpose.

UNDER the circumstances explained in Mr. Walch's letter, the detachment will provide hutting accommodation for themselves, the usual allowances being granted by the Military Department:

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secretary to Govt., P.W.D.

To the Military Department.

ORDER,—Communicated to His Excellency the Commander-in-Chief.

2. Under O.G. (Military), No. 356, dated 30th January 1872, *all* special charges, including cost of hutting, incurred on account of Sappers employed on purely civil works, form a debit against the Public Works Department.

(True Extract.)

(Signed) H. N. D. PRENDERGAST, Col., R.E.,
Ag. Secretary to Government, Mily. Dept.

ORDER THEREON, No. 1,035 W., dated 27th April 1880.
COMMUNICATED to the Examiner of Public Works Accounts.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Military Department, dated 16th June 1880, No. 3,763.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri District, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 27th May 1880, No. 547.

I HAVE the honor to inform you that immediately on receipt of G.O., No. 996-AW., dated 21st April 1880, I put myself in communication with Mr. Vanstavern, and enclose copy of my last letter* to him to which I have received the enclosed reply, in which I am sorry to say he declines to undertake the superintendence of the coal shaft sinking for the reason which he states in a private letter.

That reason being that he thinks it probable that private affairs may render it necessary for him to leave the country before it would be possible to complete the shaft.

2. I am now at a loss to know how to carry out the wishes of Government as regards the speedy sinking of the shaft. An extra Overseer having come (see my No. 519, of 24th May 1880) I could send him, but he knows nothing of the kind of work, and it is doubtful if the working under him of the Sappers, whom it is proposed to send, would be smooth, and I would recommend that a Non-Commissioned Officer of the Sappers and Miners should be sent for the work.

3. Mr. Vanstavern states that, though borings could be got down during the rains and when the river was high, the difficulties and expense of sinking a shaft would, he is sure from a knowledge of the place, be much greater than in the dry season, as water would be met with at a much higher level and in much greater quantities.

No. 126.

REFERRED to the Military Department, with request that it may be ascertained if the services of any Non-Commissioned Officer of Sappers (European) acquainted with mining or shaft sinking can be placed at the disposal of this department for directing the operations as suggested by Mr. Walch. If such a Non-Commissioned Officer can be found, it is requested that he may be directed to proceed at once to the spot.

(Signed) R. H. SANKEY, Colonel, R.E.,
5th June 1880. Secretary to Government, P.W.D.

From the Adjutant-General, No. 173, dated 14th June 1880.

In returning Military Department memorandum No. 3,561, of the 7th current, I have the honor, by order, to inform you that the services of Corporal Nicks of the

"Queen's Own" Sappers and Miners are available for the Godáviri coal shaft. He is stated to be zealous and by trade a "Fitter."

ORDER,—Ordered that the Adjutant-General's letter be communicated to the Public Works Department.

2. His Excellency the Commander-in-Chief is requested to cause Corporal Nicks to be detailed at once for the duty.

(True Extract.)

(Signed) J. MICHAEL, Col.,
Secy. to Govt., Mily. Dept.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 28th July 1880, No. 1,164.

WITH reference to our inspection of the proposed site for coal shaft on 22nd instant, I have the honor to forward tracing from plan of survey which I then ordered to be made.

2. I append the orders now issued to the Corporal in charge of the party with reference to this survey.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to Corporal F. NICKS, Golagudiem, dated 28th July 1880, No. 1,163.

WITH reference to the accompanying plan a report ought to have been sent stating whether there are any indications that point E., said to have been shown by villagers as site of bore-hole No. 16, is really the site.

2. If there be not any trustworthy indications that it really is so, the shaft is to be sunk at point A., or should that be in a local depression where trouble will be given by surface drainage, at some convenient point between it and D.

NOTE.

WITH reference to the annexed letter No. 1,164, of the 28th July 1880, from the Superintendent of Works, Godáviri, on the subject of the coal sinkings, I beg to offer the following brief remarks, having lately had the opportunity of inspecting the site of the operations in company with Mr. Martindale and Mr. Walch.

2. Leaving Dowlaishweram on morning of the 21st ultimo, Mr. Walch and I taking the new steam launch, *Arthur Cotton*, were enabled to pass very nearly through the Godáviri gorge before anchoring for the night, although the current was strong, 5-3 feet in depth, passing over the crest of the anicut.

3. Next morning picking up Mr. Martindale at Woodagudiem, we arrived at the site of the coal operations about noon, and spent some five or six hours in inspecting the locality and chiefly in endeavouring to find out the precise position of bore-hole No. 16, at which point, owing to the promising results of the previous borings, it had been decided to sink the shaft.

4. We found Corporal Nicks with his fourteen Sappers encamped at Golagudiem (*Golagaram* of the Indian Atlas), the party were well and sufficiently provided with shelter till the new shed 80 feet x 18 feet now sanctioned (and for which corrugated iron sheets have been brought down from the spare stores at Dumagudiem) has been run up, as it will be immediately.

5. In addition to an ample supply of tools of all kinds there was ready a pump which will, I hope, answer all purposes till a depth of 80 feet has been reached, when

one driven by steam now preparing at the Madras workshops will be sent up for unwatering the shaft at greater depths.

6. Twenty horizontal circular frames of angle iron, sufficient if spaced at 5 feet apart to reach to a depth of 100 feet, were also on the ground. If stiff soil or rock be met with, these may be spaced at greater intervals or omitted altogether and answer for 150 feet in depth, but in any case Mr. Walch can readily send up all that is needed in this respect from Dowlaishweram.

7. Mr. Martindale, who takes a kindly interest in the work, will see that the party have ample and good supplies, and if, as I hope, the men only keep their health, the work should progress favorably, though it is at the same time to be feared that, particularly at this season, water may be met with close to the surface, and difficulties on this account may delay operations.

8. Corporal Nicks had explored nearly all the area of previous operations, but had failed to discover the precise location of bore hole No. 16. Most of the sites of the other bore holes as pointed out by the villagers had been marked by a rough block of red sand stone, but in this particular case no indication could be found and it was thus fortunate that we were able to visit the place at this time.

9. From there not being a single definite point or bearing given on the survey whereby to recognise the old holes, and from these having been mere punctures and easily obliterated, it was necessary to fix the point in question by as many approximations as we could. The result is shown by the tracing now sent up by Mr. Walch. Our approximations led us to decide on the point A., and it would now appear from subsequent information received from the villagers (probably those of Totapilly, who we were informed had been engaged on this particular portion of the old work) that the point E. at no great distance from A. is the true point.

10. I feel assured that in no case will the point selected here be much out, though, of course, it would have been very much more satisfactory to find the exact locality.

Mr. Walch's present decision as conveyed to Corporal Nicks may therefore, I think, be safely accepted.

11. The whole country about is rather undulating, clayey, with bushy jungle here and there, and well raised above the river, but showing from the moisture which lodges in the lower portions, that at this season much water may have to be encountered in sinking the shaft.

12. It would, of course, be premature to say much about the results of these operations, but if Mr. Vanstavern (whom I met at Woodagudiem, but who owing to illness was unable to accompany me to the coal field) is to be credited, the coal is likely to turn out very shaley. The best specimen, he informed me, only yielded 30 per cent. of carbon, and the worst 9 per cent.

13. As regards the proper designation of this coal field, there is some doubt. Totapilly, by which it appears to have been first known, though shown on the atlas, is a very insignificant village and at a distance from our present workings. Tiperpenti (Tipurapentaneed of the tracing) is not shown on the atlas, and is also both insignificant and at some distance. If the field is to be called after any of the neighbouring villages, Golagudiem, where the camp is and which is both shown on the atlas and is on the river bank, would be the most appropriate designation.

14. But to the best of my judgment it would be preferable to call it the Bhadrachalam field, as it is sufficiently near to this, which is certainly the best known and most important place in the neighbourhood.

15. If the Government approve, therefore, I would in all future correspondence designate this the Bhadrachalam coal field.

16. The Superintendent of Works has orders to send up fortnightly progress reports of the work done.

(Signed) R. H. SANKEY, Colonel, R.E.,
Chief Engineer, P.W.D.

9th August 1880.

No. 318.

MEMORANDUM.

THE accompanying note is forwarded to the Superintendent of Works, Godavari, for information.

2. The decision conveyed in his letter No. 1,164, of the 28th July 1880, with reference to the point at which the shaft is to be sunk is accepted.

3. Fortnightly progress reports should be continued in order that His Grace the Governor may be kept advised of the results.

4. This field will in future be designated the Bhadrachalam field in all official documents.

(Signed) R. H. SANKEY, Colonel, R.E.,
14th August 1880. Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 18th August 1880, No. 1,336.

IN continuation of my letter No. 1,164, of the 28th July 1880, I have the honor to forward, herewith, an extract from letter No. 4, of the 5th August 1880, received from Corporal Nicks stating that he is fully convinced that bore hole No. 16 was at the point E. shown on the survey plan, of which copy was sent with my No. 1,164.

Extract of a letter from Corporal F. NICKS, R.E., in charge of Coal Shaft Sinking, to G. T. WALCH, Esq., Superintendent of Works, Godavari, dated 5th August 1880, No. 4.

WITH reference to your docket No. 1,163, dated 28th July 1880, regarding point E as shown by villagers, I am fully convinced it is the actual site of bore hole No. 16. In the first place I was taken to the spot E by two villagers who stated they were employed at the boring. I examined the surface soil and found indications that boring had been done there. I found two different soils, viz., light colored clay and sand stone in layers, the same as would come from an auger after boring.

2. On the 3rd instant I made inquiries at the village of Tipurapentaneed and found a man who was employed from the commencement to the finishing of the borings under Mr. Vanstavern; he also took me to the exact spot marked E as shown on plan and showed me the above soil as mentioned, and states that was what came up with the auger; he also pointed to a tree where they cooked their meals, which is only 10 yards from the spot. I intend to sink the shaft at the place pointed. I have already commenced getting stores on the spot to commence work.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 23rd August 1880, No. 1,434.

Report No. 1 on progress of work at Bhadrachalam coal fields to 14th August 1880.

THE sheds having been erected and necessary machinery moved up to site for shaft, actual sinking was commenced on 12th August, and up to 14th depth gone down to was 4 feet 6 inches.

No. 393, dated 3rd September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 3rd September 1880, No. 1,587.

Report No. 2 on progress of work at Bhadrachalam coal fields from 15th to 28th August 1880.

SHAFT sunk from 4 feet 6 inches to 15 feet; soil passed through chiefly "blue and yellow clay" with kunkur; sand stone just reached; some trouble given by water after heavy storms. Party apparently not working quite satisfactorily. Will be visited soon.

No. 450, dated 17th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 16th September 1880, No. 1,721.

Report No. 3 on progress of work at Bhadrachalam coal fields from 28th August to 15th September 1880.

SHAFT sunk from 15 to 34 feet; soil passed through chiefly yellow sand stone compact *in situ*, but breaking up easily when dug out. Pump arrangements fixed.

No. 490, dated 30th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 22nd September 1880, No. 1,722.

I HAVE the honor to inform you that I have on 15th, 20th and 21st instant inspected the work at the Bhadrachalam coal fields, and I find that, though going on slowly, it is being well done.

2. The shaft has now been sunk to a depth of 39 feet and water has just been reached.

3. The first 5 feet passed through was ordinary alluvial and vegetable soil; then came for 10 feet yellow clay, about the lower 5 feet of which was mixed with kunkur; then for 14 feet 6 inches yellow sand stone compact and hard *in situ*, but disintegrating when removed to the surface; and below this to the 39 feet depth a light blue clay chiefly "pipe clay" with at 38 feet a stratum of a few inches of sand stone.

4. Through this last thin stratum of sand stone water has commenced to come in slowly. At 4 P.M. on 20th I saw the bottom of the shaft practically cleared of water, and at 6 A.M. (21st) 1 foot 8 inches in depth had accumulated.

5. The Abyssinian pump sent from Madras has been fixed and works well, clearing such water as is now coming in with perfect ease.

6. The party is well housed and has kept in fair health. Corporal Nicks and some of the men have had rheumatism, one or two have had slight fever, and the Naigue who went up with the party has been sent back to Dowlaishweram with bad ulcers on his feet, and he has been replaced by another man.

7. There have been no accidents, and I am quite satisfied with the care taken by Corporal Nicks, who is in immediate charge of the operations. I cannot say I am quite satisfied with the rate at which the work has been carried on, but native Sappers, it appears to me, do not generally work rapidly.

No. 506, dated 5th October 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 5th October 1880, No. 1,843.

Report No. 4 on progress of work at Bhadrachalam coal fields from 15th to 30th September 1880.

SHAFT sunk from 34 to 44 feet; soil passed through, sand stone, with layers of light blue clay, chiefly pipe clay; water coming in quickly. Pump, "Abyssinian," has now to be worked night and day.

2. The Corporal in charge reports that his detachment is working unsatisfactorily, and that "if the sepoys are required to work in the shaft or at the winch they report themselves sick."

3. It seems likely that these men are behaving as they are with the object of being sent back to their Company, which they think may soon be sent to Bangalore; it would, I think, be well to let them know for certain that they will not be sent away from the work till it is finished, and that if they are sick they will have to go into hospital at Rajahmundry and when discharged return to the work. Eight coolies are now employed to assist the detachment.

No. 2,331.

THE Chief Engineer concurs with the Superintendent of Works that it will be advisable to let the Sappers distinctly understand that they will not, by malingering, be enabled to desert the work which they have been sent up to carry out.

2. When sick they may be sent to the hospital at Rajahmundry as proposed.

(By Order.)

(Signed) J. PENNYCUICK, Major, R.E.,
Deputy Chief Engineer, P.W.D.

18th October 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Yernagudem, 20th October 1880, No. 2,006.

Report No. 5 on progress of work at Bhadrachalam coal fields from 1st to 15th October 1880.

SHAFT sunk from 44 to 50 feet; soil passed through, sand stone, said to be hard, with thin layers of clay.

2. Slow progress due to large quantities of water to be dealt with, and the Corporal reports that the Abyssinian pump can no longer keep the water down, and no further sinking can go on till the steam pump is at work. This is expected daily.

No. 2,422, dated 2nd November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th November 1880, No. 2,641 W.

Proceedings of the Madras Government, Military Department, dated 13th November 1880, No. 7,102.

Telegram from the Superintendent of Works, Godáviri, to the Public Works Department, Madras, dated 26th October 1880.

"Another Non-Commissioned Officer to help Corporal Nicks, often ill, and Dresser for coal party much wanted."

TRANSFERRED to the Military Department, with a request that it may be stated whether any Non-Commissioned Officer can be sent from the "Queen's Own" Sappers and Miners for the purpose.

OOTACAMUND,
29th October 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From the Adjutant-General, dated 10th November 1880, No. 499.

With reference to a telegram from the Superintendent of Works, Rajahmundry, dated 26th October 1880, transferred to the Military Department under Public Works Department No. 601 of 26th ultimo, and referred to His Excellency the Commander-in-Chief under Government endorsement memorandum No. 6,887 of 30th idem, herewith returned as requested, I have the honor, by order, to state that there is no objection to the services of Corporal B. Fuller, R.E., being placed at the disposal of Government in the Public Works Department for employment at Rajahmundry.

ORDER.—The Adjutant-General's letter communicated to the Public Works Department.

(True Extract.)

(Signed) J. MICHAEL, Colonel,
Secretary to Government, Milly, Dept.

ORDER THEREON, No. 2,641 W., dated 18th November 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

2. It is requested that the services of Corporal Fuller may be made available as early as possible.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 30th November 1880, No. 2,674.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 4th November 1880, No. 2,254.

Report No. 6 on progress of work at Bhadrachalam coal fields from 16th to 31st October 1880.

SHAFT sunk from 50 feet to 55½ feet; sand stone passed through to 55 feet, then a layer of clay. Below this it has been impossible to go with the Abyssinian pump and the steam* pump must be awaited.

* Arrived at Dowlaiswaram, 2nd Nov. 1880.
Despatched by steamer to Golagudiem, 4th November 1880.

Firewood is being collected for the engine.

The Corporal in charge of the party has been suffering from dysentery and fever, and it appears that without his personal presence on the work it does not go on properly; another Non-Commissioned Officer is therefore very necessary, especially as pumping will have to be kept up at night. The unhealthiness of the place at this time of the year and the possibility of accidents make it also highly advisable that a Dresser should be attached to the party. Telegram of 26th October asking for another Non-Commissioned Officer and a Dresser was therefore sent.

Telegram from the Secretary to Government, Public Works Department, Madras, to the Superintendent of Works, Godáviri, Rajahmundry, dated 16th November 1880.

"Does further experience show that a Dresser for the coal party is still essential?"

Telegram from Superintendent of Works, Godáviri, Rajahmundry, to the Secretary to Government, Public Works Department, Madras, dated 17th November 1880.

"HEALTH of coal party better, since rain stopped. May do without Dresser."

ORDER THEREON, No. 2,674 W., dated 30th November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd December 1880, No. 2,708.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 18th November 1880, No. 2,401.

Report No. 7 on progress of work at Bhadrachalam coal fields from 1st to 13th November 1880.

THE steam pump arrived at Golagudiem on 6th, and since then the party have been fully occupied in taking it, and the engine to work it, to the shaft and setting it up; the Corporal in charge reports that "the work is proceeding in a satisfactory manner."

2. Lieutenant Gale, R.E., visited the party on the 6th and 7th, and the Corporal in charge reports that since that visit and the change of Havildars which was then made the detachment has been working better than it had been working for some time previously.

3. The health of the party is better than it was, and it is thought that now it may get on without a Dresser, though of course it would be safer to have one on the spot, and another Non-Commissioned Officer to assist Corporal Nicks is very necessary as mentioned in the last report.

ORDER THEREON, No. 2,780, dated 3rd December 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd December 1880, No. 2,934 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 2nd December 1880, No. 2,554.

Report No. 8 on the progress of work at the Bhadrachalam Coal-field.—13th to 30th November 1880.

THE party have been engaged in keeping water down in the shaft with the Abyssinian pump and setting up the steam-pump and its engine.
No further sinking has been possible in the period under notice.

2. The Corporal in charge again reports, "there is a great deal of sickness among the detachment. Fever is very prevalent."

ORDER THEREON, No. 2,934 W., dated 22nd December 1880.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 10th January 1881, No. 38 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Wuddigudem, 16th December 1880, No. 2,751.

Report No. 9 on the progress of work at the Bhadrachalam Coal-field.—1st to 15th December 1880.

THE steam-pump was set to work on the 8th. There were then "18 feet of water in the shaft," and "it took 2 hours 35 minutes to pump dry;" owing, however, to extra framing, &c., being found necessary, actual work of excavation was not recommenced till 13th.

2. On the 15th the undersigned inspected the work. The shaft was down 56 feet, it was in good order and the pump going dead slow was keeping it clear of water.

A layer of clay (chiefly pipe-clay) had just been reached through which water was coming in freely.

The water has for some time past been sensibly affected by variations in the level of the river, which is now low, though not so low as it will be. It is impossible to say whether the one pump will be able to deal with the water which will be met with in the next 100 feet, and it will probably be advisable to have another ready; it could be driven by the same engine and driving machinery.

3. The huts were being moved up to near the shaft.
4. Ninety cubic yards of firewood for the engine have been cut.
5. The health of the party is not good, there are generally one-third or so of the sepoys down with fever, but it does not appear to be of a virulent type.
6. Corporal Fuller, R.E., has now (on 15th) joined the work.
7. No steamer will be able after this to get to Gollagudem, and probably not even to Wuddigudem till next June or July.

ORDER THEREON, No. 38 W., dated 10th January 1881.

THE Government consider that the additional pumping power referred to in paragraph 3 of the foregoing letter should be provided. The Superintendent of Works, Godáviri, will arrange accordingly.

2. The work being unhealthy should be pushed on as rapidly as possible.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 14th January 1881, No. 96 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 7th January 1881, No. 2,927.

Report No. 10 on the progress of works at the Bhadrachalam Coal-field.—16th to 31st December 1880.

- (1.) Shaft deepened by 8 feet to 64 feet.
- (2.) Soil passed through "different kinds of clay."
- (3.) Removal of huts to site of shaft finished.

ORDER THEREON, No. 96 W., dated 14th January 1881.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 25th January 1881, No. 195 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 10th January 1881, No. 2,966.

I HAVE the honor to send herewith a letter from Corporal Nicks, R.E., in charge of the coal operations near Bhadrachalam, reporting the inrush of a large volume of water into the shaft.

2. Till this occurred all seemed to be going on well, though slowly.

3. I have told Corporal Nicks to again rig up the Abyssinian pump and see if with it he cannot get the water down low enough to get at the steam-pump box and again set it going, and then if the two will keep the water down sufficiently low it is possible that by putting in specially prepared cylinders we may be able to get through the treacherous stratum which has led to the present mishap; but if water with our present appliances cannot be kept so low, another pump more powerful than the present one, with machinery and engine to drive it, must be sent up.

4. Such machinery and engine however could not be got to the place before the next season of freshes in the river, say next July, and should it be found quite impossible to deal with the water with the present appliances I would request instructions as to what in the interval is to be done with the Sapper coal party.

From Corporal F. NICKS, R.E., to the Superintendent of Works, Godávári, Dowlaishweram, dated Gollagudem, 5th January 1881, No. 118.

On Tuesday evening we were deep enough for 9th ring, and on Wednesday morning myself and Corporal Fuller started putting in same, as the soil was very treacherous it not being safe to trust sepoys; we had a slip of earth from the north side of shaft at about 11 A.M. We started then to plank that portion, as we had put in on (4) four plining (*sic*) planks and placed ring, we worked on and had placed four planks in the north quarter; we then noticed the water gradually rise, and the pump would not keep it down. I then sent Corporal Fuller up to ascertain if the engine was under proper steam, he informed me as he was coming down in *bucket* that steam gauge indicated 25 lb. ☐ As I was in the act of guiding the bucket down the water burst in from the *south-west* side, bringing with it a large quantity of "clay," about one-quarter yard, which knocked me down. Corporal Fuller said to me we had better take all tools up with us, but before he could get out of the bucket the water rose to my waist. I then said, never mind the tools we must get above the water in case the rings in upper work give way, as I had put my arm in where water was rushing from and found a large hole about 6 inches by 2 feet, so the clay could not be more than 1 foot 6 inches thick in front of the hole we had previously left, a berm of 6 inches in other work and considering this work was very dangerous we left a berm of 1 foot 3 inches.

We then cleared out of shaft as soon as possible with the water rising at the rate of 1 foot per minute, leaving all tools at bottom as we could not get at them for the water. I also kept engine at work till 10-25 P.M. making 25 strokes per minute, but the water still kept rising.

Rise of water	4-10 P.M.	No water more than ordinary.	5th January 1881.
Burst in at	4-15 P.M.		
7 feet	4-25 "		
21 feet 3 inches	5-50 "		
26 feet 8 inches	7-50 "		

Whilst taking measurement at 10 P.M. the pump gone out depth of water at the above time 29 feet 4 inches. I then gave orders to engine driver to draw fire, I then emptied boiler as I had been under steam near 400 hours.

At present we cannot get pump clear as working box is under water, the only remedy will be to get another set of top gear pipes and pump rods; if it is the Godávári which is broke in upon us, which I think it is, it will be useless. 11-30 P.M.

I took measurements at 11-35 and found 33 feet 4 inches and at 7 A.M., the 6th, and found 38 feet 8 inches.

Please give me further instruction in answer to this.

ORDER THEREON, No. 195 W., 25th January 1881.

THE Superintendent of Works, Godávári, has already been authorised* to arrange
* G.O., No. 38 W., dated 10th January 1881. for the provision of additional pumping power.

2. The Government await a further report before passing orders on the subject of paragraph 4 of the letter above read.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Yanam, 19th January 1881, No. 3,073.

In continuation of my No. 2,966, dated 10th instant, I have the honor to state that Corporal Nicks reports that in spite of all efforts it has been found impossible to raise the pump to get at the upper box and working barrel, and that at noon on the 6th the water had attained the "height of 40 feet" since which it has not varied.

2. It is evident, therefore, that another and more powerful pump must be provided if the work is to be persevered with.

Telegram to the Superintendent of Works, Godávári, Rajahmundry, dated 27th January 1881, No. 193.

MORE powerful pump for coal workings sanctioned. Arrange for one at once.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd February 1881, No. 308 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated 28th January 1881, No. 3,185.

Report No. 11 on the progress of work at the Bhadrachalam Coal-fields.—1st to 15th January 1881.

Work progressed steadily till 5th, when the shaft was down 69 feet, water in large quantities then came in and overpowered the pump (see letters Nos. 2,966, 10th January 1881, and 3,073, 19th January 1881, to the Chief Engineer), and on the 15th there were 40 feet 4 inches depth of water in the shaft.

2. The Abyssinian pump which had been taken away and put on the barge was again taken to the shaft, and its placing commenced with the hope (a faint one) that with it the water can be so lowered that it may prove possible to get at the steam-pump boxes and set it going again. (See paragraph 3 of letter No. 2,966, 10th January 1881, to Chief Engineer.)

ORDER THEREON, No. 308 W., dated 3rd February 1881.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd February 1881, No. 493 W.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 31st January 1881, No. 3,225.

With reference to your telegram of 27th I have the honor to report that I have no means of here arranging for a more powerful pump for the coal shaft, and can only suggest that one may be supplied from the workshops at Madras or obtained from England.

2. Having had no experience in the work for which the pump is required, and having no one here who has had such experience, I cannot state with any certainty what is the nature and power of the pump required, and it seems therefore that it is best for me to explain the conditions of the case and from them possibly some Mining Engineer or manufacturer of mining machinery will be able to decide what is wanted. The conditions are these—

3. (a)—The shaft is 6 feet 3 inches diameter.
- (b)—It is sunk at about 1 mile from the edge of the Godávári.
- (c)—The substrata already passed through (to 69 feet depth) have been almost entirely yellow sandstone, alternating with bands of yellowish and greyish clay, chiefly pipe-clay, and the boring shows that the general character of the strata to be yet passed through will be similar, but with fewer bands of clay, down to about 120 feet, when shale and coal will be met with.

(d)—Down to 55 feet there was but little water, but at that depth the Abyssinian pump could no longer deal with it, and the steam-pump sent up from the Madras Workshops was put up; whilst doing this (it occupied some days) the water rose 18 feet, this the pump when set to work cleared out in 2 hours 35 minutes.

(e)—This pump, driven by an old 8 horse-power engine, kept the water down easily enough till the shaft had reached a depth of 69 feet, when there

• For the first 7 feet came in at the rate of a stratum of pipe-clay and the water rose* 29 feet 4 inches in 5½ hours against the pump going 22 strokes a minute. The

See copy of letter from Corporal Nicks, No. 118, 5th January 1881, herewith. pump then got choked and the water rose another 10 feet 8 inches, that is 40 feet

in all (or to 29 below top of shaft) in another 14 hours and at that level it has stood.

(f)—The shaft has to go down to a total depth of about 150 feet.

(g)—The river—the variations in level of which have been noted to affect the water in the shaft—rises in the season of floods (from June to October) from 15 feet to 20 feet or so above its present level, or approximately to from about 10 feet to 15 feet below level of top of shaft.

(h)—As most of the soil to be passed through is sandstone, much sharp sand comes up with the water, and it has been found to rapidly wear away any leather it comes in contact with, such as "buckets," valves, &c.

4. As already stated in my No. 2,966, 10th January 1881, paragraph 4, machinery or apparatus of any kind, weighing more than could be carried by two coolies, could not be got to the shaft till next July, because it could not be taken by water much if at all beyond Koide, some 34 miles below Gollagudem, and between the two places there is no road, only a jungle track, which in places passes over rocky slopes of hills.

P.S.—As all pumps occasionally get out of order and all engines require to be stopped now and then, it will be highly advisable, if not necessary, to have two pumps and two engines, and it is of course of great convenience that the working parts of the pump should be easily raised or got at.

From the same officer, dated 6th February 1881, No. 3,294.

Report No. 12 on the progress of work at the Bhadrachalam Coal-field.—16th to 31st January 1881.

The Abyssinian pump (see paragraph 2 of last report) was fully rigged up by 19th, and pumping then commenced with it; by 24th the water had been reduced 11 feet, or to 29 feet in depth, and then the working part of the steam-pump was got at.

2. The leather "buckets" which had worn out (they are constantly wearing out owing to the action of the gritty sand, see paragraph 3, (g.), No. 3,225, 31st January 1881), were renewed and the pump was started again on 25th; by the evening of 27th it had reduced the water by 8 feet, or to 21 feet, in depth, below which it could not reduce it, and the leathers having again worn out it had to be stopped for a time, when the water immediately rose against the Abyssinian pump to 30 feet 7 inches depth.

3. It is quite evident that with the present pumping power it will be impossible to recommence sinking operations.

4. There can be little doubt that the water in the shaft is in communication through some permeable stratum with the water in the river, and that enormously powerful machinery and a very great expenditure will be necessary to enable the shaft to be sunk to where it will reach the shale and inferior coal which borings and geological researches have established to exist in small quantities in the locality.

ORDER THEREON, No. 493 W., dated 22nd February 1881.

THE Right Honorable the Governor in Council considers that before any further expenditure is incurred the opinion of an expert in mining matters should be obtained. The Chief Engineer has, it is understood, written to Calcutta to inquire whether the services of any qualified person can be secured.

Meanwhile the work should be suspended.

2. Orders have already been issued to the Superintendent of Works, directing the Sappers to return to their Company.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 542 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 11th February 1881, No. 3,370.

FURTHER information has shown me that I was wrong in supposing that when water burst into the coal shaft at Bhadrachalam it came in at the rate of "630 gallons a minute," as stated in the margin, paragraph 3, clause (e) of my No. 3,225, 31st January 1881; it came in at the rate approximately of 200 gallons a minute.

2. I would take this opportunity of asking for early orders on paragraph 4 of my No. 2,966, 10th January 1881.

ORDER THEREON, No. 541 W., dated 23rd February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 541 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 17th February 1881, No. 3,463.

Report No. 13 on Bhadrachalam Coal-field work.—1st to 15th February 1881.

As stated in last report it is quite impossible to proceed with the work, and it therefore has been at a complete stand-still during the last fifteen days.

ORDER THEREON, No. 542 W., dated 28th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th March 1880, No. 698 W.

Read the following paper :—

MINUTE BY HIS GRACE THE GOVERNOR.

THE question of getting access to coal in this Presidency for railway and navigation purposes is a very important one.

2. That coal exists in the Nizam's territory, between the Godáviri and Kistna, is well ascertained, and the quality of that recently obtained and tried, although the results are not yet accurately calculated, show that the coal is of a good, useful description, and reported by the Public Works Workshops as quite equal to the ordinary Indian coal they have in use. It becomes a question of price.

3. Coal is wanted for railway and steam purposes at Madras, for the navigation of the Godáviri and at Cocanada, and will no doubt be also consumed on the canal.

4. It has been ascertained that coal exists on the Godáviri river on the British side, and some coal raised from the dry bed See Map. About one-third of the distance of the river has given "good results" in between Bhadrachalam and Rékapalle. the Godáviri steamers. The quality of the coal, as tested by boring with small bores, is necessarily uncertain. Some is spoken of as fair, some as inferior; but it is close to the river, and the ground apparently not costly to sink in. If, as estimated by Mr. Vanstavern (who was especially employed upon the coal investigation), the coal seams can be reached by a shaft for an amount of under Rs. 2,000, it would be a matter to be tried at once without doubt; but I would put it higher, and taking the estimate above given, I would make allowance for pumping, ventilating and levelling, say that the trial should be considered as not to be effectually made under a possible Rs. 5,000; say at No. 16 bore, where the coal is within 150 feet from surface and about 18 feet thick, and the shaft only 1 mile from river, but above flood lines.

5. Coal in such a situation ought to be sufficient and economical for all purposes of steam engines on the river and delta and also at Cocanada, as its price must be low from the freight being entirely water and down-stream, so that an extra quantity might be used. How much further it could be carried can only be really known by actual test.

6. The opening of coal at this spot would doubtless stimulate the opening on the Nizam's side.

7. In ordinary times I should not hesitate to recommend the expenditure necessary to reach and test the coal seams, and even in the present times it seems to me desirable to do so. If the coal sufficed only for Godáviri use, the cost would not be wasted.

8. The opening of any coal operation would tend to develope and thus to pacify the country around.

9. The question to be decided then is—

Shall Government endeavour, at a cost which may reach Rs. 5,000, to open the coal already ascertained to exist?

10. If that be agreed then the Chief Engineer should suggest the arrangements, and the co-operation of Mr. Vanstavern should be secured, for his local knowledge and long experience of the district.

11. The working season is from now to June.

5th January 1880.

(Signed) BUCKINGHAM AND CHANDOS.

N.B.—The original maps, sections and memoranda should be returned to Mr. Vanstavern, as they are only lent. I could not trace the copies in Government possession—possibly lost.

ORDER THEREON, No. 698 W., dated 18th March 1880.

THE Revenue Department will arrange to place at the disposal of the Public Works Department the sum of Rs. 5,000 from the accumulated Cattle Trespass Fund for certain experiments on coal-boring operations in the Godávári district.

2. This amount will be recouped when necessary for the farm purposes later on.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

No. 859.

MEMORANDUM.

HIS GRACE the Governor in Council having decided to make an early commencement with sinking a shaft for working a coal seam, whose existence has been proved at a point midway between Bhadrachalam and Rékapalle on the left bank of the Godávári, the undersigned is desired to inquire whether His Excellency the Commander-in-Chief thinks that a party consisting of, say, two European Non-Commissioned Officers and a Havildar and Naigue with fourteen Sappers, who are acquainted with mining could conveniently be spared from the Companies of the "Queen's Own" Sappers and Miners which are now attached to the force under the command of Colonel Buck.

2. Their employment in sinking the shaft required might possibly extend to six months.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.
15th March 1880.
To the Secretary to Government, Military Department.

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 20th March 1880, No. 213.

WITH reference to your docket memorandum, No. 1,771, dated 16th March 1880,

* Herewith returned.

I have the honor to inform you that the Officer Commanding, Sappers and Miners at Dowlaishweram, has been directed to detach two British Non-Commissioned Officers with a Havildar and Naigue and fourteen Sappers for the purpose of sinking a shaft in the Godávári district.

2. It is of great importance that these men should not be exposed in tents during the hot season, and His Excellency trusts that Government will see the necessity of having thatched huts for the natives, and suitable erections for the shelter of the British Non-Commissioned Officers employed.

No. 1,964.

TRANSFERRED to the Public Works Department, with reference to its memorandum, No. 859, dated 15th March 1880.

(By Order.)

FORT ST. GEORGE, (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
25th March 1880. Acting Secretary to Govt., Mily. Dept.

No. 972.

MEMORANDUM.

THE Chief Engineer has the honor to forward, for the information of the Superintendent of Works, Godávári, a copy of a Minute by His Grace the Governor regarding coal-boring explorations on the British side of the Godávári river, with copies of the correspondence that has passed on the subject.

2. On receipt of an intimation from Mr. Vanstavern that he has no objection to the free use of the plans, &c., borings can be commenced. As it is understood that the working season will only last for about two months longer, every exertion should be made.

3. Meanwhile, in accordance with the wishes of His Excellency the Commander-in-Chief, proper shelter for the British Non-Commissioned Officers employed and thatched huts for the natives should at once be provided.

4. Mr. Walch's attention is invited to Lieutenant Baddeley's letter of the 15th March, in case the requisite machinery, &c., cannot be got from the Dowlaishweram shops.

(Signed) R. H. SANKEY, Col., R.E.,
Chief Engineer, P.W.D.

31st March 1880.

To the Superintendent of Works, Godávári.

Proceedings of the Madras Government, Public Works Department, dated 14th April 1880, No. 960 W.

Read the following paper:—

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 2nd April 1880, No. 250.

IN continuation of Adjutant-General's letter, No. 213, dated 20th March 1880,

1 Havildar.
1 Naigue,
14 Privates.

I have the honor, by order, to state that the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram reports that the party, as

per margin, is in readiness to proceed under the orders of the Public Works Department.

2. There are no European Non-Commissioned Officers with the Detachment.

No. 2,117.

TRANSFERRED to the Public Works Department, in continuation of No. 1,964, dated 25th March 1880.

FORT ST. GEORGE, (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
3rd April 1880. Acting Secretary to Govt., Mily. Dept.

ORDER THEREON, No. 960 W., dated 14th April 1880.

COMMUNICATED to the Superintendent of Works, Godávári.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 21st April 1880, No. 996-A W.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 6th April 1880, No. 84.

I HAVE the honor to acknowledge the receipt of your memorandum No. 972, dated 31st ultimo.

One Indent in triplicate.

2. As you will have seen from my letter No. 701, dated 31st March 1880, and its enclosure, I have no officer or upper

subordinate whom I can send for the coal operations, and the Officer Commanding the Detachment of the "Queen's Own" Sappers and Miners here has no European Non-Commissioned Officer.

3. In paragraph 10 of the Minute by His Grace the Governor it is said that "the co-operation of Mr. Vanstavern should be secured," and it seems to me that it would be advisable, as he lives not far from where the operations are to be carried on and has had some experience in such work, to employ him on a salary to superintend the work, but I have no authority to open negotiations officially with him on the subject, or to make him any offer.

4. The steamers cannot now go up the river further than Koide (52 miles), and only boats of very small draft can get from there to where the operations are proposed, some 35 miles further.

5. There are no pumps here at all suited for deep shaft sinking, and I enclose an indent for such a pump and machinery to drive it, which, if approved, please send on to the Government workshops, Madras. If the pump be sent it should be accompanied by a Maistry who understands its working.

6. I think if you will consider all the circumstances of the case you will see that there is no probability of the work being done in the "two months" mentioned in paragraph 2 of your memorandum under notice.

From Lieutenant W. L. C. BADDELEY, R.E., General Superintendent of Public Works Workshops and Stores, Madras, to the Secretary to Government, Public Works Department, dated 15th March 1880.

We have two deep well pumps in store which would be suitable for working a shaft 80 feet in depth.

2. The five-inch lift pump which we made for the Ooregum Company is a good pattern for deep shafts, and we could make up these very soon if required.

3. One of the Workshop Maistries would be available to look after the pumping machinery, but there is no one here who understands anything about mining.

4. If Dowlaishweram cannot provide the engines, we can spare a 4 horse-power portable or any number of Gwynne's or Nasmyth's 4 and 6 horse-power engines and boilers combined. These also could be made fairly portable by fitting them on a stand with wheels.

5. We have no machinery for working or lifting coal, but probably there would be no difficulty in making up any ordinary appliances.

ORDER THEREON, No. 996-A W., dated 21st April 1880.

THE Superintendent of Works, Presidency, will at once direct the General Superintendent, Public Works Workshops, to despatch one of the deep well pumps mentioned by him as suitable for a shaft 80 feet deep to the Superintendent of Works, Godáviri, along with one of the Workshop Maistries for looking after this and such other machinery as it may be found necessary to send for unwatering the coal shaft.

That officer should also be directed to place himself without delay in correspondence with the Superintendent of Works, Godáviri, relative to any steam pumping or other machinery that may be deemed necessary for sinking the shaft below 80 feet.

2. The Superintendent of Works, Godáviri Division, is authorised to make arrangements with Mr. Vanstavern for directing the operations, preferably fixing a definite sum on the shaft being sunk to the bottom of the seam indicated by the borings, and reporting the terms as soon as possible for the information of Government.

3. The original borings having been executed during the monsoon, His Grace in Council has no reason to suppose that the work need now be subjected to any delay

on account of the season, and as he attaches the greatest importance to the sinking of the shaft, no efforts should be spared to effect that object at the earliest date.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 27th April 1880, No. 1,035 W.

Proceedings of the Madras Government, Military Department, dated 14th April 1880, No. 2,404.

Read the following papers:—

Proceedings of the Madras Government, Public Works Department, dated 7th April 1880, No. 893 W.

Read letter from the Superintendent of Works, Godáviri, dated 30th March 1880, No. 701.

I HAVE the honor to enclose copy of a letter received this day from the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram, and to request instructions.

2. I would point out that the district is shorthanded, that just at this season there is a great amount of work in connection with the anicut and head works, canals, &c., which has to be compressed into a very short time; and I trust, therefore, that no one will have to be taken away from such work to carry out the "hutting," &c., referred to by Major Hamilton, and which it appears to me the men might carry out themselves.

3. I do not know where the Kottapalle referred to is.

From the Officer Commanding Detachment "Queen's Own" Sappers and Miners, to the Superintendent of Works, Godáviri, dated 29th March 1880, No. 209.

WITH reference to letter, No. 822, dated 20th March, from the Adjutant-General (copy annexed for your information), I have the honor to report that the party, consisting of one Havildar, one Naigue and fourteen Privates, is in readiness to proceed up the river under your orders. There are no European Non-Commissioned Officers with this detachment.

2. I presume that you will supply all necessary tools.

3. The party will have to be hutted by the Public Works Department.

From the Officiating Adjutant-General, to the Officer Commanding "Queen's Own" Sappers and Miners, Dowlaishweram, dated 20th March 1880, No. 822.

At the request of Government in the Public Works Department the Commander-in-Chief has sanctioned the services of a party of two European Non-Commissioned Officers, a Havildar, Naigue and fourteen Sappers, who are acquainted with mining, from the companies attached to the force under Colonel Buck, for employment in sinking a shaft for working a coal seam between Bhadrachalam and Kottapalle on the left bank of the Godáviri, and you are requested to detach the above party for this purpose.

UNDER the circumstances explained in Mr. Walch's letter, the detachment will provide hutting accommodation for themselves, the usual allowances being granted by the Military Department.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secretary to Govt., P.W.D.

To the Military Department.

ORDER,—Communicated to His Excellency the Commander-in-Chief.

2. Under O.G. (Military), No. 356, dated 30th January 1872, all special charges, including cost of hutting, incurred on account of Sappers employed on purely civil works, form a debit against the Public Works Department.

(True Extract.)

(Signed) H. N. D. PRENDERGAST, Col., R.E.,
Ag. Secretary to Government, Mily. Dept.

ORDER THEREON, No. 1,035 W., dated 27th April 1880.
COMMUNICATED to the Examiner of Public Works Accounts.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Military Department, dated 16th June 1880, No. 3,763.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri District, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 27th May 1880, No. 547.

I HAVE the honor to inform you that immediately on receipt of G.O., No. 996-AW., dated 21st April 1880, I put myself in communication with Mr. Vanstavern, and enclose copy of my last letter* to him to which I have received the enclosed reply, in which I am sorry to say he declines to undertake the superintendence of the coal shaft sinking for the reason which he states in a private letter.

That reason being that he thinks it probable that private affairs may render it necessary for him to leave the country before it would be possible to complete the shaft.

2. I am now at a loss to know how to carry out the wishes of Government as regards the speedy sinking of the shaft. An extra Overseer having come (see my No. 519, of 24th May 1880) I could send him, but he knows nothing of the kind of work, and it is doubtful if the working under him of the Sappers, whom it is proposed to send, would be smooth, and I would recommend that a Non-Commissioned Officer of the Sappers and Miners should be sent for the work.

3. Mr. Vanstavern states that, though borings could be got down during the rains and when the river was high, the difficulties and expense of sinking a shaft would, he is sure from a knowledge of the place, be much greater than in the dry season, as water would be met with at a much higher level and in much greater quantities.

No. 126.

REFERRED to the Military Department, with request that it may be ascertained if the services of any Non-Commissioned Officer of Sappers (European) acquainted with mining or shaft sinking can be placed at the disposal of this department for directing the operations as suggested by Mr. Walch. If such a Non-Commissioned Officer can be found, it is requested that he may be directed to proceed at once to the spot.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

5th June 1880.

From the Adjutant-General, No. 173, dated 14th June 1880.

In returning Military Department memorandum No. 3,561, of the 7th current, I have the honor, by order, to inform you that the services of Corporal Nicks of the

"Queen's Own" Sappers and Miners are available for the Godáviri coal shaft. He is stated to be zealous and by trade a "Fitter."

ORDER,—Ordered that the Adjutant-General's letter be communicated to the Public Works Department.

2. His Excellency the Commander-in-Chief is requested to cause Corporal Nicks to be detailed at once for the duty.

(True Extract.)

(Signed) J. MICHAEL, Col.,
Secy. to Govt., Mily. Dept.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 28th July 1880, No. 1,164.

WITH reference to our inspection of the proposed site for coal shaft on 22nd instant, I have the honor to forward tracing from plan of survey which I then ordered to be made.

2. I append the orders now issued to the Corporal in charge of the party with reference to this survey.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to Corporal F. NICKS, Golagudiem, dated 28th July 1880, No. 1,163.

WITH reference to the accompanying plan a report ought to have been sent stating whether there are any indications that point E., said to have been shown by villagers as site of bore-hole No. 16, is really the site.

2. If there be not any trustworthy indications that it really is so, the shaft is to be sunk at point A., or should that be in a local depression where trouble will be given by surface drainage, at some convenient point between it and D.

NOTE.

WITH reference to the annexed letter No. 1,164, of the 28th July 1880, from the Superintendent of Works, Godáviri, on the subject of the coal sinkings, I beg to offer the following brief remarks, having lately had the opportunity of inspecting the site of the operations in company with Mr. Martindale and Mr. Walch.

2. Leaving Dowlaishweram on morning of the 21st ultimo, Mr. Walch and I taking the new steam launch, *Arthur Cotton*, were enabled to pass very nearly through the Godáviri gorge before anchoring for the night; although the current was strong, 5-3 feet in depth, passing over the crest of the anicut.

3. Next morning picking up Mr. Martindale at Woodagudiem, we arrived at the site of the coal operations about noon, and spent some five or six hours in inspecting the locality and chiefly in endeavouring to find out the precise position of bore-hole No. 16, at which point, owing to the promising results of the previous borings, it had been decided to sink the shaft.

4. We found Corporal Nicks with his fourteen Sappers encamped at Golagudiem (*Golagaram* of the Indian Atlas), the party were well and sufficiently provided with shelter till the new shed 80 feet x 18 feet now sanctioned (and for which corrugated iron sheets have been brought down from the spare stores at Dumagudiem) has been run up, as it will be immediately.

5. In addition to an ample supply of tools of all kinds there was ready a pump which will, I hope, answer all purposes till a depth of 80 feet has been reached, when

one driven by steam now preparing at the Madras workshops will be sent up for unwatering the shaft at greater depths.

6. Twenty horizontal circular frames of angle iron, sufficient if spaced at 5 feet apart to reach to a depth of 100 feet, were also on the ground. If stiff soil or rock be met with, these may be spaced at greater intervals or omitted altogether and answer for 150 feet in depth, but in any case Mr. Walch can readily send up all that is needed in this respect from Dowlaishweram.

7. Mr. Martindale, who takes a kindly interest in the work, will see that the party have ample and good supplies, and if, as I hope, the men only keep their health, the work should progress favorably, though it is at the same time to be feared that, particularly at this season, water may be met with close to the surface, and difficulties on this account may delay operations.

8. Corporal Nicks had explored nearly all the area of previous operations, but had failed to discover the precise location of bore hole No. 16. Most of the sites of the other bore holes as pointed out by the villagers had been marked by a rough block of red sand stone, but in this particular case no indication could be found and it was thus fortunate that we were able to visit the place at this time.

9. From there not being a single definite point or bearing given on the survey whereby to recognise the old holes, and from these having been mere punctures and easily obliterated, it was necessary to fix the point in question by as many approximations as we could. The result is shown by the tracing now sent up by Mr. Walch. Our approximations led us to decide on the point A., and it would now appear from subsequent information received from the villagers (probably those of Totapilly, who we were informed had been engaged on this particular portion of the old work) that the point E. at no great distance from A. is the true point.

10. I feel assured that in no case will the point selected here be much out, though, of course, it would have been very much more satisfactory to find the exact locality.

Mr. Walch's present decision as conveyed to Corporal Nicks may therefore, I think, be safely accepted.

11. The whole country about is rather undulating, clayey, with bushy jungle here and there, and well raised above the river, but showing from the moisture which lodges in the lower portions, that at this season much water may have to be encountered in sinking the shaft.

12. It would, of course, be premature to say much about the results of these operations, but if Mr. Vanstavern (whom I met at Woodagudiem, but who owing to illness was unable to accompany me to the coal field) is to be credited, the coal is likely to turn out very shaley. The best specimen, he informed me, only yielded 30 per cent. of carbon, and the worst 9 per cent.

13. As regards the proper designation of this coal field, there is some doubt. Totapilly, by which it appears to have been first known, though shown on the atlas, is a very insignificant village and at a distance from our present workings. Tiperpenti (Tipurapentaneed of the tracing) is not shown on the atlas, and is also both insignificant and at some distance. If the field is to be called after any of the neighbouring villages, Golagudiem, where the camp is and which is both shown on the atlas and is on the river bank, would be the most appropriate designation.

14. But to the best of my judgment it would be preferable to call it the Bhadrachalam field, as it is sufficiently near to this, which is certainly the best known and most important place in the neighbourhood.

15. If the Government approve, therefore, I would in all future correspondence designate this the Bhadrachalam coal field.

16. The Superintendent of Works has orders to send up fortnightly progress reports of the work done.

9th August 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Chief Engineer, P.W.D.

No. 318.

MEMORANDUM.

THE accompanying note is forwarded to the Superintendent of Works, Godavari, for information.

2. The decision conveyed in his letter No. 1,164, of the 28th July 1880, with reference to the point at which the shaft is to be sunk is accepted.

3. Fortnightly progress reports should be continued in order that His Grace the Governor may be kept advised of the results.

4. This field will in future be designated the Bhadrachalam field in all official documents.

(Signed) R. H. SANKEY, Colonel, R.E.,
14th August 1880. Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 18th August 1880, No. 1,336.

IN continuation of my letter No. 1,164, of the 28th July 1880, I have the honor to forward, herewith, an extract from letter No. 4, of the 5th August 1880, received from Corporal Nicks stating that he is fully convinced that bore hole No. 16 was at the point E. shown on the survey plan, of which copy was sent with my No. 1,164.

Extract of a letter from Corporal F. NICKS, R.E., in charge of Coal Shaft Sinking, to G. T. WALCH, Esq., Superintendent of Works, Godavari, dated 5th August 1880, No. 4.

WITH reference to your docket No. 1,163, dated 28th July 1880, regarding point E as shown by villagers, I am fully convinced it is the actual site of bore hole No. 16. In the first place I was taken to the spot E by two villagers who stated they were employed at the boring. I examined the surface soil and found indications that boring had been done there. I found two different soils, viz., light colored clay and sand stone in layers, the same as would come from an auger after boring.

2. On the 3rd instant I made inquiries at the village of Tipurapentaneed and found a man who was employed from the commencement to the finishing of the borings under Mr. Vanstavern; he also took me to the exact spot marked E as shown on plan and showed me the above soil as mentioned, and states that was what came up with the auger; he also pointed to a tree where they cooked their meals, which is only 10 yards from the spot. I intend to sink the shaft at the place pointed. I have already commenced getting stores on the spot to commence work.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 23rd August 1880, No. 1,434.

Report No. 1 on progress of work at Bhadrachalam coal fields to 14th August 1880.

THE sheds having been erected and necessary machinery moved up to site for shaft, actual sinking was commenced on 12th August, and up to 14th depth gone down to was 4 feet 6 inches.

No. 393, dated 3rd September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 3rd September 1880, No. 1,587.

Report No. 2 on progress of work at Bhadrachalam coal fields from 15th to 28th August 1880.

SHAFT sunk from 4 feet 6 inches to 15 feet; soil passed through chiefly "blue and yellow clay" with kunkur; sand stone just reached; some trouble given by water after heavy storms. Party apparently not working quite satisfactorily. Will be visited soon.

No. 450, dated 17th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 16th September 1880, No. 1,721.

Report No. 3 on progress of work at Bhadrachalam coal fields from 28th August to 15th September 1880.

SHAFT sunk from 15 to 34 feet; soil passed through chiefly yellow sand stone compact *in situ*, but breaking up easily when dug out. Pump arrangements fixed.

No. 490, dated 30th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 22nd September 1880, No. 1,722.

I HAVE the honor to inform you that I have on 15th, 20th and 21st instant inspected the work at the Bhadrachalam coal fields, and I find that, though going on slowly, it is being well done.

2. The shaft has now been sunk to a depth of 39 feet and water has just been reached.

3. The first 5 feet passed through was ordinary alluvial and vegetable soil; then came for 10 feet yellow clay, about the lower 5 feet of which was mixed with kunkur; then for 14 feet 6 inches yellow sand stone compact and hard *in situ*, but disintegrating when removed to the surface; and below this to the 39 feet depth a light blue clay chiefly "pipe clay" with at 38 feet a stratum of a few inches of sand stone.

4. Through this last thin stratum of sand stone water has commenced to come in slowly. At 4 P.M. on 20th I saw the bottom of the shaft practically cleared of water, and at 6 A.M. (21st) 1 foot 8 inches in depth had accumulated.

5. The Abyssinian pump sent from Madras has been fixed and works well, clearing such water as is now coming in with perfect ease.

6. The party is well housed and has kept in fair health. Corporal Nicks and some of the men have had rheumatism, one or two have had slight fever, and the Naigue who went up with the party has been sent back to Dowlaiswaram with bad ulcers on his feet, and he has been replaced by another man.

7. There have been no accidents, and I am quite satisfied with the care taken by Corporal Nicks, who is in immediate charge of the operations. I cannot say I am quite satisfied with the rate at which the work has been carried on, but native Sappers, it appears to me, do not generally work rapidly.

No. 506, dated 5th October 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 5th October 1880, No. 1,843.

Report No. 4 on progress of work at Bhadrachalam coal fields from 15th to 30th September 1880.

SHAFT sunk from 34 to 44 feet; soil passed through, sand stone, with layers of light blue clay, chiefly pipe clay; water coming in quickly. Pump, "Abyssinian," has now to be worked night and day.

2. The Corporal in charge reports that his detachment is working unsatisfactorily, and that "if the sepoys are required to work in the shaft or at the winch they report themselves sick."

3. It seems likely that these men are behaving as they are with the object of being sent back to their Company, which they think may soon be sent to Bangalore; it would, I think, be well to let them know for certain that they will not be sent away from the work till it is finished, and that if they are sick they will have to go into hospital at Rajahmundry and when discharged return to the work. Eight coolies are now employed to assist the detachment.

No. 2,331.

THE Chief Engineer concurs with the Superintendent of Works that it will be advisable to let the Sappers distinctly understand that they will not, by malingering, be enabled to desert the work which they have been sent up to carry out.

2. When sick they may be sent to the hospital at Rajahmundry as proposed.

(By Order.)

(Signed) J. PENNYCUICK, Major, R.E.,
Deputy Chief Engineer, P.W.D.

18th October 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Yernagudem, 20th October 1880, No. 2,006.

Report No. 5 on progress of work at Bhadrachalam coal fields from 1st to 15th October 1880.

SHAFT sunk from 44 to 50 feet; soil passed through, sand stone, said to be hard, with thin layers of clay.

2. Slow progress due to large quantities of water to be dealt with, and the Corporal reports that the Abyssinian pump can no longer keep the water down, and no further sinking can go on till the steam pump is at work. This is expected daily.

No. 2,422, dated 2nd November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th November 1880, No. 2,641 W.

Proceedings of the Madras Government, Military Department, dated 13th November 1880, No. 7,102.

Telegram from the Superintendent of Works, Godáviri, to the Public Works Department, Madras, dated 26th October 1880.

"Another Non-Commissioned Officer to help Corporal Nicks, often ill, and Dresser for coal party much wanted."

TRANSFERRED to the Military Department, with a request that it may be stated whether any Non-Commissioned Officer can be sent from the "Queen's Own" Sappers and Miners for the purpose.

Ootacamund,
29th October 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From the Adjutant-General, dated 10th November 1880, No. 499.

With reference to a telegram from the Superintendent of Works, Rajahmundry, dated 26th October 1880, transferred to the Military Department under Public Works Department No. 601 of 26th ultimo, and referred to His Excellency the Commander-in-Chief under Government endorsement memorandum No. 6,887 of 30th idem, herewith returned as requested, I have the honor, by order, to state that there is no objection to the services of Corporal B. Fuller, R.E., being placed at the disposal of Government in the Public Works Department for employment at Rajahmundry.

ORDER.—The Adjutant-General's letter communicated to the Public Works Department.

(True Extract.)

(Signed) J. MICHAEL, Colonel,
Secretary to Government, Mily. Dept.

ORDER THEREON, No. 2,641 W., dated 18th November 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

2. It is requested that the services of Corporal Fuller may be made available as early as possible.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 30th November 1880, No. 2,674.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 4th November 1880, No. 2,254.

Report No. 6 on progress of work at Bhadrachalam coal fields from 16th to 31st October 1880.

SHAFT sunk from 50 feet to 55½ feet; sand stone passed through to 55 feet, then a layer of clay. Below this it has been impossible to go with the Abyssinian pump and the steam pump must be awaited.

* Arrived at Dowlaiswaram, 2nd Nov. 1880.
Despatched by steamer to Golagudiem, 4th November 1880.

Firewood is being collected for the engine.

The Corporal in charge of the party has been suffering from dysentery and fever, and it appears that without his personal presence on the work it does not go on properly; another Non-Commissioned Officer is therefore very necessary, especially as pumping will have to be kept up at night. The unhealthiness of the place at this time of the year and the possibility of accidents make it also highly advisable that a Dresser should be attached to the party. Telegram of 26th October asking for another Non-Commissioned Officer and a Dresser was therefore sent.

Telegram from the Secretary to Government, Public Works Department, Madras, to the Superintendent of Works, Godáviri, Rajahmundry, dated 16th November 1880.

"Does further experience show that a Dresser for the coal party is still essential?"

Telegram from Superintendent of Works, Godáviri, Rajahmundry, to the Secretary to Government, Public Works Department, Madras, dated 17th November 1880.

"HEALTH of coal party better, since rain stopped. May do without Dresser."

ORDER THEREON, No. 2,674 W., dated 30th November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd December 1880, No. 2,708.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 18th November 1880, No. 2,401.

Report No. 7 on progress of work at Bhadrachalam coal fields from 1st to 13th November 1880.

The steam pump arrived at Golagudiem on 6th, and since then the party have been fully occupied in taking it, and the engine to work it, to the shaft and setting it up; the Corporal in charge reports that "the work is proceeding in a satisfactory manner."

2. Lieutenant Gale, R.E., visited the party on the 6th and 7th, and the Corporal in charge reports that since that visit and the change of Havildars which was then made the detachment has been working better than it had been working for some time previously.

3. The health of the party is better than it was, and it is thought that now it may get on without a Dresser, though of course it would be safer to have one on the spot, and another Non-Commissioned Officer to assist Corporal Nicks is very necessary as mentioned in the last report.

ORDER THEREON, No. 2,780, dated 3rd December 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd December 1880, No. 2,934 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 2nd December 1880, No. 2,554.

Report No. 8 on the progress of work at the Bhadrachalam Coal-field.—13th to 30th November 1880.

THE party have been engaged in keeping water down in the shaft with the Abyssinian pump and setting up the steam-pump and its engine. No further sinking has been possible in the period under notice.

2. The Corporal in charge again reports, "there is a great deal of sickness among the detachment. Fever is very prevalent."

ORDER THEREON, No. 2,934 W., dated 22nd December 1880.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 10th January 1881, No. 38 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Wuddigudem, 16th December 1880, No. 2,751.

Report No. 9 on the progress of work at the Bhadrachalam Coal-field.—1st to 15th December 1880.

THE steam-pump was set to work on the 8th. There were then "18 feet of water in the shaft," and "it took 2 hours 35 minutes to pump dry;" owing, however, to extra framing, &c., being found necessary, actual work of excavation was not recommenced till 13th.

2. On the 15th the undersigned inspected the work. The shaft was down 56 feet, it was in good order and the pump going dead slow was keeping it clear of water.

A layer of clay (chiefly pipe-clay) had just been reached through which water was coming in freely.

The water has for some time past been sensibly affected by variations in the level of the river, which is now low, though not so low as it will be. It is impossible to say whether the one pump will be able to deal with the water which will be met with in the next 100 feet, and it will probably be advisable to have another ready; it could be driven by the same engine and driving machinery.

3. The huts were being moved up to near the shaft.
4. Ninety cubic yards of firewood for the engine have been cut.
5. The health of the party is not good, there are generally one-third or so of the sepoys down with fever, but it does not appear to be of a virulent type.
6. Corporal Fuller, R.E., has now (on 15th) joined the work.
7. No steamer will be able after this to get to Gollagudem, and probably not even to Wuddigudem till next June or July.

ORDER THEREON, No. 38 W., dated 10th January 1881.

THE Government consider that the additional pumping power referred to in paragraph 3 of the foregoing letter should be provided. The Superintendent of Works, Godáviri, will arrange accordingly.

2. The work being unhealthy should be pushed on as rapidly as possible.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 14th January 1881, No. 96 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 7th January 1881, No. 2,927.

Report No. 10 on the progress of works at the Bhadrachalam Coal-field.—16th to 31st December 1880.

- (1.) Shaft deepened by 8 feet to 64 feet.
- (2.) Soil passed through "different kinds of clay."
- (3.) Removal of huts to site of shaft finished.

ORDER THEREON, No. 96 W., dated 14th January 1881.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 25th January 1881, No. 195 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 10th January 1881, No. 2,966.

I HAVE the honor to send herewith a letter from Corporal Nicks, R.E., in charge of the coal operations near Bhadrachalam, reporting the inrush of a large volume of water into the shaft.

2. Till this occurred all seemed to be going on well, though slowly.

3. I have told Corporal Nicks to again rig up the Abyssinian pump and see if with it he cannot get the water down low enough to get at the steam-pump box and again set it going, and then if the two will keep the water down sufficiently low it is possible that by putting in specially prepared cylinders we may be able to get through the treacherous stratum which has led to the present mishap; but if water with our present appliances cannot be kept so low, another pump more powerful than the present one, with machinery and engine to drive it, must be sent up.

4. Such machinery and engine however could not be got to the place before the next season of freshes in the river, say next July, and should it be found quite impossible to deal with the water with the present appliances I would request instructions as to what in the interval is to be done with the Sapper coal party.

From Corporal F. NICKS, R.E., to the Superintendent of Works, Godávári, Dowlaishweram, dated Gollagudem, 5th January 1881, No. 118.

On Tuesday evening we were deep enough for 9th ring, and on Wednesday morning myself and Corporal Fuller started putting in same, as the soil was very treacherous it not being safe to trust sepoys; we had a slip of earth from the north side of shaft at about 11 A.M. We started then to plank that portion, as we had put in on (4) four plining (*sic*) planks and placed ring, we worked on and had placed four planks in the north quarter; we then noticed the water gradually rise, and the pump would not keep it down. I then sent Corporal Fuller up to ascertain if the engine was under proper steam, he informed me as he was coming down in bucket that steam gauge indicated 25 lb. ☐ As I was in the act of guiding the bucket down the water burst in from the south-west side, bringing with it a large quantity of "clay," about one-quarter yard, which knocked me down. Corporal Fuller said to me we had better take all tools up with us, but before he could get out of the bucket the water rose to my waist. I then said, never mind the tools we must get above the water in case the rings in upper work give way, as I had put my arm in where water was rushing from and found a large hole about 6 inches by 2 feet, so the clay could not be more than 1 foot 6 inches thick in front of the hole we had previously left, a berm of 6 inches in other work and considering this work was very dangerous we left a berm of 1 foot 3 inches.

We then cleared out of shaft as soon as possible with the water rising at the rate of 1 foot per minute, leaving all tools at bottom as we could not get at them for the water. I also kept engine at work till 10-25 P.M. making 25 strokes per minute, but the water still kept rising.

Rise of water	4-10 P.M.	No water more than ordinary.	5th January 1881.
Burst in at	4-15 P.M.		
7 feet	4-25 "		
21 feet 3 inches	5-50 "		
26 feet 8 inches	7-50 "		

Whilst taking measurement at 10 P.M. the pump gone out depth of water at the above time 29 feet 4 inches. I then gave orders to engine driver to draw fire, I then emptied boiler as I had been under steam near 400 hours.

At present we cannot get pump clear as working box is under water, the only remedy will be to get another set of top gear pipes and pump rods; if it is the Godávári which is broke in upon us, which I think it is, it will be useless. 11-30 P.M.

I took measurements at 11-35 and found 33 feet 4 inches and at 7 A.M., the 6th, and found 38 feet 8 inches.

Please give me further instruction in answer to this.

ORDER THEREON, No. 195 W., 25th January 1881.

THE Superintendent of Works, Godávári, has already been authorised* to arrange
* G.O., No. 38 W., dated 10th January 1881. for the provision of additional pumping power.

2. The Government await a further report before passing orders on the subject of paragraph 4 of the letter above read.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Yanam, 19th January 1881, No. 3,073.

In continuation of my No. 2,966, dated 10th instant, I have the honor to state that Corporal Nicks reports that in spite of all efforts it has been found impossible to raise the pump to get at the upper box and working barrel, and that at noon on the 6th the water had attained the "height of 40 feet" since which it has not varied.

2. It is evident, therefore, that another and more powerful pump must be provided if the work is to be persevered with.

Telegram to the Superintendent of Works, Godávári, Rajahmundry, dated 27th January 1881, No. 193.

MORE powerful pump for coal workings sanctioned. Arrange for one at once.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd February 1881, No. 308 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated 28th January 1881, No. 3,185.

Report No. 11 on the progress of work at the Bhadrachalam Coal-fields.—1st to 15th January 1881.

WORK progressed steadily till 5th, when the shaft was down 69 feet, water in large quantities then came in and overpowered the pump (see letters Nos. 2,966, 10th January 1881, and 3,073, 19th January 1881, to the Chief Engineer), and on the 15th there were 40 feet 4 inches depth of water in the shaft.

2. The Abyssinian pump which had been taken away and put on the barge was again taken to the shaft, and its placing commenced with the hope (a faint one) that with it the water can be so lowered that it may prove possible to get at the steam-pump boxes and set it going again. (See paragraph 3 of letter No. 2,966, 10th January 1881, to Chief Engineer.)

ORDER THEREON, No. 308 W., dated 3rd February 1881.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd February 1881, No. 493 W.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 31st January 1881, No. 3,225.

WITH reference to your telegram of 27th I have the honor to report that I have no means of here arranging for a more powerful pump for the coal shaft, and can only suggest that one may be supplied from the workshops at Madras or obtained from England.

2. Having had no experience in the work for which the pump is required, and having no one here who has had such experience, I cannot state with any certainty what is the nature and power of the pump required, and it seems therefore that it is best for me to explain the conditions of the case and from them possibly some Mining Engineer or manufacturer of mining machinery will be able to decide what is wanted. The conditions are these—

3. (a)—The shaft is 6 feet 3 inches diameter.
- (b)—It is sunk at about 1 mile from the edge of the Godávári.
- (c)—The strata already passed through (to 69 feet depth) have been almost entirely yellow sandstone, alternating with bands of yellowish and greyish clay, chiefly pipe-clay, and the boring shows that the general character of the strata to be yet passed through will be similar, but with fewer bands of clay, down to about 120 feet, when shale and coal will be met with.

(d)—Down to 55 feet there was but little water, but at that depth the Abyssinian pump could no longer deal with it, and the steam-pump sent up from the Madras Workshops was put up; whilst doing this (it occupied some days) the water rose 18 feet, this the pump when set to work cleared out in 2 hours 35 minutes.

(e)—This pump, driven by an old 8 horse-power engine, kept the water down easily enough till the shaft had reached a depth of 69 feet, when there

was a sudden inrush through a stratum of pipe-clay and the water rose 29 feet 4 inches in 5½ hours against the pump going 22 strokes a minute. The pump then got choked and the water rose another 10 feet 8 inches, that is 40 feet in all (or to 29 below top of shaft) in another 14 hours and at that level it has stood.

* For the first 7 feet came in at the rate of about 630 gallons a minute.

See copy of letter from Corporal Nicks, No. 118, 5th January 1881, herewith.

(f)—The shaft has to go down to a total depth of about 150 feet.

(g)—The river—the variations in level of which have been noted to affect the water in the shaft—rises in the season of floods (from June to October) from 15 feet to 20 feet or so above its present level, or approximately to from about 10 feet to 15 feet below level of top of shaft.

(h)—As most of the soil to be passed through is sandstone, much sharp sand comes up with the water, and it has been found to rapidly wear away any leather it comes in contact with, such as "buckets," valves, &c.

4. As already stated in my No. 2,966, 10th January 1881, paragraph 4, machinery or apparatus of any kind, weighing more than could be carried by two coolies, could not be got to the shaft till next July, because it could not be taken by water much if at all beyond Koide, some 34 miles below Gollagudem, and between the two places there is no road, only a jungle track, which in places passes over rocky slopes of hills.

P.S.—As all pumps occasionally get out of order and all engines require to be stopped now and then, it will be highly advisable, if not necessary, to have two pumps and two engines, and it is of course of great convenience that the working parts of the pump should be easily raised or got at.

From the same officer, dated 6th February 1881, No. 3,294.

Report No. 12 on the progress of work at the Bhadrachalam Coal-field.—16th to 31st January 1881.

The Abyssinian pump (see paragraph 2 of last report) was fully rigged up by 19th, and pumping then commenced with it; by 24th the water had been reduced 11 feet, or to 29 feet in depth, and then the working part of the steam-pump was got at.

2. The leather "buckets" which had worn out (they are constantly wearing out owing to the action of the gritty sand, see paragraph 3, (g.), No. 3,225, 31st January 1881), were renewed and the pump was started again on 25th; by the evening of 27th it had reduced the water by 8 feet, or to 21 feet, in depth, below which it could not reduce it, and the leathers having again worn out it had to be stopped for a time, when the water immediately rose against the Abyssinian pump to 30 feet 7 inches depth.

3. It is quite evident that with the present pumping power it will be impossible to recommence sinking operations.

4. There can be little doubt that the water in the shaft is in communication through some permeable stratum with the water in the river, and that enormously powerful machinery and a very great expenditure will be necessary to enable the shaft to be sunk to where it will reach the shale and inferior coal which borings and geological researches have established to exist in small quantities in the locality.

ORDER THEREON, No. 493 W., dated 22nd February 1881.

THE Right Honorable the Governor in Council considers that before any further expenditure is incurred the opinion of an expert in mining matters should be obtained. The Chief Engineer has, it is understood, written to Calcutta to inquire whether the services of any qualified person can be secured.

Meanwhile the work should be suspended.

2. Orders have already been issued to the Superintendent of Works, directing the Sappers to return to their Company.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 542 W.

Read the following paper :—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 11th February 1881, No. 3,370.

FURTHER information has shown me that I was wrong in supposing that when water burst into the coal shaft at Bhadrachalam it came in at the rate of "630 gallons a minute," as stated in the margin, paragraph 3, clause (e) of my No. 3,225, 31st January 1881; it came in at the rate approximately of 200 gallons a minute.

2. I would take this opportunity of asking for early orders on paragraph 4 of my No. 2,966, 10th January 1881.

ORDER THEREON, No. 541 W., dated 28th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 541 W.

Read the following paper :—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 17th February 1881, No. 3,463.

Report No. 13 on Bhadrachalam Coal-field work.—1st to 15th February 1881.

As stated in last report it is quite impossible to proceed with the work, and it therefore has been at a complete stand-still during the last fifteen days.

ORDER THEREON, No. 542 W., dated 28th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th March 1880, No. 698 W.

Read the following paper:—

MINUTE BY HIS GRACE THE GOVERNOR.

THE question of getting access to coal in this Presidency for railway and navigation purposes is a very important one.

2. That coal exists in the Nizam's territory, between the Godáviri and Kistna, is well ascertained, and the quality of that recently obtained and tried, although the results are not yet accurately calculated, show that the coal is of a good, useful description, and reported by the Public Works Workshops as quite equal to the ordinary Indian coal they have in use. It becomes a question of price.

3. Coal is wanted for railway and steam purposes at Madras, for the navigation of the Godáviri and at Cocanada, and will no doubt be also consumed on the canal.

4. It has been ascertained that coal exists on the Godáviri river on the British side, and some coal raised from the dry bed of the river has given "good results" in the Godáviri steamers. The quality of the coal, as tested by boring with small bores, is necessarily uncertain. Some is spoken of as fair, some as inferior; but it is close to the river, and the ground apparently not costly to sink in. If, as estimated by Mr. Vanstavern (who was especially employed upon the coal investigation), the coal seams can be reached by a shaft for an amount of under Rs. 2,000, it would be a matter to be tried at once without doubt; but I would put it higher, and taking the estimate above given, I would make allowance for pumping, ventilating and levelling, say that the trial should be considered as not to be effectually made under a possible Rs. 5,000; say at No. 16 bore, where the coal is within 150 feet from surface and about 18 feet thick, and the shaft only 1 mile from river, but above flood lines.

5. Coal in such a situation ought to be sufficient and economical for all purposes of steam engines on the river and delta and also at Cocanada, as its price must be low from the freight being entirely water and down-stream, so that an extra quantity might be used. How much further it could be carried can only be really known by actual test.

6. The opening of coal at this spot would doubtless stimulate the opening on the Nizam's side.

7. In ordinary times I should not hesitate to recommend the expenditure necessary to reach and test the coal seams, and even in the present times it seems to me desirable to do so. If the coal sufficed only for Godáviri use, the cost would not be wasted.

8. The opening of any coal operation would tend to develop and thus to pacify the country around.

9. The question to be decided then is—

Shall Government endeavour, at a cost which may reach Rs. 5,000, to open the coal already ascertained to exist?

10. If that be agreed then the Chief Engineer should suggest the arrangements, and the co-operation of Mr. Vanstavern should be secured, for his local knowledge and long experience of the district.

11. The working season is from now to June.

5th January 1880.

(Signed) BUCKINGHAM AND CHANDOS.

N.B.—The original maps, sections and memoranda should be returned to Mr. Vanstavern, as they are only lent. I could not trace the copies in Government possession—possibly lost.

ORDER THEREON, No. 698 W., dated 18th March 1880.

THE Revenue Department will arrange to place at the disposal of the Public Works Department the sum of Rs. 5,000 from the accumulated Cattle Trespass Fund for certain experiments on coal-boring operations in the Godávári district.

2. This amount will be recouped when necessary for the farm purposes later on.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

No. 859.

MEMORANDUM.

HIS GRACE the Governor in Council having decided to make an early commencement with sinking a shaft for working a coal seam, whose existence has been proved at a point midway between Bhadrachalam and Rékapalle on the left bank of the Godávári, the undersigned is desired to inquire whether His Excellency the Commander-in-Chief thinks that a party consisting of, say, two European Non-Commissioned Officers and a Havildar and Naigue with fourteen Sappers, who are acquainted with mining could conveniently be spared from the Companies of the "Queen's Own" Sappers and Miners which are now attached to the force under the command of Colonel Buck.

2. Their employment in sinking the shaft required might possibly extend to six months.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

15th March 1880.

To the Secretary to Government, Military Department.

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 20th March 1880, No. 213.

WITH reference to your docket memorandum, No. 1,771, dated 16th March 1880,

* Herewith returned.

I have the honor to inform you that the Officer Commanding, Sappers and Miners

at Dowlaishweram, has been directed to detach two British Non-Commissioned Officers with a Havildar and Naigue and fourteen Sappers for the purpose of sinking a shaft in the Godávári district.

2. It is of great importance that these men should not be exposed in tents during the hot season, and His Excellency trusts that Government will see the necessity of having thatched huts for the natives, and suitable erections for the shelter of the British Non-Commissioned Officers employed.

No. 1,964.

TRANSFERRED to the Public Works Department, with reference to its memorandum, No. 859, dated 15th March 1880.

(By Order.)

FORT ST. GEORGE, (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
25th March 1880. Acting Secretary to Govt., Mily. Dept.

No. 972.

MEMORANDUM.

THE Chief Engineer has the honor to forward, for the information of the Superintendent of Works, Godávári, a copy of a Minute by His Grace the Governor regarding coal-boring explorations on the British side of the Godávári river, with copies of the correspondence that has passed on the subject.

2. On receipt of an intimation from Mr. Vanstavern that he has no objection to the free use of the plans, &c., borings can be commenced. As it is understood that the working season will only last for about two months longer, every exertion should be made.

3. Meanwhile, in accordance with the wishes of His Excellency the Commander-in-Chief, proper shelter for the British Non-Commissioned Officers employed and thatched huts for the natives should at once be provided.

4. Mr. Walch's attention is invited to Lieutenant Baddeley's letter of the 15th March, in case the requisite machinery, &c., cannot be got from the Dowlaishweram shops.

(Signed) R. H. SANKEY, Col., R.E.,
Chief Engineer, P.W.D.

31st March 1880.

To the Superintendent of Works, Godávári.

Proceedings of the Madras Government, Public Works Department, dated 14th April 1880, No. 960 W.

Read the following paper :—

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 2nd April 1880, No. 250.

In continuation of Adjutant-General's letter, No. 213, dated 20th March 1880,

1 Havildar.
1 Naigue.
14 Privates.

I have the honor, by order, to state that the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram reports that the party, as

per margin, is in readiness to proceed under the orders of the Public Works Department.

2. There are no European Non-Commissioned Officers with the Detachment.

No. 2,117.

TRANSFERRED to the Public Works Department, in continuation of No. 1,964, dated 25th March 1880.

FORT ST. GEORGE, (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
3rd April 1880. Acting Secretary to Govt., Mily. Dept.

ORDER THEREON, No. 960 W., dated 14th April 1880.

COMMUNICATED to the Superintendent of Works, Godávári.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 21st April 1880, No. 996-A W.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 6th April 1880; No. 84.

I HAVE the honor to acknowledge the receipt of your memorandum No. 972, dated 31st ultimo.

One Indent in triplicate.

2. As you will have seen from my letter No. 701, dated 31st March 1880, and its enclosure, I have no officer or upper

subordinate whom I can send for the coal operations, and the Officer Commanding the Detachment of the "Queen's Own" Sappers and Miners here has no European Non-Commissioned Officer.

3. In paragraph 10 of the Minute by His Grace the Governor it is said that "the co-operation of Mr. Vanstavern should be secured," and it seems to me that it would be advisable, as he lives not far from where the operations are to be carried on and has had some experience in such work, to employ him on a salary to superintend the work, but I have no authority to open negotiations officially with him on the subject, or to make him any offer.

4. The steamers cannot now go up the river further than Koide (52 miles), and only boats of very small draft can get from there to where the operations are proposed, some 35 miles further.

5. There are no pumps here at all suited for deep shaft sinking, and I enclose an indent for such a pump and machinery to drive it, which, if approved, please send on to the Government workshops, Madras. If the pump be sent it should be accompanied by a Maistry who understands its working.

6. I think if you will consider all the circumstances of the case you will see that there is no probability of the work being done in the "two months" mentioned in paragraph 2 of your memorandum under notice.

From Lieutenant W. L. C. BADDELEY, R.E., General Superintendent of Public Works Workshops and Stores, Madras, to the Secretary to Government, Public Works Department, dated 15th March 1880.

We have two deep well pumps in store which would be suitable for working a shaft 80 feet in depth.

2. The five-inch lift pump which we made for the Ooregum Company is a good pattern for deep shafts, and we could make up these very soon if required.

3. One of the Workshop Maistries would be available to look after the pumping machinery, but there is no one here who understands anything about mining.

4. If Dowlaisheram cannot provide the engines, we can spare a 4 horse-power portable or any number of Gwynne's or Nasmyth's 4 and 6 horse-power engines and boilers combined. These also could be made fairly portable by fitting them on a stand with wheels.

5. We have no machinery for working or lifting coal, but probably there would be no difficulty in making up any ordinary appliances.

ORDER THEREON, No. 996-A W., dated 21st April 1880.

THE Superintendent of Works, Presidency, will at once direct the General Superintendent, Public Works Workshops, to despatch one of the deep well pumps mentioned by him as suitable for a shaft 80 feet deep to the Superintendent of Works, Godavari, along with one of the Workshop Maistries for looking after this and such other machinery as it may be found necessary to send for unwatering the coal shaft.

That officer should also be directed to place himself without delay in correspondence with the Superintendent of Works, Godavari, relative to any steam pumping or other machinery that may be deemed necessary for sinking the shaft below 80 feet.

2. The Superintendent of Works, Godavari Division, is authorised to make arrangements with Mr. Vanstavern for directing the operations, preferably fixing a definite sum on the shaft being sunk to the bottom of the seam indicated by the borings, and reporting the terms as soon as possible for the information of Government.

3. The original borings having been executed during the monsoon, His Grace in Council has no reason to suppose that the work need now be subjected to any delay

on account of the season, and as he attaches the greatest importance to the sinking of the shaft, no efforts should be spared to effect that object at the earliest date.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 27th April 1880, No. 1,035 W.

Proceedings of the Madras Government, Military Department, dated 14th April 1880, No. 2,404.

Read the following papers:—

Proceedings of the Madras Government, Public Works Department, dated 7th April 1880, No. 893 W.

Read letter from the Superintendent of Works, Godavari, dated 30th March 1880, No. 701.

I HAVE the honor to enclose copy of a letter received this day from the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaisheram, and to request instructions.

2. I would point out that the district is shorthanded, that just at this season there is a great amount of work in connection with the anicut and head works, canals, &c., which has to be compressed into a very short time; and I trust, therefore, that no one will have to be taken away from such work to carry out the "hutting," &c., referred to by Major Hamilton, and which it appears to me the men might carry out themselves.

3. I do not know where the Kottapalle referred to is.

From the Officer Commanding Detachment "Queen's Own" Sappers and Miners, to the Superintendent of Works, Godavari, dated 29th March 1880, No. 209.

With reference to letter, No. 822, dated 20th March, from the Adjutant-General (copy annexed for your information), I have the honor to report that the party, consisting of one Havildar, one Naigue and fourteen Privates, is in readiness to proceed up the river under your orders. There are no European Non-Commissioned Officers with this detachment.

2. I presume that you will supply all necessary tools.

3. The party will have to be huttet by the Public Works Department.

From the Officiating Adjutant-General, to the Officer Commanding "Queen's Own" Sappers and Miners, Dowlaisheram, dated 20th March 1880, No. 822.

At the request of Government in the Public Works Department the Commander-in-Chief has sanctioned the services of a party of two European Non-Commissioned Officers, a Havildar, Naigue and fourteen Sappers, who are acquainted with mining, from the companies attached to the force under Colonel Buck, for employment in sinking a shaft for working a coal seam between Bhadrachalam and Kottapalle on the left bank of the Godavari, and you are requested to detach the above party for this purpose.

UNDER the circumstances explained in Mr. Walch's letter, the detachment will provide hutting accommodation for themselves, the usual allowances being granted by the Military Department.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secretary to Govt., P.W.D.

To the Military Department.

ORDER,—Communicated to His Excellency the Commander-in-Chief.

2. Under O.G. (Military), No. 356, dated 30th January 1872, *all* special charges, including cost of hutting, incurred on account of Sappers employed on purely civil works, form a debit against the Public Works Department.

(True Extract.)

(Signed) H. N. D. PRENDERGAST, Col., R.E.,
Ag. Secretary to Government, Mily. Dept.

ORDER THEREON, No. 1,035 W., dated 27th April 1880.
COMMUNICATED to the Examiner of Public Works Accounts.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Military Department, dated 16th June 1880, No. 3,763.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri District, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 27th May 1880, No. 547.

I HAVE the honor to inform you that immediately on receipt of G.O., No. 996-AW., dated 21st April 1880, I put myself in communication with Mr. Vanstavern, and enclose copy of my last letter* to him to which I have received the enclosed reply, in which I am sorry to say he declines to undertake the superintendence of the coal shaft sinking for the reason which he states in a private letter.

That reason being that he thinks it probable that private affairs may render it necessary for him to leave the country before it would be possible to complete the shaft.

2. I am now at a loss to know how to carry out the wishes of Government as regards the speedy sinking of the shaft. An extra Overseer having come (see my No. 519, of 24th May 1880) I could send him, but he knows nothing of the kind of work, and it is doubtful if the working under him of the Sappers, whom it is proposed to send, would be smooth, and I would recommend that a Non-Commissioned Officer of the Sappers and Miners should be sent for the work.

3. Mr. Vanstavern states that, though borings could be got down during the rains and when the river was high, the difficulties and expense of sinking a shaft would, he is sure from a knowledge of the place, be much greater than in the dry season, as water would be met with at a much higher level and in much greater quantities.

No. 126.

REFERRED to the Military Department, with request that it may be ascertained if the services of any Non-Commissioned Officer of Sappers (European) acquainted with mining or shaft sinking can be placed at the disposal of this department for directing the operations as suggested by Mr. Walch. If such a Non-Commissioned Officer can be found, it is requested that he may be directed to proceed at once to the spot.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

5th June 1880.

From the Adjutant-General, No. 173, dated 14th June 1880.

In returning Military Department memorandum No. 3,561, of the 7th current, I have the honor, by order, to inform you that the services of Corporal Nicks of the

"Queen's Own" Sappers and Miners are available for the Godáviri coal shaft. He is stated to be zealous and by trade a "Fitter."

ORDER,—Ordered that the Adjutant-General's letter be communicated to the Public Works Department.

2. His Excellency the Commander-in-Chief is requested to cause Corporal Nicks to be detailed at once for the duty.

(True Extract.)

(Signed) J. MICHAEL, Col.,
Secy. to Govt., Mily. Dept.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 28th July 1880, No. 1,164.

WITH reference to our inspection of the proposed site for coal shaft on 22nd instant, I have the honor to forward tracing from plan of survey which I then ordered to be made.

2. I append the orders now issued to the Corporal in charge of the party with reference to this survey.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to Corporal F. NICKS, Golagudiem, dated 28th July 1880, No. 1,163.

WITH reference to the accompanying plan a report ought to have been sent stating whether there are any *indications* that point E., said to have been shown by villagers as site of bore-hole No. 16, is really the site.

2. If there be not any trustworthy indications that it really is so, the shaft is to be sunk at point A., or should that be in a local depression where trouble will be given by surface drainage, at some convenient point between it and D.

NOTE.

WITH reference to the annexed letter No. 1,164, of the 28th July 1880, from the Superintendent of Works, Godáviri, on the subject of the coal sinkings, I beg to offer the following brief remarks, having lately had the opportunity of inspecting the site of the operations in company with Mr. Martindale and Mr. Walch.

2. Leaving Dowlaishweram on morning of the 21st ultimo, Mr. Walch and I taking the new steam launch, *Arthur Cotton*, were enabled to pass very nearly through the Godáviri gorge before anchoring for the night, although the current was strong, 5.3 feet in depth, passing over the crest of the anicut.

3. Next morning picking up Mr. Martindale at Woodagudiem, we arrived at the site of the coal operations about noon, and spent some five or six hours in inspecting the locality and chiefly in endeavouring to find out the precise position of bore-hole No. 16, at which point, owing to the promising results of the previous borings, it had been decided to sink the shaft.

4. We found Corporal Nicks with his fourteen Sappers encamped at Golagudiem (*Golagaram* of the Indian Atlas), the party were well and sufficiently provided with shelter till the new shed 80 feet x 18 feet now sanctioned (and for which corrugated iron sheets have been brought down from the spare stores at Dumagudiem) has been run up, as it will be immediately.

5. In addition to an ample supply of tools of all kinds there was ready a pump which will, I hope, answer all purposes till a depth of 80 feet has been reached, when

one driven by steam now preparing at the Madras workshops will be sent up for unwatering the shaft at greater depths.

6. Twenty horizontal circular frames of angle iron, sufficient if spaced at 5 feet apart to reach to a depth of 100 feet, were also on the ground. If stiff soil or rock be met with, these may be spaced at greater intervals or omitted altogether and answer for 150 feet in depth, but in any case Mr. Walch can readily send up all that is needed in this respect from Dowlaisheram.

7. Mr. Martindale, who takes a kindly interest in the work, will see that the party have ample and good supplies, and if, as I hope, the men only keep their health, the work should progress favorably, though it is at the same time to be feared that, particularly at this season, water may be met with close to the surface, and difficulties on this account may delay operations.

8. Corporal Nicks had explored nearly all the area of previous operations, but had failed to discover the precise location of bore hole No. 16. Most of the sites of the other bore holes as pointed out by the villagers had been marked by a rough block of red sand stone, but in this particular case no indication could be found and it was thus fortunate that we were able to visit the place at this time.

9. From there not being a single definite point or bearing given on the survey whereby to recognise the old holes, and from these having been mere punctures and easily obliterated, it was necessary to fix the point in question by as many approximations as we could. The result is shown by the tracing now sent up by Mr. Walch. Our approximations led us to decide on the point A., and it would now appear from subsequent information received from the villagers (probably those of Totapilly, who we were informed had been engaged on this particular portion of the old work) that the point E. at no great distance from A. is the true point.

10. I feel assured that in no case will the point selected here be much out, though, of course, it would have been very much more satisfactory to find the exact locality.

Mr. Walch's present decision as conveyed to Corporal Nicks may therefore, I think, be safely accepted.

11. The whole country about is rather undulating, clayey, with bushy jungle here and there, and well raised above the river, but showing from the moisture which lodges in the lower portions, that at this season much water may have to be encountered in sinking the shaft.

12. It would, of course, be premature to say much about the results of these operations, but if Mr. Vanstavern (whom I met at Woodagudiem, but who owing to illness was unable to accompany me to the coal field) is to be credited, the coal is likely to turn out very shaley. The best specimen, he informed me, only yielded 30 per cent. of carbon, and the worst 9 per cent.

13. As regards the proper designation of this coal field, there is some doubt. Totapilly, by which it appears to have been first known, though shown on the atlas, is a very insignificant village and at a distance from our present workings. Tiperpenti (Tipurapentaneed of the tracing) is not shown on the atlas, and is also both insignificant and at some distance. If the field is to be called after any of the neighbouring villages, Golagudiem, where the camp is and which is both shown on the atlas and is on the river bank, would be the most appropriate designation.

14. But to the best of my judgment it would be preferable to call it the Bhadrachalam field, as it is sufficiently near to this, which is certainly the best known and most important place in the neighbourhood.

15. If the Government approve, therefore, I would in all future correspondence designate this the Bhadrachalam coal field.

16. The Superintendent of Works has orders to send up fortnightly progress reports of the work done.

9th August 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Chief Engineer, P.W.D.

No. 318.

MEMORANDUM.

THE accompanying note is forwarded to the Superintendent of Works, Godavari, for information.

2. The decision conveyed in his letter No. 1,164, of the 28th July 1880, with reference to the point at which the shaft is to be sunk is accepted.

3. Fortnightly progress reports should be continued in order that His Grace the Governor may be kept advised of the results.

4. This field will in future be designated the Bhadrachalam field in all official documents.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.
14th August 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaisheram, 18th August 1880, No. 1,336.

IN continuation of my letter No. 1,164, of the 28th July 1880, I have the honor to forward, herewith, an extract from letter No. 4, of the 5th August 1880, received from Corporal Nicks stating that he is fully convinced that bore hole No. 16 was at the point E. shown on the survey plan, of which copy was sent with my No. 1,164.

Extract of a letter from Corporal F. NICKS, R.E., in charge of Coal Shaft Sinking, to G. T. WALCH, Esq., Superintendent of Works, Godavari, dated 5th August 1880, No. 4.

WITH reference to your docket No. 1,163, dated 28th July 1880, regarding point E as shown by villagers, I am fully convinced it is the actual site of bore hole No. 16. In the first place I was taken to the spot E by two villagers who stated they were employed at the boring. I examined the surface soil and found indications that boring had been done there. I found two different soils, viz., light colored clay and sand stone in layers, the same as would come from an auger after boring.

2. On the 3rd instant I made inquiries at the village of Tipurapentaneed and found a man who was employed from the commencement to the finishing of the borings under Mr. Vanstavern; he also took me to the exact spot marked E as shown on plan and showed me the above soil as mentioned, and states that was what came up with the auger; he also pointed to a tree where they cooked their meals, which is only 10 yards from the spot. I intend to sink the shaft at the place pointed. I have already commenced getting stores on the spot to commence work.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 23rd August 1880, No. 1,434.

Report No. 1 on progress of work at Bhadrachalam coal fields to 14th August 1880.

THE sheds having been erected and necessary machinery moved up to site for shaft, actual sinking was commenced on 12th August, and up to 14th depth gone down to was 4 feet 6 inches.

No. 393, dated 3rd September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 3rd September 1880, No. 1,587.

Report No. 2 on progress of work at Bhadrachalam coal fields from 15th to 28th August 1880.

SHAFT sunk from 4 feet 6 inches to 15 feet; soil passed through chiefly "blue and yellow clay" with kunkur; sand stone just reached; some trouble given by water after heavy storms. Party apparently not working quite satisfactorily. Will be visited soon.

No. 450, dated 17th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 16th September 1880, No. 1,721.

Report No. 3 on progress of work at Bhadrachalam coal fields from 28th August to 15th September 1880.

SHAFT sunk from 15 to 34 feet; soil passed through chiefly yellow sand stone compact *in situ*, but breaking up easily when dug out. Pump arrangements fixed.

No. 490, dated 30th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 22nd September 1880, No. 1,722.

I HAVE the honor to inform you that I have on 15th, 20th and 21st instant inspected the work at the Bhadrachalam coal fields, and I find that, though going on slowly, it is being well done.

2. The shaft has now been sunk to a depth of 39 feet and water has just been reached.

3. The first 5 feet passed through was ordinary alluvial and vegetable soil; then came for 10 feet yellow clay, about the lower 5 feet of which was mixed with kunkur; then for 14 feet 6 inches yellow sand stone compact and hard *in situ*, but disintegrating when removed to the surface; and below this to the 39 feet depth a light blue clay chiefly "pipe clay" with at 38 feet a stratum of a few inches of sand stone.

4. Through this last thin stratum of sand stone water has commenced to come in slowly. At 4 P.M. on 20th I saw the bottom of the shaft practically cleared of water, and at 6 A.M. (21st) 1 foot 8 inches in depth had accumulated.

5. The Abyssinian pump sent from Madras has been fixed and works well, clearing such water as is now coming in with perfect ease.

6. The party is well housed and has kept in fair health. Corporal Nicks and some of the men have had rheumatism, one or two have had slight fever, and the Naigue who went up with the party has been sent back to Dowlaiswaram with bad ulcers on his feet, and he has been replaced by another man.

7. There have been no accidents, and I am quite satisfied with the care taken by Corporal Nicks, who is in immediate charge of the operations. I cannot say I am quite satisfied with the rate at which the work has been carried on, but native Sappers, it appears to me, do not generally work rapidly.

No. 506, dated 5th October 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 5th October 1880, No. 1,843.

Report No. 4 on progress of work at Bhadrachalam coal fields from 15th to 30th September 1880.

SHAFT sunk from 34 to 44 feet; soil passed through, sand stone, with layers of light blue clay, chiefly pipe clay; water coming in quickly. Pump, "Abyssinian," has now to be worked night and day.

2. The Corporal in charge reports that his detachment is working unsatisfactorily, and that "if the sepoys are required to work in the shaft or at the winch they report themselves sick."

3. It seems likely that these men are behaving as they are with the object of being sent back to their Company, which they think may soon be sent to Bangalore; it would, I think, be well to let them know for certain that they will not be sent away from the work till it is finished, and that if they are sick they will have to go into hospital at Rajahmundry and when discharged return to the work. Eight coolies are now employed to assist the detachment.

No. 2,331.

THE Chief Engineer concurs with the Superintendent of Works that it will be advisable to let the Sappers distinctly understand that they will not, by malingering, be enabled to desert the work which they have been sent up to carry out.

2. When sick they may be sent to the hospital at Rajahmundry as proposed.

(By Order.)

(Signed) J. PENNYCUICK, Major, R.E.,
Deputy Chief Engineer, P.W.D.
18th October 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Yernagudem, 20th October 1880, No. 2,006.

Report No. 5 on progress of work at Bhadrachalam coal fields from 1st to 15th October 1880.

SHAFT sunk from 44 to 50 feet; soil passed through, sand stone, said to be hard, with thin layers of clay.

2. Slow progress due to large quantities of water to be dealt with, and the Corporal reports that the Abyssinian pump can no longer keep the water down, and no further sinking can go on till the steam pump is at work. This is expected daily.

No. 2,422, dated 2nd November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th November 1880, No. 2,641 W.

Proceedings of the Madras Government, Military Department, dated 13th November 1880, No. 7,102.

Telegram from the Superintendent of Works, Godáviri, to the Public Works Department, Madras, dated 26th October 1880.

"Another Non-Commissioned Officer to help Corporal Nicks, often ill, and Dresser for coal party much wanted."

TRANSFERRED to the Military Department, with a request that it may be stated whether any Non-Commissioned Officer can be sent from the "Queen's Own" Sappers and Miners for the purpose.

OOTACAMUND, (Signed) R. H. SANKEY, Colonel, R.E.,
29th October 1880. Secretary to Government, P.W.D.

From the Adjutant-General, dated 10th November 1880, No. 499.

With reference to a telegram from the Superintendent of Works, Rajahmundry, dated 26th October 1880, transferred to the Military Department under Public Works Department No. 601 of 26th ultimo, and referred to His Excellency the Commander-in-Chief under Government endorsement memorandum No. 6,887 of 30th idem, herewith returned as requested, I have the honor, by order, to state that there is no objection to the services of Corporal B. Fuller, R.E., being placed at the disposal of Government in the Public Works Department for employment at Rajahmundry.

ORDER.—The Adjutant-General's letter communicated to the Public Works Department.

(True Extract.)

(Signed) J. MICHAEL, Colonel,
Secretary to Government, Mily. Dept.

ORDER THEREON, No. 2,641 W., dated 18th November 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

2. It is requested that the services of Corporal Fuller may be made available as early as possible.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 30th November 1880, No. 2,674.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 4th November 1880, No. 2,254.

Report No. 6 on progress of work at Bhadrachalam coal fields from 16th to 31st October 1880.

SHAFT sunk from 50 feet to 55½ feet; sand stone passed through to 55 feet, then a layer of clay. Below this it has been impossible to go with the Abyssinian pump and the steam* pump must be awaited.
* Arrived at Dowlaishweram, 2nd Nov. 1880.
Despatched by steamer to Golagudiem, 4th November 1880.

Firewood is being collected for the engine.

The Corporal in charge of the party has been suffering from dysentery and fever, and it appears that without his personal presence on the work it does not go on properly; another Non-Commissioned Officer is therefore very necessary, especially as pumping will have to be kept up at night. The unhealthiness of the place at this time of the year and the possibility of accidents make it also highly advisable that a Dresser should be attached to the party. Telegram of 26th October asking for another Non-Commissioned Officer and a Dresser was therefore sent.

Telegram from the Secretary to Government, Public Works Department, Madras, to the Superintendent of Works, Godáviri, Rajahmundry, dated 16th November 1880.

"Does further experience show that a Dresser for the coal party is still essential."

Telegram from Superintendent of Works, Godáviri, Rajahmundry, to the Secretary to Government, Public Works Department, Madras, dated 17th November 1880.

"HEALTH of coal party better, since rain stopped. May do without Dresser."

ORDER THEREON, No. 2,674 W., dated 30th November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd December 1880, No. 2,708.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 18th November 1880, No. 2,401.

Report No. 7 on progress of work at Bhadrachalam coal fields from 1st to 13th November 1880.

THE steam pump arrived at Golagudiem on 6th, and since then the party have been fully occupied in taking it, and the engine to work it, to the shaft and setting it up; the Corporal in charge reports that "the work is proceeding in a satisfactory manner."

2. Lieutenant Gale, R.E., visited the party on the 6th and 7th, and the Corporal in charge reports that since that visit and the change of Havildars which was then made the detachment has been working better than it had been working for some time previously.

3. The health of the party is better than it was, and it is thought that now it may get on without a Dresser, though of course it would be safer to have one on the spot, and another Non-Commissioned Officer to assist Corporal Nicks is very necessary as mentioned in the last report.

ORDER THEREON, No. 2,780, dated 3rd December 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd December 1880, No. 2,934 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 2nd December 1880, No. 2,554.

Report No. 8 on the progress of work at the Bhadrachalam Coal-field.—13th to 30th November 1880.

THE party have been engaged in keeping water down in the shaft with the Abyssinian pump and setting up the steam-pump and its engine.

No further sinking has been possible in the period under notice.

2. The Corporal in charge again reports, "there is a great deal of sickness among the detachment. Fever is very prevalent."

ORDER THEREON, No. 2,934 W., dated 22nd December 1880.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 10th January 1881, No. 38 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Wuddigudem, 16th December 1880, No. 2,751.

Report No. 9 on the progress of work at the Bhadrachalam Coal-field.—1st to 15th December 1880.

THE steam-pump was set to work on the 8th. There were then "18 feet of water in the shaft," and "it took 2 hours 35 minutes to pump dry;" owing, however, to extra framing, &c., being found necessary, actual work of excavation was not recommenced till 13th.

2. On the 15th the undersigned inspected the work. The shaft was down 56 feet, it was in good order and the pump going dead slow was keeping it clear of water.

A layer of clay (chiefly pipe-clay) had just been reached through which water was coming in freely.

The water has for some time past been sensibly affected by variations in the level of the river, which is now low, though not so low as it will be. It is impossible to say whether the one pump will be able to deal with the water which will be met with in the next 100 feet, and it will probably be advisable to have another ready; it could be driven by the same engine and driving machinery.

3. The huts were being moved up to near the shaft.

4. Ninety cubic yards of firewood for the engine have been cut.

5. The health of the party is not good, there are generally one-third or so of the sepoys down with fever, but it does not appear to be of a virulent type.

6. Corporal Fuller, R.E., has now (on 15th) joined the work.

7. No steamer will be able after this to get to Gollagudem, and probably not even to Wuddigudem till next June or July.

ORDER THEREON, No. 38 W., dated 10th January 1881.

THE Government consider that the additional pumping power referred to in paragraph 3 of the foregoing letter should be provided. The Superintendent of Works, Godáviri, will arrange accordingly.

2. The work being unhealthy should be pushed on as rapidly as possible.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 14th January 1881, No. 96 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaisweram, 7th January 1881, No. 2,927.

Report No. 10 on the progress of works at the Bhadrachalam Coal-field.—16th to 31st December 1880.

(1.) Shaft deepened by 8 feet to 64 feet.

(2.) Soil passed through "different kinds of clay."

(3.) Removal of huts to site of shaft finished.

ORDER THEREON, No. 96 W., dated 14th January 1881.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 25th January 1881, No. 195 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaisweram, 10th January 1881, No. 2,966.

I HAVE the honor to send herewith a letter from Corporal Nicks, R.E., in charge of the coal operations near Bhadrachalam, reporting the inrush of a large volume of water into the shaft.

2. Till this occurred all seemed to be going on well, though slowly.

3. I have told Corporal Nicks to again rig up the Abyssinian pump and see if with it he cannot get the water down low enough to get at the steam-pump box and again set it going, and then if the two will keep the water down sufficiently low it is possible that by putting in specially prepared cylinders we may be able to get through the treacherous stratum which has led to the present mishap; but if water with our present appliances cannot be kept so low, another pump more powerful than the present one, with machinery and engine to drive it, must be sent up.

4. Such machinery and engine however could not be got to the place before the next season of freshes in the river, say next July, and should it be found quite impossible to deal with the water with the present appliances I would request instructions as to what in the interval is to be done with the Sapper coal party.

From Corporal F. NICKS, R.E., to the Superintendent of Works, Godávári, Dowlaiswaram, dated Gollagudem, 5th January 1881, No. 118.

On Tuesday evening we were deep enough for 9th ring, and on Wednesday morning myself and Corporal Fuller started putting in same, as the soil was very treacherous it not being safe to trust sepoys; we had a slip of earth from the north side of shaft at about 11 A.M. We started then to plank that portion, as we had put in on (4) four plining (sic) planks and placed ring, we worked on and had placed four planks in the north quarter; we then noticed the water gradually rise, and the pump would not keep it down. I then sent Corporal Fuller up to ascertain if the engine was under proper steam, he informed me as he was coming down in bucket that steam gauge indicated 25 lb. □ As I was in the act of guiding the bucket down the water burst in from the south-west side, bringing with it a large quantity of "clay," about one-quarter yard, which knocked me down. Corporal Fuller said to me we had better take all tools up with us, but before he could get out of the bucket the water rose to my waist. I then said, never mind the tools we must get above the water in case the rings in upper work give way, as I had put my arm in where water was rushing from and found a large hole about 6 inches by 2 feet, so the clay could not be more than 1 foot 6 inches thick in front of the hole we had previously left, a berm of 6 inches in other work and considering this work was very dangerous we left a berm of 1 foot 3 inches.

We then cleared out of shaft as soon as possible with the water rising at the rate of 1 foot per minute, leaving all tools at bottom as we could not get at them for the water. I also kept engine at work till 10-25 P.M. making 25 strokes per minute, but the water still kept rising.

Rise of water	4-10 P.M.	No water more than ordinary.	5th January 1881.
Burst in at	4-15 P.M.		
7 feet	4-25 "		
21 feet 3 inches	5-50 "		
26 feet 8 inches	7-50 "		

Whilst taking measurement at 10 P.M. the pump gone out depth of water at the above time 29 feet 4 inches. I then gave orders to engine driver to draw fire, I then emptied boiler as I had been under steam near 400 hours.

At present we cannot get pump clear as working box is under water, the only remedy will be to get another set of top gear pipes and pump rods; if it is the Godávári which is broke in upon us, which I think it is, it will be useless. 11-30 P.M.

I took measurements at 11-35 and found 33 feet 4 inches and at 7 A.M., the 6th, and found 38 feet 8 inches.

Please give me further instruction in answer to this.

ORDER THEREON, No. 195 W., 25th January 1881.

THE Superintendent of Works, Godávári, has already been authorised* to arrange • G.O., No. 38 W., dated 10th January 1881. for the provision of additional pumping power.

2. The Government await a further report before passing orders on the subject of paragraph 4 of the letter above read.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Yanam, 19th January 1881, No. 3,073.

In continuation of my No. 2,966, dated 10th instant, I have the honor to state that Corporal Nicks reports that in spite of all efforts it has been found impossible to raise the pump to get at the upper box and working barrel, and that at noon on the 6th the water had attained the "height of 40 feet" since which it has not varied.

2. It is evident, therefore, that another and more powerful pump must be provided if the work is to be persevered with.

Telegram to the Superintendent of Works, Godávári, Rajahmundry, dated 27th January 1881, No. 193.

MORE powerful pump for coal workings sanctioned. Arrange for one at once.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd February 1881, No. 308 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated 28th January 1881, No. 3,185.

Report No. 11 on the progress of work at the Bhadrachalam Coal-fields.—1st to 15th January 1881.

WORK progressed steadily till 5th, when the shaft was down 69 feet, water in large quantities then came in and overpowered the pump (see letters Nos. 2,966, 10th January 1881, and 3,073, 19th January 1881, to the Chief Engineer), and on the 15th there were 40 feet 4 inches depth of water in the shaft.

2. The Abyssinian pump which had been taken away and put on the barge was again taken to the shaft, and its placing commenced with the hope (a faint one) that with it the water can be so lowered that it may prove possible to get at the steam-pump boxes and set it going again. (See paragraph 3 of letter No. 2,966, 10th January 1881, to Chief Engineer.)

ORDER THEREON, No. 308 W., dated 3rd February 1881.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd February 1881, No. 493 W.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 31st January 1881, No. 3,225.

WITH reference to your telegram of 27th I have the honor to report that I have no means of here arranging for a more powerful pump for the coal shaft, and can only suggest that one may be supplied from the workshops at Madras or obtained from England.

2. Having had no experience in the work for which the pump is required, and having no one here who has had such experience, I cannot state with any certainty what is the nature and power of the pump required, and it seems therefore that it is best for me to explain the conditions of the case and from them possibly some Mining Engineer or manufacturer of mining machinery will be able to decide what is wanted. The conditions are these—

3. (a)—The shaft is 6 feet 3 inches diameter.
- (b)—It is sunk at about 1 mile from the edge of the Godávári.
- (c)—The substrata already passed through (to 69 feet depth) have been almost entirely yellow sandstone, alternating with bands of yellowish and greyish clay, chiefly pipe-clay, and the boring shows that the general character of the strata to be yet passed through will be similar, but with fewer bands of clay, down to about 120 feet, when shale and coal will be met with.

(d)—Down to 55 feet there was but little water, but at that depth the Abyssinian pump could no longer deal with it, and the steam-pump sent up from the Madras Workshops was put up; whilst doing this (it occupied some days) the water rose 18 feet, this the pump when set to work cleared out in 2 hours 35 minutes.

(e)—This pump, driven by an old 8 horse-power engine, kept the water down easily enough till the shaft had reached a depth of 69 feet, when there

* For the first 7 feet came in at the rate of a stratum of pipe-clay and the water rose 29 feet 4 inches in 5½ hours against the pump going 22 strokes a minute. The

See copy of letter from Corporal Nicka, No. 118, 5th January 1881, herewith. The pump then got choked and the water rose another 10 feet 8 inches, that is 40 feet

in all (or to 29 below top of shaft) in another 14 hours and at that level it has stood.

(f)—The shaft has to go down to a total depth of about 150 feet.

(g)—The river—the variations in level of which have been noted to affect the water in the shaft—rises in the season of floods (from June to October) from 15 feet to 20 feet or so above its present level, or approximately to from about 10 feet to 15 feet below level of top of shaft.

(h)—As most of the soil to be passed through is sandstone, much sharp sand comes up with the water, and it has been found to rapidly wear away any leather it comes in contact with, such as "buckets," valves, &c.

4. As already stated in my No. 2,966, 10th January 1881, paragraph 4, machinery or apparatus of any kind, weighing more than could be carried by two coolies, could not be got to the shaft till next July, because it could not be taken by water much if at all beyond Koide, some 34 miles below Gollagudem, and between the two places there is no road, only a jungle track, which in places passes over rocky slopes of hills.

P.S.—As all pumps occasionally get out of order and all engines require to be stopped now and then, it will be highly advisable, if not necessary, to have two pumps and two engines, and it is of course of great convenience that the working parts of the pump should be easily raised or got at.

From the same officer, dated 6th February 1881, No. 3,294.

Report No. 12 on the progress of work at the Bhadrachalam Coal-field.—16th to 31st January 1881.

The Abyssinian pump (see paragraph 2 of last report) was fully rigged up by 19th, and pumping then commenced with it; by 24th the water had been reduced 11 feet, or to 29 feet in depth, and then the working part of the steam-pump was got at.

2. The leather "buckets" which had worn out (they are constantly wearing out owing to the action of the gritty sand, see paragraph 3, (g.), No. 3,225, 31st January 1881), were renewed and the pump was started again on 25th; by the evening of 27th it had reduced the water by 8 feet, or to 21 feet, in depth, below which it could not reduce it, and the leathers having again worn out it had to be stopped for a time, when the water immediately rose against the Abyssinian pump to 30 feet 7 inches depth.

3. It is quite evident that with the present pumping power it will be impossible to recommence sinking operations.

4. There can be little doubt that the water in the shaft is in communication through some permeable stratum with the water in the river, and that enormously powerful machinery and a very great expenditure will be necessary to enable the shaft to be sunk to where it will reach the shale and inferior coal which borings and geological researches have established to exist in small quantities in the locality.

ORDER THEREON, No. 493 W., dated 22nd February 1881.

THE Right Honorable the Governor in Council considers that before any further expenditure is incurred the opinion of an expert in mining matters should be obtained. The Chief Engineer has, it is understood, written to Calcutta to inquire whether the services of any qualified person can be secured.

Meanwhile the work should be suspended.

2. Orders have already been issued to the Superintendent of Works, directing the Sappers to return to their Company.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 542 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 11th February 1881, No. 3,370.

FURTHER information has shown me that I was wrong in supposing that when water burst into the coal shaft at Bhadrachalam it came in at the rate of "630 gallons a minute," as stated in the margin, paragraph 3, clause (e) of my No. 3,225, 31st January 1881; it came in at the rate approximately of 200 gallons a minute.

2. I would take this opportunity of asking for early orders on paragraph 4 of my No. 2,966, 10th January 1881.

ORDER THEREON, No. 541 W., dated 28th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 541 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 17th February 1881, No. 3,463.

Report No. 13 on Bhadrachalam Coal-field work.—1st to 15th February 1881.

As stated in last report it is quite impossible to proceed with the work, and it therefore has been at a complete stand-still during the last fifteen days.

ORDER THEREON, No. 542 W., dated 28th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th March 1880, No. 698 W.

Read the following paper:—

MINUTE BY HIS GRACE THE GOVERNOR.

THE question of getting access to coal in this Presidency for railway and navigation purposes is a very important one.

2. That coal exists in the Nizam's territory, between the Godáviri and Kistna, is well ascertained, and the quality of that recently obtained and tried, although the results are not yet accurately calculated, show that the coal is of a good, useful description, and reported by the Public Works Workshops as quite equal to the ordinary Indian coal they have in use. It becomes a question of price.

3. Coal is wanted for railway and steam purposes at Madras, for the navigation of the Godáviri and at Cocanada, and will no doubt be also consumed on the canal.

4. It has been ascertained that coal exists on the Godáviri river on the British side, and some coal raised from the dry bed See Map. About one-third of the distance of the river has given "good results" in between Bhadrachalam and Rékapalle. the Godáviri steamers. The quality of the coal, as tested by boring with small bores, is necessarily uncertain. Some is spoken of as fair, some as inferior; but it is close to the river, and the ground apparently not costly to sink in. If, as estimated by Mr. Vanstavern (who was especially employed upon the coal investigation), the coal seams can be reached by a shaft for an amount of under Rs. 2,000, it would be a matter to be tried at once without doubt; but I would put it higher, and taking the estimate above given, I would make allowance for pumping, ventilating and levelling, say that the trial should be considered as not to be effectually made under a possible Rs. 5,000; say at No. 16 bore, where the coal is within 150 feet from surface and about 18 feet thick, and the shaft only 1 mile from river, but above flood lines.

5. Coal in such a situation ought to be sufficient and economical for all purposes of steam engines on the river and delta and also at Cocanada, as its price must be low from the freight being entirely water and down-stream, so that an extra quantity might be used. How much further it could be carried can only be really known by actual test.

6. The opening of coal at this spot would doubtless stimulate the opening on the Nizam's side.

7. In ordinary times I should not hesitate to recommend the expenditure necessary to reach and test the coal seams, and even in the present times it seems to me desirable to do so. If the coal sufficed only for Godáviri use, the cost would not be wasted.

8. The opening of any coal operation would tend to develope and thus to pacify the country around.

9. The question to be decided then is—

Shall Government endeavour, at a cost which may reach Rs. 5,000, to open the coal already ascertained to exist?

10. If that be agreed then the Chief Engineer should suggest the arrangements, and the co-operation of Mr. Vanstavern should be secured, for his local knowledge and long experience of the district.

11. The working season is from now to June.

5th January 1880.

(Signed) BUCKINGHAM AND CHANDOS.

N.B.—The original maps, sections and memoranda should be returned to Mr. Vanstavern, as they are only lent. I could not trace the copies in Government possession—possibly lost.

ORDER THEREON, No. 698 W., dated 18th March 1880.

THE Revenue Department will arrange to place at the disposal of the Public Works Department the sum of Rs. 5,000 from the accumulated Cattle Trespass Fund for certain experiments on coal-boring operations in the Godáviri district.

2. This amount will be recouped when necessary for the farm purposes later on.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

No. 859.

MEMORANDUM.

HIS GRACE the Governor in Council having decided to make an early commencement with sinking a shaft for working a coal seam, whose existence has been proved at a point midway between Bhadrachalam and Rékapalle on the left bank of the Godáviri, the undersigned is desired to inquire whether His Excellency the Commander-in-Chief thinks that a party consisting of, say, two European Non-Commissioned Officers and a Havildar and Naigue with fourteen Sappers, who are acquainted with mining could conveniently be spared from the Companies of the "Queen's Own" Sappers and Miners which are now attached to the force under the command of Colonel Buck.

2. Their employment in sinking the shaft required might possibly extend to six months.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

15th March 1880.

To the Secretary to Government, Military Department.

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 20th March 1880, No. 213.

WITH reference to your docket memorandum, * No. 1,771, dated 16th March 1880,

* Herewith returned.

I have the honor to inform you that the Officer Commanding, Sappers and Miners

at Dowlaishweram, has been directed to detach two British Non-Commissioned Officers with a Havildar and Naigue and fourteen Sappers for the purpose of sinking a shaft in the Godáviri district.

2. It is of great importance that these men should not be exposed in tents during the hot season, and His Excellency trusts that Government will see the necessity of having thatched huts for the natives, and suitable erections for the shelter of the British Non-Commissioned Officers employed.

No. 1,964.

TRANSFERRED to the Public Works Department, with reference to its memorandum, No. 859, dated 15th March 1880.

(By Order.)

FORT ST. GEORGE, (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
25th March 1880. Acting Secretary to Govt., Mily. Dept.

No. 972.

MEMORANDUM.

THE Chief Engineer has the honor to forward, for the information of the Superintendent of Works, Godáviri, a copy of a Minute by His Grace the Governor regarding coal-boring explorations on the British side of the Godáviri river, with copies of the correspondence that has passed on the subject.

2. On receipt of an intimation from Mr. Vanstavern that he has no objection to the free use of the plans, &c., borings can be commenced. As it is understood that the working season will only last for about two months longer, every exertion should be made.

3. Meanwhile, in accordance with the wishes of His Excellency the Commander-in-Chief, proper shelter for the British Non-Commissioned Officers employed and thatched huts for the natives should at once be provided.

4. Mr. Walch's attention is invited to Lieutenant Baddeley's letter of the 15th March, in case the requisite machinery, &c., cannot be got from the Dowlaishweram shops.

(Signed) R. H. SANKEY, Col., R.E.,
Chief Engineer, P.W.D.

31st March 1880.

To the Superintendent of Works, Godáviri.

Proceedings of the Madras Government, Public Works Department, dated 14th April 1880, No. 960 W.

Read the following paper :—

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 2nd April 1880, No. 250.

IN continuation of Adjutant-General's letter, No. 213, dated 20th March 1880,

1 Havildar.
1 Naigue.
14 Privates.

I have the honor, by order, to state that the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram reports that the party, as

per margin, is in readiness to proceed under the orders of the Public Works Department.

2. There are no European Non-Commissioned Officers with the Detachment.

No. 2,117.

TRANSFERRED to the Public Works Department, in continuation of No. 1,964, dated 25th March 1880.

FORT ST. GEORGE, (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
3rd April 1880. Acting Secretary to Govt., Mily. Dept.

ORDER THEREON, No. 960 W., dated 14th April 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 21st April 1880, No. 996-A W.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 6th April 1880, No. 84.

I HAVE the honor to acknowledge the receipt of your memorandum No. 972, dated 31st ultimo.

One Indent in triplicate.

2. As you will have seen from my letter No. 701, dated 31st March 1880, and its enclosure, I have no officer or upper

subordinate whom I can send for the coal operations, and the Officer Commanding the Detachment of the "Queen's Own" Sappers and Miners here has no European Non-Commissioned Officer.

3. In paragraph 10 of the Minute by His Grace the Governor it is said that "the co-operation of Mr. Vanstavern should be secured," and it seems to me that it would be advisable, as he lives not far from where the operations are to be carried on and has had some experience in such work, to employ him on a salary to superintend the work, but I have no authority to open negotiations officially with him on the subject, or to make him any offer.

4. The steamers cannot now go up the river further than Koide (52 miles), and only boats of very small draft can get from there to where the operations are proposed, some 35 miles further.

5. There are no pumps here at all suited for deep shaft sinking, and I enclose an indent for such a pump and machinery to drive it, which, if approved, please send on to the Government workshops, Madras. If the pump be sent it should be accompanied by a Maistry who understands its working.

6. I think if you will consider all the circumstances of the case you will see that there is no probability of the work being done in the "two months" mentioned in paragraph 2 of your memorandum under notice.

From Lieutenant W. L. C. BADDELEY, R.E., General Superintendent of Public Works Workshops and Stores, Madras, to the Secretary to Government, Public Works Department, dated 15th March 1880.

We have two deep well pumps in store which would be suitable for working a shaft 80 feet in depth.

2. The five-inch lift pump which we made for the Ooregum Company is a good pattern for deep shafts, and we could make up these very soon if required.

3. One of the Workshop Maistries would be available to look after the pumping machinery, but there is no one here who understands anything about mining.

4. If Dowlaishweram cannot provide the engines, we can spare a 4 horse-power portable or any number of Gwynne's or Nasmyth's 4 and 6 horse-power engines and boilers combined. These also could be made fairly portable by fitting them on a stand with wheels.

5. We have no machinery for working or lifting coal, but probably there would be no difficulty in making up any ordinary appliances.

ORDER THEREON, No. 996-A W., dated 21st April 1880.

THE Superintendent of Works, Presidency, will at once direct the General Superintendent, Public Works Workshops, to despatch one of the deep well pumps mentioned by him as suitable for a shaft 80 feet deep to the Superintendent of Works, Godáviri, along with one of the Workshop Maistries for looking after this and such other machinery as it may be found necessary to send for unwatering the coal shaft.

That officer should also be directed to place himself without delay in correspondence with the Superintendent of Works, Godáviri, relative to any steam pumping or other machinery that may be deemed necessary for sinking the shaft below 80 feet.

2. The Superintendent of Works, Godáviri Division, is authorised to make arrangements with Mr. Vanstavern for directing the operations, preferably fixing a definite sum on the shaft being sunk to the bottom of the seam indicated by the borings, and reporting the terms as soon as possible for the information of Government.

3. The original borings having been executed during the monsoon, His Grace in Council has no reason to suppose that the work need now be subjected to any delay

on account of the season, and as he attaches the greatest importance to the sinking of the shaft, no efforts should be spared to effect that object at the earliest date.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 27th April 1880, No. 1,035 W.

Proceedings of the Madras Government, Military Department, dated 14th April 1880, No. 2,404.

Read the following papers:—

Proceedings of the Madras Government, Public Works Department, dated 7th April 1880, No. 893 W.

Read letter from the Superintendent of Works, Godáviri, dated 30th March 1880, No. 701.

I HAVE the honor to enclose copy of a letter received this day from the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram, and to request instructions.

2. I would point out that the district is shorthanded, that just at this season there is a great amount of work in connection with the anicut and head works, canals, &c., which has to be compressed into a very short time; and I trust, therefore, that no one will have to be taken away from such work to carry out the "hutting," &c., referred to by Major Hamilton, and which it appears to me the men might carry out themselves.

3. I do not know where the Kottapalle referred to is.

From the Officer Commanding Detachment "Queen's Own" Sappers and Miners, to the Superintendent of Works, Godáviri, dated 29th March 1880, No. 209.

WITH reference to letter, No. 822, dated 20th March, from the Adjutant-General (copy annexed for your information), I have the honor to report that the party, consisting of one Havildar, one Naigue and fourteen Privates, is in readiness to proceed up the river under your orders. There are no European Non-Commissioned Officers with this detachment.

2. I presume that you will supply all necessary tools.

3. The party will have to be hutted by the Public Works Department.

From the Officiating Adjutant-General, to the Officer Commanding "Queen's Own" Sappers and Miners, Dowlaishweram, dated 20th March 1880, No. 822.

At the request of Government in the Public Works Department the Commander-in-Chief has sanctioned the services of a party of two European Non-Commissioned Officers, a Havildar, Naigue and fourteen Sappers, who are acquainted with mining, from the companies attached to the force under Colonel Buck, for employment in sinking a shaft for working a coal seam between Bhadrachalam and Kottapalle on the left bank of the Godáviri, and you are requested to detach the above party for this purpose.

UNDER the circumstances explained in Mr. Walch's letter, the detachment will provide hutting accommodation for themselves, the usual allowances being granted by the Military Department.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secretary to Govt., P.W.D.

To the Military Department.

ORDER,—Communicated to His Excellency the Commander-in-Chief.

2. Under O.G. (Military), No. 356, dated 30th January 1872, *all* special charges, including cost of hutting, incurred on account of Sappers employed on purely civil works, form a debit against the Public Works Department.

(True Extract.)

(Signed) H. N. D. PRENDERGAST, Col., R.E.,
Ag. Secretary to Government, Mily. Dept.

ORDER THEREON, No. 1,035 W., dated 27th April 1880.
COMMUNICATED to the Examiner of Public Works Accounts.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Military Department, dated 16th June 1880, No. 3,763.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri District, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 27th May 1880, No. 547.

I HAVE the honor to inform you that immediately on receipt of G.O., No. 996-AW., dated 21st April 1880, I put myself in communication with Mr. Vanstavern, and enclose copy of my last letter* to him to which I have received the enclosed reply, in which I am sorry to say he declines to undertake the superintendence of the coal shaft sinking for the reason which he states in a private letter.

That reason being that he thinks it probable that private affairs may render it necessary for him to leave the country before it would be possible to complete the shaft.

2. I am now at a loss to know how to carry out the wishes of Government as regards the speedy sinking of the shaft. An extra Overseer having come (see my No. 519, of 24th May 1880) I could send him, but he knows nothing of the kind of work, and it is doubtful if the working under him of the Sappers, whom it is proposed to send, would be smooth, and I would recommend that a Non-Commissioned Officer of the Sappers and Miners should be sent for the work.

3. Mr. Vanstavern states that, though borings could be got down during the rains and when the river was high, the difficulties and expense of sinking a shaft would, he is sure from a knowledge of the place, be much greater than in the dry season, as water would be met with at a much higher level and in much greater quantities.

No. 126.

REFERRED to the Military Department, with request that it may be ascertained if the services of any Non-Commissioned Officer of Sappers (European) acquainted with mining or shaft sinking can be placed at the disposal of this department for directing the operations as suggested by Mr. Walch. If such a Non-Commissioned Officer can be found, it is requested that he may be directed to proceed at once to the spot.

(Signed) R. H. SANKEY, Colonel, R.E.,
5th June 1880. Secretary to Government, P.W.D.

From the Adjutant-General, No. 173, dated 14th June 1880.

IN returning Military Department memorandum No. 3,561, of the 7th current, I have the honor, by order, to inform you that the services of Corporal Nicks of the

"Queen's Own" Sappers and Miners are available for the Godáviri coal shaft. He is stated to be zealous and by trade a "Fitter."

ORDER,—Ordered that the Adjutant-General's letter be communicated to the Public Works Department.

2. His Excellency the Commander-in-Chief is requested to cause Corporal Nicks to be detailed at once for the duty.

(True Extract.)

(Signed) J. MICHAEL, Col.,
Secy. to Govt., Mily. Dept.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 28th July 1880, No. 1,164.

WITH reference to our inspection of the proposed site for coal shaft on 22nd instant, I have the honor to forward tracing from plan of survey which I then ordered to be made.

2. I append the orders now issued to the Corporal in charge of the party with reference to this survey.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to Corporal F. NICKS, Golagudiem, dated 28th July 1880, No. 1,163.

WITH reference to the accompanying plan a report ought to have been sent stating whether there are any indications that point E., said to have been shown by villagers as site of bore-hole No. 16, is really the site.

2. If there be not any trustworthy indications that it really is so, the shaft is to be sunk at point A., or should that be in a local depression where trouble will be given by surface drainage, at some convenient point between it and D.

NOTE.

WITH reference to the annexed letter No. 1,164, of the 28th July 1880, from the Superintendent of Works, Godáviri, on the subject of the coal sinkings, I beg to offer the following brief remarks, having lately had the opportunity of inspecting the site of the operations in company with Mr. Martindale and Mr. Walch.

2. Leaving Dowlaiswaram on morning of the 21st ultimo, Mr. Walch and I taking the new steam launch, *Arthur Cotton*, were enabled to pass very nearly through the Godáviri gorge before anchoring for the night, although the current was strong, 5.3 feet in depth, passing over the crest of the anicut.

3. Next morning picking up Mr. Martindale at Woodagudiem, we arrived at the site of the coal operations about noon, and spent some five or six hours in inspecting the locality and chiefly in endeavouring to find out the precise position of bore-hole No. 16, at which point, owing to the promising results of the previous borings, it had been decided to sink the shaft.

4. We found Corporal Nicks with his fourteen Sappers encamped at Golagudiem (*Golagaram* of the Indian Atlas), the party were well and sufficiently provided with shelter till the new shed 80 feet x 18 feet now sanctioned (and for which corrugated iron sheets have been brought down from the spare stores at Dumagudiem) has been run up, as it will be immediately.

5. In addition to an ample supply of tools of all kinds there was ready a pump which will, I hope, answer all purposes till a depth of 80 feet has been reached, when

one driven by steam now preparing at the Madras workshops will be sent up for unwatering the shaft at greater depths.

6. Twenty horizontal circular frames of angle iron, sufficient if spaced at 5 feet apart to reach to a depth of 100 feet, were also on the ground. If stiff soil or rock be met with, these may be spaced at greater intervals or omitted altogether and answer for 150 feet in depth, but in any case Mr. Walch can readily send up all that is needed in this respect from Dowlaiswaram.

7. Mr. Martindale, who takes a kindly interest in the work, will see that the party have ample and good supplies, and if, as I hope, the men only keep their health, the work should progress favorably, though it is at the same time to be feared that, particularly at this season, water may be met with close to the surface, and difficulties on this account may delay operations.

8. Corporal Nicks had explored nearly all the area of previous operations, but had failed to discover the precise location of bore hole No. 16. Most of the sites of the other bore holes as pointed out by the villagers had been marked by a rough block of red sand stone, but in this particular case no indication could be found and it was thus fortunate that we were able to visit the place at this time.

9. From there not being a single definite point or bearing given on the survey whereby to recognise the old holes, and from these having been mere punctures and easily obliterated, it was necessary to fix the point in question by as many approximations as we could. The result is shown by the tracing now sent up by Mr. Walch. Our approximations led us to decide on the point A., and it would now appear from subsequent information received from the villagers (probably those of Totapilly, who we were informed had been engaged on this particular portion of the old work) that the point E. at no great distance from A. is the true point.

10. I feel assured that in no case will the point selected here be much out, though, of course, it would have been very much more satisfactory to find the exact locality.

Mr. Walch's present decision as conveyed to Corporal Nicks may therefore, I think, be safely accepted.

11. The whole country about is rather undulating, clayey, with bushy jungle here and there, and well raised above the river, but showing from the moisture which lodges in the lower portions, that at this season much water may have to be encountered in sinking the shaft.

12. It would, of course, be premature to say much about the results of these operations, but if Mr. Vanstavern (whom I met at Woodagudiem, but who owing to illness was unable to accompany me to the coal field) is to be credited, the coal is likely to turn out very shaley. The best specimen, he informed me, only yielded 30 per cent. of carbon, and the worst 9 per cent.

13. As regards the proper designation of this coal field, there is some doubt. Totapilly, by which it appears to have been first known, though shown on the atlas, is a very insignificant village and at a distance from our present workings. Tiperpenti (Tipurapentaneed of the tracing) is not shown on the atlas, and is also both insignificant and at some distance. If the field is to be called after any of the neighbouring villages, Golagudiem, where the camp is and which is both shown on the atlas and is on the river bank, would be the most appropriate designation.

14. But to the best of my judgment it would be preferable to call it the Bhadrachalam field, as it is sufficiently near to this, which is certainly the best known and most important place in the neighbourhood.

15. If the Government approve, therefore, I would in all future correspondence designate this the Bhadrachalam coal field.

16. The Superintendent of Works has orders to send up fortnightly progress reports of the work done.

9th August 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Chief Engineer, P.W.D.

No. 318.

MEMORANDUM.

THE accompanying note is forwarded to the Superintendent of Works, Godavari, for information.

2. The decision conveyed in his letter No. 1,164, of the 18th July 1880, with reference to the point at which the shaft is to be sunk is accepted.

3. Fortnightly progress reports should be continued in order that His Grace the Governor may be kept advised of the results.

4. This field will in future be designated the Bhadrachalam field in all official documents.

(Signed) R. H. SANKEY, Colonel, R.E.,
14th August 1880. Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 18th August 1880, No. 1,336.

IN continuation of my letter No. 1,164, of the 28th July 1880, I have the honor to forward, herewith, an extract from letter No. 4, of the 5th August 1880, received from Corporal Nicks stating that he is fully convinced that bore hole No. 16 was at the point E. shown on the survey plan, of which copy was sent with my No. 1,164.

Extract of a letter from Corporal F. NICKS, R.E., in charge of Coal Shaft Sinking, to G. T. WALCH, Esq., Superintendent of Works, Godavari, dated 5th August 1880, No. 4.

WITH reference to your docket No. 1,163, dated 28th July 1880, regarding point E as shown by villagers, I am fully convinced it is the actual site of bore hole No. 16. In the first place I was taken to the spot E by two villagers who stated they were employed at the boring. I examined the surface soil and found indications that boring had been done there. I found two different soils, viz., light colored clay and sand stone in layers, the same as would come from an auger after boring.

2. On the 3rd instant I made inquiries at the village of Tipurapentaneed and found a man who was employed from the commencement to the finishing of the borings under Mr. Vanstavern; he also took me to the exact spot marked E as shown on plan and showed me the above soil as mentioned, and states that was what came up with the auger; he also pointed to a tree where they cooked their meals, which is only 10 yards from the spot. I intend to sink the shaft at the place pointed. I have already commenced getting stores on the spot to commence work.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 23rd August 1880, No. 1,434.

Report No. 1 on progress of work at Bhadrachalam coal fields to 14th August 1880.

THE sheds having been erected and necessary machinery moved up to site for shaft, actual sinking was commenced on 12th August, and up to 14th depth gone down to was 4 feet 6 inches.

No. 393, dated 3rd September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 3rd September 1880, No. 1,587.

Report No. 2 on progress of work at Bhadrachalam coal fields from 15th to 28th August 1880.

SHAFT sunk from 4 feet 6 inches to 15 feet; soil passed through chiefly "blue and eyellow clay" with kunkur; sand stone just reached; some trouble given by water after heavy storms. Party apparently not working quite satisfactorily. Will be visited soon.

No. 450, dated 17th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 16th September 1880, No. 1,721.

Report No. 3 on progress of work at Bhadrachalam coal fields from 28th August to 15th September 1880.

SHAFT sunk from 15 to 34 feet; soil passed through chiefly yellow sand stone compact *in situ*, but breaking up easily when dug out. Pump arrangements fixed.

No. 490, dated 30th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 22nd September 1880, No. 1,722.

I HAVE the honor to inform you that I have on 15th, 20th and 21st instant inspected the work at the Bhadrachalam coal fields, and I find that, though going on slowly, it is being well done.

2. The shaft has now been sunk to a depth of 39 feet and water has just been reached.

3. The first 5 feet passed through was ordinary alluvial and vegetable soil; then came for 10 feet yellow clay, about the lower 5 feet of which was mixed with kunkur; then for 14 feet 6 inches yellow sand stone compact and hard *in situ*, but disintegrating when removed to the surface; and below this to the 39 feet depth a light blue clay chiefly "pipe clay" with at 38 feet a stratum of a few inches of sand stone.

4. Through this last thin stratum of sand stone water has commenced to come in slowly. At 4 P.M. on 20th I saw the bottom of the shaft practically cleared of water, and at 6 A.M. (21st) 1 foot 8 inches in depth had accumulated.

5. The Abyssinian pump sent from Madras has been fixed and works well, clearing such water as is now coming in with perfect ease.

6. The party is well housed and has kept in fair health. Corporal Nicks and some of the men have had rheumatism, one or two have had slight fever, and the Naigue who went up with the party has been sent back to Dowlaishweram with bad ulcers on his feet, and he has been replaced by another man.

7. There have been no accidents, and I am quite satisfied with the care taken by Corporal Nicks, who is in immediate charge of the operations. I cannot say I am quite satisfied with the rate at which the work has been carried on, but native Sappers, it appears to me, do not generally work rapidly.

No. 506, dated 5th October 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 5th October 1880, No. 1,843.

Report No. 4 on progress of work at Bhadrachalam coal fields from 15th to 30th September 1880.

SHAFT sunk from 34 to 44 feet; soil passed through, sand stone, with layers of light blue clay, chiefly pipe clay; water coming in quickly. Pump, "Abyssinian," has now to be worked night and day.

2. The Corporal in charge reports that his detachment is working unsatisfactorily, and that "if the sepoys are required to work in the shaft or at the winch they report themselves sick."

3. It seems likely that these men are behaving as they are with the object of being sent back to their Company, which they think may soon be sent to Bangalore; it would, I think, be well to let them know for certain that they will not be sent away from the work till it is finished, and that if they are sick they will have to go into hospital at Rajahmundry and when discharged return to the work. Eight coolies are now employed to assist the detachment.

No. 2,331.

THE Chief Engineer concurs with the Superintendent of Works that it will be advisable to let the Sappers distinctly understand that they will not, by malingering, be enabled to desert the work which they have been sent up to carry out.

2. When sick they may be sent to the hospital at Rajahmundry as proposed.

(By Order.)

(Signed) J. PENNYCUICK, Major, R.E.,
Deputy Chief Engineer, P.W.D.

18th October 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Yernagudem, 20th October 1880, No. 2,006.

Report No. 5 on progress of work at Bhadrachalam coal fields from 1st to 15th October 1880.

SHAFT sunk from 44 to 50 feet; soil passed through, sand stone, said to be hard, with thin layers of clay.

2. Slow progress due to large quantities of water to be dealt with, and the Corporal reports that the Abyssinian pump can no longer keep the water down, and no further sinking can go on till the steam pump is at work. This is expected daily.

No. 2,422, dated 2nd November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th November 1880, No. 2,641 W.

Proceedings of the Madras Government, Military Department, dated 13th November 1880, No. 7,102.

Telegram from the Superintendent of Works, Godáviri, to the Public Works Department, Madras, dated 26th October 1880.

"Another Non-Commissioned Officer to help Corporal Nicks, often ill, and Dresser for coal party much wanted."

TRANSFERRED to the Military Department, with a request that it may be stated whether any Non-Commissioned Officer can be sent from the "Queen's Own" Sappers and Miners for the purpose.

Ootacamund,
29th October 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From the Adjutant-General, dated 10th November 1880, No. 499.

With reference to a telegram from the Superintendent of Works, Rajahmundry, dated 26th October 1880, transferred to the Military Department under Public Works Department No. 601 of 26th ultimo, and referred to His Excellency the Commander-in-Chief under Government endorsement memorandum No. 6,887 of 30th idem, herewith returned as requested, I have the honor, by order, to state that there is no objection to the services of Corporal B. Fuller, R.E., being placed at the disposal of Government in the Public Works Department for employment at Rajahmundry.

ORDER.—The Adjutant-General's letter communicated to the Public Works Department.

(True Extract.)

(Signed) J. MICHAEL, Colonel,
Secretary to Government, Mil. Dept.

ORDER THEREON, No. 2,641 W., dated 18th November 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

2. It is requested that the services of Corporal Fuller may be made available as early as possible.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 30th November 1880, No. 2,674.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 4th November 1880, No. 2,254.

Report No. 6 on progress of work at Bhadrachalam coal fields from 16th to 31st October 1880.

SHAFT sunk from 50 feet to 55½ feet; sand stone passed through to 55 feet, then a layer of clay. Below this it has been impossible to go with the Abyssinian pump and the steam* pump must be awaited.

Firewood is being collected for the engine.

The Corporal in charge of the party has been suffering from dysentery and fever, and it appears that without his personal presence on the work it does not go on properly; another Non-Commissioned Officer is therefore very necessary, especially as pumping will have to be kept up at night. The unhealthiness of the place at this time of the year and the possibility of accidents make it also highly advisable that a Dresser should be attached to the party. Telegram of 26th October asking for another Non-Commissioned Officer and a Dresser was therefore sent.

Telegram from the Secretary to Government, Public Works Department, Madras, to the Superintendent of Works, Godáviri, Rajahmundry, dated 16th November 1880.

"Does further experience show that a Dresser for the coal party is still essential."

Telegram from Superintendent of Works, Godáviri, Rajahmundry, to the Secretary to Government, Public Works Department, Madras, dated 17th November 1880.

"HEALTH of coal party better, since rain stopped. May do without Dresser."

ORDER THEREON, No. 2,674 W., dated 30th November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd December 1880, No. 2,708.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 18th November 1880, No. 2,401.

Report No. 7 on progress of work at Bhadrachalam coal fields from 1st to 13th November 1880.

THE steam pump arrived at Golagudiem on 6th, and since then the party have been fully occupied in taking it, and the engine to work it, to the shaft and setting it up; the Corporal in charge reports that "the work is proceeding in a satisfactory manner."

2. Lieutenant Gale, R.E., visited the party on the 6th and 7th, and the Corporal in charge reports that since that visit and the change of Havildars which was then made the detachment has been working better than it had been working for some time previously.

3. The health of the party is better than it was, and it is thought that now it may get on without a Dresser, though of course it would be safer to have one on the spot, and another Non-Commissioned Officer to assist Corporal Nicks is very necessary as mentioned in the last report.

ORDER THEREON, No. 2,780, dated 3rd December 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd December 1880, No. 2,934 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 2nd December 1880, No. 2,554.

Report No. 8 on the progress of work at the Bhadrachalam Coal-field.—13th to 30th November 1880.

THE party have been engaged in keeping water down in the shaft with the Abyssinian pump and setting up the steam-pump and its engine.

No further sinking has been possible in the period under notice.

2. The Corporal in charge again reports, "there is a great deal of sickness among the detachment. Fever is very prevalent."

ORDER THEREON, No. 2,934 W., dated 22nd December 1880.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 10th January 1881, No. 38 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Wuddigudem, 16th December 1880, No. 2,751.

Report No. 9 on the progress of work at the Bhadrachalam Coal-field.—1st to 15th December 1880.

THE steam-pump was set to work on the 8th. There were then "18 feet of water in the shaft," and "it took 2 hours 35 minutes to pump dry;" owing, however, to extra framing, &c., being found necessary, actual work of excavation was not recommenced till 13th.

2. On the 15th the undersigned inspected the work. The shaft was down 56 feet, it was in good order and the pump going dead slow was keeping it clear of water.

A layer of clay (chiefly pipe-clay) had just been reached through which water was coming in freely.

The water has for some time past been sensibly affected by variations in the level of the river, which is now low, though not so low as it will be. It is impossible to say whether the one pump will be able to deal with the water which will be met with in the next 100 feet, and it will probably be advisable to have another ready; it could be driven by the same engine and driving machinery.

3. The huts were being moved up to near the shaft.
4. Ninety cubic yards of firewood for the engine have been cut.
5. The health of the party is not good, there are generally one-third or so of the sepoys down with fever, but it does not appear to be of a virulent type.
6. Corporal Fuller, R.E., has now (on 15th) joined the work.
7. No steamer will be able after this to get to Gollagudem, and probably not even to Wuddigudem till next June or July.

ORDER THEREON, No. 38 W., dated 10th January 1881.

THE Government consider that the additional pumping power referred to in paragraph 3 of the foregoing letter should be provided. The Superintendent of Works, Godáviri, will arrange accordingly.

2. The work being unhealthy should be pushed on as rapidly as possible.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 14th January 1881, No. 96 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 7th January 1881, No. 2,927.

Report No. 10 on the progress of works at the Bhadrachalam Coal-field.—16th to 31st December 1880.

- (1.) Shaft deepened by 8 feet to 64 feet.
- (2.) Soil passed through "different kinds of clay."
- (3.) Removal of huts to site of shaft finished.

ORDER THEREON, No. 96 W., dated 14th January 1881.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 25th January 1881, No. 195 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 10th January 1881, No. 2,966.

I HAVE the honor to send herewith a letter from Corporal Nicks, R.E., in charge of the coal operations near Bhadrachalam, reporting the inrush of a large volume of water into the shaft.

2. Till this occurred all seemed to be going on well, though slowly.

3. I have told Corporal Nicks to again rig up the Abyssinian pump and see if with it he cannot get the water down low enough to get at the steam-pump box and again set it going, and then if the two will keep the water down sufficiently low it is possible that by putting in specially prepared cylinders we may be able to get through the treacherous stratum which has led to the present mishap; but if water with our present appliances cannot be kept so low, another pump more powerful than the present one, with machinery and engine to drive it, must be sent up.

4. Such machinery and engine however could not be got to the place before the next season of freshes in the river, say next July, and should it be found quite impossible to deal with the water with the present appliances I would request instructions as to what in the interval is to be done with the Sapper coal party.

From Corporal F. NICKS, R.E., to the Superintendent of Works, Godávári, Dowlaishweram, dated Gollagudem, 5th January 1881, No. 118.

On Tuesday evening we were deep enough for 9th ring, and on Wednesday morning myself and Corporal Fuller started putting in same, as the soil was very treacherous it not being safe to trust sepoys; we had a slip of earth from the north side of shaft at about 11 A.M. We started then to plank that portion, as we had put in on (4) four plining (*sic*) planks and placed ring, we worked on and had placed four planks in the north quarter; we then noticed the water gradually rise, and the pump would not keep it down. I then sent Corporal Fuller up to ascertain if the engine was under proper steam, he informed me as he was coming down in bucket that steam gauge indicated 25 lb. ☐ As I was in the act of guiding the bucket down the water burst in from the south-west side, bringing with it a large quantity of "clay," about one-quarter yard, which knocked me down. Corporal Fuller said to me we had better take all tools up with us, but before he could get out of the bucket the water rose to my waist. I then said, never mind the tools we must get above the water in case the rings in upper work give way, as I had put my arm in where water was rushing from and found a large hole about 6 inches by 2 feet, so the clay could not be more than 1 foot 6 inches thick in front of the hole we had previously left, a berm of 6 inches in other work and considering this work was very dangerous we left a berm of 1 foot 3 inches.

We then cleared out of shaft as soon as possible with the water rising at the rate of 1 foot per minute, leaving all tools at bottom as we could not get at them for the water. I also kept engine at work till 10-25 P.M. making 25 strokes per minute, but the water still kept rising.

Rise of water	4-10 P.M.	No water more than ordinary.	5th January 1881.
Burst in at	4-15 P.M.		
7 feet	4-25 "		
21 feet 3 inches	5-50 "		
26 feet 8 inches	7-50 "		

Whilst taking measurement at 10 P.M. the pump gone out depth of water at the above time 29 feet 4 inches. I then gave orders to engine driver to draw fire, I then emptied boiler as I had been under steam near 400 hours.

At present we cannot get pump clear as working box is under water, the only remedy will be to get another set of top gear pipes and pump rods; if it is the Godávári which is broke in upon us, which I think it is, it will be useless. 11-30 P.M.

I took measurements at 11-35 and found 33 feet 4 inches and at 7 A.M., the 6th, and found 38 feet 8 inches.

Please give me further instruction in answer to this.

ORDER THEREON, No. 195 W., 25th January 1881.

THE Superintendent of Works, Godávári, has already been authorised* to arrange
* G.O., No. 38 W., dated 10th January 1881. for the provision of additional pumping power.

2. The Government await a further report before passing orders on the subject of paragraph 4 of the letter above read.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Yanam, 19th January 1881, No. 3,073.

In continuation of my No. 2,966, dated 10th instant, I have the honor to state that Corporal Nicks reports that in spite of all efforts it has been found impossible to raise the pump to get at the upper box and working barrel, and that at noon on the 6th the water had attained the "height of 40 feet" since which it has not varied.

2. It is evident, therefore, that another and more powerful pump must be provided if the work is to be persevered with.

Telegram to the Superintendent of Works, Godávári, Rajahmundry, dated 27th January 1881, No. 193.

MORE powerful pump for coal workings sanctioned. Arrange for one at once.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd February 1881, No. 308 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated 28th January 1881, No. 3,185.

Report No. 11 on the progress of work at the Bhadrachalam Coal-fields.—1st to 15th January 1881.

WORK progressed steadily till 5th, when the shaft was down 69 feet, water in large quantities then came in and overpowered the pump (see letters Nos. 2,966, 10th January 1881, and 3,073, 19th January 1881, to the Chief Engineer), and on the 15th there were 40 feet 4 inches depth of water in the shaft.

2. The Abyssinian pump which had been taken away and put on the barge was again taken to the shaft, and its placing commenced with the hope (a faint one) that with it the water can be so lowered that it may prove possible to get at the steam-pump boxes and set it going again. (See paragraph 3 of letter No. 2,966, 10th January 1881, to Chief Engineer.)

ORDER THEREON, No. 308 W., dated 3rd February 1881.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd February 1881, No. 493 W.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 31st January 1881, No. 3,225.

With reference to your telegram of 27th I have the honor to report that I have no means of here arranging for a more powerful pump for the coal shaft, and can only suggest that one may be supplied from the workshops at Madras or obtained from England.

2. Having had no experience in the work for which the pump is required, and having no one here who has had such experience, I cannot state with any certainty what is the nature and power of the pump required, and it seems therefore that it is best for me to explain the conditions of the case and from them possibly some Mining Engineer or manufacturer of mining machinery will be able to decide what is wanted. The conditions are these—

3. (a)—The shaft is 6 feet 3 inches diameter.
- (b)—It is sunk at about 1 mile from the edge of the Godávári.
- (c)—The substrata already passed through (to 69 feet depth) have been almost entirely yellow sandstone, alternating with bands of yellowish and greyish clay, chiefly pipe-clay, and the boring shows that the general character of the strata to be yet passed through will be similar, but with fewer bands of clay, down to about 120 feet, when shale and coal will be met with.

(d)—Down to 55 feet there was but little water, but at that depth the Abyssinian pump could no longer deal with it, and the steam-pump sent up from the Madras Workshops was put up; whilst doing this (it occupied some days) the water rose 18 feet, this the pump when set to work cleared out in 2 hours 35 minutes.

(e)—This pump, driven by an old 8 horse-power engine, kept the water down easily enough till the shaft had reached a depth of 69 feet, when there

• For the first 7 feet came in at the rate of about 630 gallons a minute. was a sudden inrush through a stratum of pipe-clay and the water rose 29 feet 4 inches in 5 $\frac{3}{4}$ hours against the pump going 22 strokes a minute. The

See copy of letter from Corporal Nicks, No. 118, 5th January 1881, herewith. pump then got choked and the water rose another 10 feet 8 inches, that is 40 feet

in all (or to 29 below top of shaft) in another 14 hours and at that level it has stood.

(f)—The shaft has to go down to a total depth of about 150 feet.

(g)—The river—the variations in level of which have been noted to affect the water in the shaft—rises in the season of floods (from June to October) from 15 feet to 20 feet or so above its present level, or approximately to from about 10 feet to 15 feet below level of top of shaft.

(h)—As most of the soil to be passed through is sandstone, much sharp sand comes up with the water, and it has been found to rapidly wear away any leather it comes in contact with, such as "buckets," valves, &c.

4. As already stated in my No. 2,966, 10th January 1881, paragraph 4, machinery or apparatus of any kind, weighing more than could be carried by two coolies, could not be got to the shaft till next July, because it could not be taken by water much if at all beyond Koide, some 34 miles below Gollagudem, and between the two places there is no road, only a jungle track, which in places passes over rocky slopes of hills.

P.S.—As all pumps occasionally get out of order and all engines require to be stopped now and then, it will be highly advisable, if not necessary, to have two pumps and two engines, and it is of course of great convenience that the working parts of the pump should be easily raised or got at.

From the same officer, dated 6th February 1881, No. 3,294.

Report No. 12 on the progress of work at the Bhadrachalam Coal-field.—16th to 31st January 1881.

The Abyssinian pump (see paragraph 2 of last report) was fully rigged up by 19th, and pumping then commenced with it; by 24th the water had been reduced 11 feet, or to 29 feet in depth, and then the working part of the steam-pump was got at.

2. The leather "buckets" which had worn out (they are constantly wearing out owing to the action of the gritty sand, see paragraph 3, (g.), No. 3,225, 31st January 1881), were renewed and the pump was started again on 25th; by the evening of 27th it had reduced the water by 8 feet, or to 21 feet, in depth, below which it could not reduce it, and the leathers having again worn out it had to be stopped for a time, when the water immediately rose against the Abyssinian pump to 30 feet 7 inches depth.

3. It is quite evident that with the present pumping power it will be impossible to recommence sinking operations.

4. There can be little doubt that the water in the shaft is in communication through some permeable stratum with the water in the river, and that enormously powerful machinery and a very great expenditure will be necessary to enable the shaft to be sunk to where it will reach the shale and inferior coal which borings and geological researches have established to exist in small quantities in the locality.

ORDER THEREON, No. 493 W., dated 22nd February 1881.

The Right Honorable the Governor in Council considers that before any further expenditure is incurred the opinion of an expert in mining matters should be obtained. The Chief Engineer has, it is understood, written to Calcutta to inquire whether the services of any qualified person can be secured.

Meanwhile the work should be suspended.

2. Orders have already been issued to the Superintendent of Works, directing the Sappers to return to their Company.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 542 W.

Read the following paper :—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaisheram, 11th February 1881, No. 3,370.

FURTHER information has shown me that I was wrong in supposing that when water burst into the coal shaft at Bhadrachalam it came in at the rate of "630 gallons a minute," as stated in the margin, paragraph 3, clause (e) of my No. 3,225, 31st January 1881; it came in at the rate approximately of 200 gallons a minute.

2. I would take this opportunity of asking for early orders on paragraph 4 of my No. 2,966, 10th January 1881.

ORDER THEREON, No. 541 W., dated 28th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 541 W.

Read the following paper :—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 17th February 1881, No. 3,463.

Report No. 13 on Bhadrachalam Coal-field work.—1st to 15th February 1881.

As stated in last report it is quite impossible to proceed with the work, and it therefore has been at a complete stand-still during the last fifteen days.

ORDER THEREON, No. 542 W., dated 28th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th March 1880, No. 698 W.

Read the following paper :—

MINUTE BY HIS GRACE THE GOVERNOR.

THE question of getting access to coal in this Presidency for railway and navigation purposes is a very important one.

2. That coal exists in the Nizam's territory, between the Godáviri and Kistna, is well ascertained, and the quality of that recently obtained and tried, although the results are not yet accurately calculated, show that the coal is of a good, useful description, and reported by the Public Works Workshops as quite equal to the ordinary Indian coal they have in use. It becomes a question of price.

3. Coal is wanted for railway and steam purposes at Madras, for the navigation of the Godáviri and at Cocanada, and will no doubt be also consumed on the canal.

4. It has been ascertained that coal exists on the Godáviri river on the British side, and some coal raised from the dry bed See Map. About one-third of the distance between Bhadrachalam and Rékapalle. of the river has given "good results" in the Godáviri steamers. The quality of the coal, as tested by boring with small bores, is necessarily uncertain. Some is spoken of as fair, some as inferior; but it is close to the river, and the ground apparently not costly to sink in. If, as estimated by Mr. Vanstavern (who was especially employed upon the coal investigation), the coal seams can be reached by a shaft for an amount of under Rs. 2,000, it would be a matter to be tried at once without doubt; but I would put it higher, and taking the estimate above given, I would make allowance for pumping, ventilating and levelling, say that the trial should be considered as not to be effectually made under a possible Rs. 5,000; say at No. 16 bore, where the coal is within 150 feet from surface and about 18 feet thick, and the shaft only 1 mile from river, but above flood lines.

5. Coal in such a situation ought to be sufficient and economical for all purposes of steam engines on the river and delta and also at Cocanada, as its price must be low from the freight being entirely water and down-stream, so that an extra quantity might be used. How much further it could be carried can only be really known by actual test.

6. The opening of coal at this spot would doubtless stimulate the opening on the Nizam's side.

7. In ordinary times I should not hesitate to recommend the expenditure necessary to reach and test the coal seams, and even in the present times it seems to me desirable to do so. If the coal sufficed only for Godáviri use, the cost would not be wasted.

8. The opening of any coal operation would tend to develop and thus to pacify the country around.

9. The question to be decided then is—

Shall Government endeavour, at a cost which may reach Rs. 5,000, to open the coal already ascertained to exist?

10. If that be agreed then the Chief Engineer should suggest the arrangements, and the co-operation of Mr. Vanstavern should be secured, for his local knowledge and long experience of the district.

11. The working season is from now to June.

5th January 1880.

(Signed) BUCKINGHAM AND CHANDOS.

N.B.—The original maps, sections and memoranda should be returned to Mr. Vanstavern, as they are only lent. I could not trace the copies in Government possession—possibly lost.

ORDER THEREON, No. 698 W., dated 18th March 1880.

THE Revenue Department will arrange to place at the disposal of the Public Works Department the sum of Rs. 5,000 from the accumulated Cattle Trespass Fund for certain experiments on coal-boring operations in the Godáviri district.

2. This amount will be recouped when necessary for the farm purposes later on.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

No. 859.

MEMORANDUM.

HIS GRACE the Governor in Council having decided to make an early commencement with sinking a shaft for working a coal seam, whose existence has been proved at a point midway between Bhadrachalam and Rékapalle on the left bank of the Godáviri, the undersigned is desired to inquire whether His Excellency the Commander-in-Chief thinks that a party consisting of, say, two European Non-Commissioned Officers and a Havildar and Naigue with fourteen Sappers, who are acquainted with mining could conveniently be spared from the Companies of the "Queen's Own" Sappers and Miners which are now attached to the force under the command of Colonel Buck.

2. Their employment in sinking the shaft required might possibly extend to six months.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

15th March 1880.

To the Secretary to Government, Military Department.

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 20th March 1880, No. 213.

WITH reference to your docket memorandum, No. 1,771, dated 16th March 1880,

* Herewith returned. I have the honor to inform you that the Officer Commanding, Sappers and Miners

at Dowlaishweram, has been directed to detach two British Non-Commissioned Officers with a Havildar and Naigue and fourteen Sappers for the purpose of sinking a shaft in the Godáviri district.

2. It is of great importance that these men should not be exposed in tents during the hot season, and His Excellency trusts that Government will see the necessity of having thatched huts for the natives, and suitable erections for the shelter of the British Non-Commissioned Officers employed.

No. 1,964.

TRANSFERRED to the Public Works Department, with reference to its memorandum, No. 859, dated 15th March 1880.

(By Order.)

FORT ST. GEORGE, (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
25th March 1880. Acting Secretary to Govt., Mily. Dept.

No. 972.

MEMORANDUM.

THE Chief Engineer has the honor to forward, for the information of the Superintendent of Works, Godáviri, a copy of a Minute by His Grace the Governor regarding coal-boring explorations on the British side of the Godáviri river, with copies of the correspondence that has passed on the subject.

2. On receipt of an intimation from Mr. Vanstavern that he has no objection to the free use of the plans, &c., borings can be commenced. As it is understood that the working season will only last for about two months longer, every exertion should be made.

3. Meanwhile, in accordance with the wishes of His Excellency the Commander-in-Chief, proper shelter for the British Non-Commissioned Officers employed and thatched huts for the natives should at once be provided.

4. Mr. Walch's attention is invited to Lieutenant Baddeley's letter of the 15th March, in case the requisite machinery, &c., cannot be got from the Dowlaishweram shops.

(Signed) R. H. SANKEY, Col., R.E.,
Chief Engineer, P.W.D.

31st March 1880.

To the Superintendent of Works, Godáviri.

Proceedings of the Madras Government, Public Works Department, dated 14th April 1880, No. 960 W.

Read the following paper :—

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 2nd April 1880, No. 250.

IN continuation of Adjutant-General's letter, No. 213, dated 20th March 1880,

1 Havildar.
1 Naigue.
14 Privates.

I have the honor, by order, to state that the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram reports that the party, as

per margin, is in readiness to proceed under the orders of the Public Works Department.

2. There are no European Non-Commissioned Officers with the Detachment.

No. 2,117.

TRANSFERRED to the Public Works Department, in continuation of No. 1,964, dated 25th March 1880.

FORT ST. GEORGE, (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
3rd April 1880. Acting Secretary to Govt., Mily. Dept.

ORDER THEREON, No. 960 W., dated 14th April 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 21st April 1880, No. 996-A W.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 6th April 1880, No. 84.

I HAVE the honor to acknowledge the receipt of your memorandum No. 972, dated 31st ultimo.

One Indent in triplicate.

2. As you will have seen from my letter No. 701, dated 31st March 1880, and its enclosure, I have no officer or upper

subordinate whom I can send for the coal operations, and the Officer Commanding the Detachment of the "Queen's Own" Sappers and Miners here has no European Non-Commissioned Officer.

3. In paragraph 10 of the Minute by His Grace the Governor it is said that "the co-operation of Mr. Vanstavern should be secured," and it seems to me that it would be advisable, as he lives not far from where the operations are to be carried on and has had some experience in such work, to employ him on a salary to superintend the work, but I have no authority to open negotiations officially with him on the subject, or to make him any offer.

4. The steamers cannot now go up the river further than Koide (52 miles), and only boats of very small draft can get from there to where the operations are proposed, some 35 miles further.

5. There are no pumps here at all suited for deep shaft sinking, and I enclose an indent for such a pump and machinery to drive it, which, if approved, please send on to the Government workshops, Madras. If the pump be sent it should be accompanied by a Maistry who understands its working.

6. I think if you will consider all the circumstances of the case you will see that there is no probability of the work being done in the "two months" mentioned in paragraph 2 of your memorandum under notice.

From Lieutenant W. L. C. BADDELEY, R.E., General Superintendent of Public Works Workshops and Stores, Madras, to the Secretary to Government, Public Works Department, dated 15th March 1880.

We have two deep well pumps in store which would be suitable for working a shaft 80 feet in depth.

2. The five-inch lift pump which we made for the Ooregum Company is a good pattern for deep shafts, and we could make up these very soon if required.

3. One of the Workshop Maistries would be available to look after the pumping machinery, but there is no one here who understands anything about mining.

4. If Dowlaisweram cannot provide the engines, we can spare a 4 horse-power portable or any number of Gwynne's or Nasmyth's 4 and 6 horse-power engines and boilers combined. These also could be made fairly portable by fitting them on a stand with wheels.

5. We have no machinery for working or lifting coal, but probably there would be no difficulty in making up any ordinary appliances.

ORDER THEREON, No. 996-A W., dated 21st April 1880.

THE Superintendent of Works, Presidency, will at once direct the General Superintendent, Public Works Workshops, to despatch one of the deep well pumps mentioned by him as suitable for a shaft 80 feet deep to the Superintendent of Works, Godáviri, along with one of the Workshop Maistries for looking after this and such other machinery as it may be found necessary to send for unwatering the coal shaft.

That officer should also be directed to place himself without delay in correspondence with the Superintendent of Works, Godáviri, relative to any steam pumping or other machinery that may be deemed necessary for sinking the shaft below 80 feet.

2. The Superintendent of Works, Godáviri Division, is authorised to make arrangements with Mr. Vanstavern for directing the operations, preferably fixing a definite sum on the shaft being sunk to the bottom of the seam indicated by the borings, and reporting the terms as soon as possible for the information of Government.

3. The original borings having been executed during the monsoon, His Grace in Council has no reason to suppose that the work need now be subjected to any delay.

on account of the season, and as he attaches the greatest importance to the sinking of the shaft, no efforts should be spared to effect that object at the earliest date.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 27th April 1880, No. 1,035 W.

Proceedings of the Madras Government, Military Department, dated 14th April 1880, No. 2,404.

Read the following papers:—

Proceedings of the Madras Government, Public Works Department, dated 7th April 1880, No. 893 W.

Read letter from the Superintendent of Works, Godáviri, dated 30th March 1880, No. 701.

I HAVE the honor to enclose copy of a letter received this day from the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaisweram, and to request instructions.

2. I would point out that the district is short-handed, that just at this season there is a great amount of work in connection with the anicut and head works, canals, &c., which has to be compressed into a very short time; and I trust, therefore, that no one will have to be taken away from such work to carry out the "hutting," &c., referred to by Major Hamilton, and which it appears to me the men might carry out themselves.

3. I do not know where the Kottapalle referred to is.

From the Officer Commanding Detachment "Queen's Own" Sappers and Miners, to the Superintendent of Works, Godáviri, dated 29th March 1880, No. 209.

WITH reference to letter, No. 822, dated 20th March, from the Adjutant-General (copy annexed for your information), I have the honor to report that the party, consisting of one Havildar, one Naigue and fourteen Privates, is in readiness to proceed up the river under your orders. There are no European Non-Commissioned Officers with this detachment.

2. I presume that you will supply all necessary tools.

3. The party will have to be hutted by the Public Works Department.

From the Officiating Adjutant-General, to the Officer Commanding "Queen's Own" Sappers and Miners, Dowlaisweram, dated 20th March 1880, No. 822.

At the request of Government in the Public Works Department the Commander-in-Chief has sanctioned the services of a party of two European Non-Commissioned Officers, a Havildar, Naigue and fourteen Sappers, who are acquainted with mining, from the companies attached to the force under Colonel Buck, for employment in sinking a shaft for working a coal seam between Bhadrachalam and Kottapalle on the left bank of the Godáviri, and you are requested to detach the above party for this purpose.

UNDER the circumstances explained in Mr. Walch's letter, the detachment will provide hutting accommodation for themselves, the usual allowances being granted by the Military Department.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secretary to Govt., P.W.D.

To the Military Department.

ORDER,—Communicated to His Excellency the Commander-in-Chief.

2. Under O.G. (Military), No. 356, dated 30th January 1872, all special charges, including cost of hutting, incurred on account of Sappers employed on purely civil works, form a debit against the Public Works Department.

(True Extract.)

(Signed) H. N. D. PRENDERGAST, Col., R.E.,
Ag. Secretary to Government, Mily. Dept.

ORDER THEREON, No. 1,035 W., dated 27th April 1880.
COMMUNICATED to the Examiner of Public Works Accounts.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Military Department, dated 16th June 1880, No. 3,763.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri District, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 27th May 1880, No. 547.

I HAVE the honor to inform you that immediately on receipt of G.O., No. 996-AW., dated 21st April 1880, I put myself in communication with Mr. Vanstavern, and enclose copy of my last letter* to him to which I have received the enclosed reply, in which I am sorry to say he declines to undertake the superintendence of the coal shaft sinking for the reason which he states in a private letter.

That reason being that he thinks it probable that private affairs may render it necessary for him to leave the country before it would be possible to complete the shaft.

2. I am now at a loss to know how to carry out the wishes of Government as regards the speedy sinking of the shaft. An extra Overseer having come (see my No. 519, of 24th May 1880) I could send him, but he knows nothing of the kind of work, and it is doubtful if the working under him of the Sappers, whom it is proposed to send, would be smooth, and I would recommend that a Non-Commissioned Officer of the Sappers and Miners should be sent for the work.

3. Mr. Vanstavern states that, though borings could be got down during the rains and when the river was high, the difficulties and expense of sinking a shaft would, he is sure from a knowledge of the place, be much greater than in the dry season, as water would be met with at a much higher level and in much greater quantities.

No. 126.

REFERRED to the Military Department, with request that it may be ascertained if the services of any Non-Commissioned Officer of Sappers (European) acquainted with mining or shaft sinking can be placed at the disposal of this department for directing the operations as suggested by Mr. Walch. If such a Non-Commissioned Officer can be found, it is requested that he may be directed to proceed at once to the spot.

(Signed) R. H. SANKEY, Colonel, R.E.,
5th June 1880. Secretary to Government, P.W.D.

From the Adjutant-General, No. 173, dated 14th June 1880.

IN returning Military Department memorandum No. 3,561, of the 7th current, I have the honor, by order, to inform you that the services of Corporal Nicks of the

“Queen’s Own” Sappers and Miners are available for the Godáviri coal shaft. He is stated to be zealous and by trade a “Fitter.”

ORDER,—Ordered that the Adjutant-General’s letter be communicated to the Public Works Department.

2. His Excellency the Commander-in-Chief is requested to cause Corporal Nicks to be detailed at once for the duty.

(True Extract.)

(Signed) J. MICHAEL, Col.,
Secy. to Govt., Mily. Dept.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 28th July 1880, No. 1,164.

WITH reference to our inspection of the proposed site for coal shaft on 22nd instant, I have the honor to forward tracing from plan of survey which I then ordered to be made.

2. I append the orders now issued to the Corporal in charge of the party with reference to this survey.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to Corporal F. NICKS, Golagudiem, dated 28th July 1880, No. 1,163.

WITH reference to the accompanying plan a report ought to have been sent stating whether there are any indications that point E., said to have been shown by villagers as site of bore-hole No. 16, is really the site.

2. If there be not any trustworthy indications that it really is so, the shaft is to be sunk at point A., or should that be in a local depression where trouble will be given by surface drainage, at some convenient point between it and D.

NOTE.

WITH reference to the annexed letter No. 1,164, of the 28th July 1880, from the Superintendent of Works, Godáviri, on the subject of the coal sinkings, I beg to offer the following brief remarks, having lately had the opportunity of inspecting the site of the operations in company with Mr. Martindale and Mr. Walch.

2. Leaving Dowlaishweram on morning of the 21st ultimo, Mr. Walch and I taking the new steam launch, *Arthur Cotton*, were enabled to pass very nearly through the Godáviri gorge before anchoring for the night, although the current was strong, 5.3 feet in depth, passing over the crest of the anicut.

3. Next morning picking up Mr. Martindale at Woodagudiem, we arrived at the site of the coal operations about noon, and spent some five or six hours in inspecting the locality and chiefly in endeavouring to find out the precise position of bore-hole No. 16, at which point, owing to the promising results of the previous borings, it had been decided to sink the shaft.

4. We found Corporal Nicks with his fourteen Sappers encamped at Golagudiem (*Golagaram* of the Indian Atlas), the party were well and sufficiently provided with shelter till the new shed 80 feet x 18 feet now sanctioned (and for which corrugated iron sheets have been brought down from the spare stores at Dumagudiem) has been run up, as it will be immediately.

5. In addition to an ample supply of tools of all kinds there was ready a pump which will, I hope, answer all purposes till a depth of 80 feet has been reached, when

one driven by steam now preparing at the Madras workshops will be sent up for unwatering the shaft at greater depths.

6. Twenty horizontal circular frames of angle iron, sufficient if spaced at 5 feet apart to reach to a depth of 100 feet, were also on the ground. If stiff soil or rock be met with, these may be spaced at greater intervals or omitted altogether and answer for 150 feet in depth, but in any case Mr. Walch can readily send up all that is needed in this respect from Dowlaishweram.

7. Mr. Martindale, who takes a kindly interest in the work, will see that the party have ample and good supplies, and if, as I hope, the men only keep their health, the work should progress favorably, though it is at the same time to be feared that, particularly at this season, water may be met with close to the surface, and difficulties on this account may delay operations.

8. Corporal Nicks had explored nearly all the area of previous operations, but had failed to discover the precise location of bore hole No. 16. Most of the sites of the other bore holes as pointed out by the villagers had been marked by a rough block of red sand stone, but in this particular case no indication could be found and it was thus fortunate that we were able to visit the place at this time.

9. From there not being a single definite point or bearing given on the survey whereby to recognise the old holes, and from these having been mere punctures and easily obliterated, it was necessary to fix the point in question by as many approximations as we could. The result is shown by the tracing now sent up by Mr. Walch. Our approximations led us to decide on the point A., and it would now appear from subsequent information received from the villagers (probably those of Totapilly, who we were informed had been engaged on this particular portion of the old work) that the point E. at no great distance from A. is the true point.

10. I feel assured that in no case will the point selected here be much out, though, of course, it would have been very much more satisfactory to find the exact locality.

Mr. Walch's present decision as conveyed to Corporal Nicks may therefore, I think, be safely accepted.

11. The whole country about is rather undulating, clayey, with bushy jungle here and there, and well raised above the river, but showing from the moisture which lodges in the lower portions, that at this season much water may have to be encountered in sinking the shaft.

12. It would, of course, be premature to say much about the results of these operations, but if Mr. Vanstavern (whom I met at Woodagudiem, but who owing to illness was unable to accompany me to the coal field) is to be credited, the coal is likely to turn out very shaley. The best specimen, he informed me, only yielded 30 per cent. of carbon, and the worst 9 per cent.

13. As regards the proper designation of this coal field, there is some doubt. Totapilly, by which it appears to have been first known, though shown on the atlas, is a very insignificant village and at a distance from our present workings. Tiperpenti (Tipurapentaneed of the tracing) is not shown on the atlas, and is also both insignificant and at some distance. If the field is to be called after any of the neighbouring villages, Golagudiem, where the camp is and which is both shown on the atlas and is on the river bank, would be the most appropriate designation.

14. But to the best of my judgment it would be preferable to call it the Bhadrachalam field, as it is sufficiently near to this, which is certainly the best known and most important place in the neighbourhood.

15. If the Government approve, therefore, I would in all future correspondence designate this the Bhadrachalam coal field.

16. The Superintendent of Works has orders to send up fortnightly progress reports of the work done.

(Signed) R. H. SANKEY, Colonel, R.E.,
Chief Engineer, P.W.D.

9th August 1880.

No. 318.

MEMORANDUM.

THE accompanying note is forwarded to the Superintendent of Works, Godavari, for information.

2. The decision conveyed in his letter No. 1,164, of the 28th July 1880, with reference to the point at which the shaft is to be sunk is accepted.

3. Fortnightly progress reports should be continued in order that His Grace the Governor may be kept advised of the results.

4. This field will in future be designated the Bhadrachalam field in all official documents.

(Signed) R. H. SANKEY, Colonel, R.E.,
14th August 1880. Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 18th August 1880, No. 1,336.

IN continuation of my letter No. 1,164, of the 28th July 1880, I have the honor to forward, herewith, an extract from letter No. 4, of the 5th August 1880, received from Corporal Nicks stating that he is fully convinced that bore hole No. 16 was at the point E. shown on the survey plan, of which copy was sent with my No. 1,164.

Extract of a letter from Corporal F. NICKS, R.E., in charge of Coal Shaft Sinking, to G. T. WALCH, Esq., Superintendent of Works, Godavari, dated 5th August 1880, No. 4.

WITH reference to your docket No. 1,163, dated 28th July 1880, regarding point E as shown by villagers, I am fully convinced it is the actual site of bore hole No. 16. In the first place I was taken to the spot E by two villagers who stated they were employed at the boring. I examined the surface soil and found indications that boring had been done there. I found two different soils, viz., light colored clay and sand stone in layers, the same as would come from an auger after boring.

2. On the 3rd instant I made inquiries at the village of Tipurapentaneed and found a man who was employed from the commencement to the finishing of the borings under Mr. Vanstavern; he also took me to the exact spot marked E as shown on plan and showed me the above soil as mentioned, and states that was what came up with the auger; he also pointed to a tree where they cooked their meals, which is only 10 yards from the spot. I intend to sink the shaft at the place pointed. I have already commenced getting stores on the spot to commence work.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 23rd August 1880, No. 1,434.

Report No. 1 on progress of work at Bhadrachalam coal fields to 14th August 1880.

THE sheds having been erected and necessary machinery moved up to site for shaft, actual sinking was commenced on 12th August, and up to 14th depth gone down to was 4 feet 6 inches.

No. 393, dated 3rd September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 3rd September 1880, No. 1,587.

Report No. 2 on progress of work at Bhadrachalam coal fields from 15th to 28th August 1880.

SHAFT sunk from 4 feet 6 inches to 15 feet; soil passed through chiefly "blue and eyllow clay" with kunkur; sand stone just reached; some trouble given by water after heavy storms. Party apparently not working quite satisfactorily. Will be visited soon.

No. 450, dated 17th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 16th September 1880, No. 1,721.

Report No. 3 on progress of work at Bhadrachalam coal fields from 28th August to 15th September 1880.

SHAFT sunk from 15 to 34 feet; soil passed through chiefly yellow sand stone compact *in situ*, but breaking up easily when dug out. Pump arrangements fixed.

No. 490, dated 30th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 22nd September 1880, No. 1,722.

I HAVE the honor to inform you that I have on 15th, 20th and 21st instant inspected the work at the Bhadrachalam coal fields, and I find that, though going on slowly, it is being well done.

2. The shaft has now been sunk to a depth of 39 feet and water has just been reached.

3. The first 5 feet passed through was ordinary alluvial and vegetable soil; then came for 10 feet yellow clay, about the lower 5 feet of which was mixed with kunkur; then for 14 feet 6 inches yellow sand stone compact and hard *in situ*, but disintegrating when removed to the surface; and below this to the 39 feet depth a light blue clay chiefly "pipe clay" with at 38 feet a stratum of a few inches of sand stone.

4. Through this last thin stratum of sand stone water has commenced to come in slowly. At 4 p.m. on 20th I saw the bottom of the shaft practically cleared of water, and at 6 a.m. (21st) 1 foot 8 inches in depth had accumulated.

5. The Abyssinian pump sent from Madras has been fixed and works well, clearing such water as is now coming in with perfect ease.

6. The party is well housed and has kept in fair health. Corporal Nicks and some of the men have had rheumatism, one or two have had slight fever, and the Naigue who went up with the party has been sent back to Dowlaiswaram with bad ulcers on his feet, and he has been replaced by another man.

7. There have been no accidents, and I am quite satisfied with the care taken by Corporal Nicks, who is in immediate charge of the operations. I cannot say I am quite satisfied with the rate at which the work has been carried on, but native Sappers, it appears to me, do not generally work rapidly.

No. 506, dated 5th October 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 5th October 1880, No. 1,843.

Report No. 4 on progress of work at Bhadrachalam coal fields from 15th to 30th September 1880.

SHAFT sunk from 34 to 44 feet; soil passed through, sand stone, with layers of light blue clay, chiefly pipe clay; water coming in quickly. Pump, "Abyssinian," has now to be worked night and day.

2. The Corporal in charge reports that his detachment is working unsatisfactorily, and that "if the sepoys are required to work in the shaft or at the winch they report themselves sick."

3. It seems likely that these men are behaving as they are with the object of being sent back to their Company, which they think may soon be sent to Bangalore; it would, I think, be well to let them know for certain that they will not be sent away from the work till it is finished, and that if they are sick they will have to go into hospital at Rajahmundry and when discharged return to the work. Eight coolies are now employed to assist the detachment.

No. 2,331.

THE Chief Engineer concurs with the Superintendent of Works that it will be advisable to let the Sappers distinctly understand that they will not, by malingering, be enabled to desert the work which they have been sent up to carry out.

2. When sick they may be sent to the hospital at Rajahmundry as proposed.

(By Order.)

(Signed) J. PENNYCUICK, Major, R.E.,
Deputy Chief Engineer, P.W.D.
18th October 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Yernagudem, 20th October 1880, No. 2,006.

Report No. 5 on progress of work at Bhadrachalam coal fields from 1st to 15th October 1880.

SHAFT sunk from 44 to 50 feet; soil passed through, sand stone, said to be hard, with thin layers of clay.

2. Slow progress due to large quantities of water to be dealt with, and the Corporal reports that the Abyssinian pump can no longer keep the water down, and no further sinking can go on till the steam pump is at work. This is expected daily.

No. 2,422, dated 2nd November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th November 1880, No. 2,641 W.

Proceedings of the Madras Government, Military Department, dated 13th November 1880, No. 7,102.

Telegram from the Superintendent of Works, Godáviri, to the Public Works Department, Madras, dated 26th October 1880.

"Another Non-Commissioned Officer to help Corporal Nicks, often ill, and Dresser for coal party much wanted."

TRANSFERRED to the Military Department, with a request that it may be stated whether any Non-Commissioned Officer can be sent from the "Queen's Own" Sappers and Miners for the purpose.

OOTACAMUND, 29th October 1880. (Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From the Adjutant-General, dated 10th November 1880, No. 499.

WITH reference to a telegram from the Superintendent of Works, Rajahmundry, dated 26th October 1880, transferred to the Military Department under Public Works Department No. 601 of 26th ultimo, and referred to His Excellency the Commander-in-Chief under Government endorsement memorandum No. 6,887 of 30th idem, herewith returned as requested, I have the honor, by order, to state that there is no objection to the services of Corporal B. Fuller, R.E., being placed at the disposal of Government in the Public Works Department for employment at Rajahmundry.

ORDER.—The Adjutant-General's letter communicated to the Public Works Department.

(True Extract.)

(Signed) J. MICHAEL, Colonel,
Secretary to Government, Milly. Dept.

ORDER THEREON, No. 2,641 W., dated 18th November 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

2. It is requested that the services of Corporal Fuller may be made available as early as possible.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 30th November 1880, No. 2,674.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 4th November 1880, No. 2,254.

Report No. 6 on progress of work at Bhadrachalam coal fields from 16th to 31st October 1880.

SHAFT sunk from 50 feet to 55½ feet; sand stone passed through to 55 feet, then a layer of clay. Below this it has been impossible to go with the Abyssinian pump and the steam* pump must be awaited.
* Arrived at Dowlaishweram, 2nd Nov. 1880.
Despatched by steamer to Golagudiem, 4th November 1880.

Firewood is being collected for the engine.

The Corporal in charge of the party has been suffering from dysentery and fever, and it appears that without his personal presence on the work it does not go on properly; another Non-Commissioned Officer is therefore very necessary, especially as pumping will have to be kept up at night. The unhealthiness of the place at this time of the year and the possibility of accidents make it also highly advisable that a Dresser should be attached to the party. Telegram of 26th October asking for another Non-Commissioned Officer and a Dresser was therefore sent.

Telegram from the Secretary to Government, Public Works Department, Madras, to the Superintendent of Works, Godáviri, Rajahmundry, dated 16th November 1880.

"Does further experience show that a Dresser for the coal party is still essential?"

Telegram from Superintendent of Works, Godáviri, Rajahmundry, to the Secretary to Government, Public Works Department, Madras, dated 17th November 1880.

"HEALTH of coal party better, since rain stopped. May do without Dresser."

ORDER THEREON, No. 2,674 W., dated 30th November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd December 1880, No. 2,708.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 18th November 1880, No. 2,401.

Report No. 7 on progress of work at Bhadrachalam coal fields from 1st to 13th November 1880.

THE steam pump arrived at Golagudiem on 6th, and since then the party have been fully occupied in taking it, and the engine to work it, to the shaft and setting it up; the Corporal in charge reports that "the work is proceeding in a satisfactory manner."

2. Lieutenant Gale, R.E., visited the party on the 6th and 7th, and the Corporal in charge reports that since that visit and the change of Havildars which was then made the detachment has been working better than it had been working for some time previously.

3. The health of the party is better than it was, and it is thought that now it may get on without a Dresser, though of course it would be safer to have one on the spot, and another Non-Commissioned Officer to assist Corporal Nicks is very necessary as mentioned in the last report.

ORDER THEREON, No. 2,780, dated 3rd December 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd December 1880, No. 2,934 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 2nd December 1880, No. 2,554.

Report No. 8 on the progress of work at the Bhadrachalam Coal-field.—13th to 30th November 1880.

THE party have been engaged in keeping water down in the shaft with the Abyssinian pump and setting up the steam-pump and its engine. No further sinking has been possible in the period under notice.

2. The Corporal in charge again reports, "there is a great deal of sickness among the detachment. Fever is very prevalent."

ORDER THEREON, No. 2,934 W., dated 22nd December 1880.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 10th January 1881, No. 38 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Wuddigudem, 16th December 1880, No. 2,751.

Report No. 9 on the progress of work at the Bhadrachalam Coal-field.—1st to 15th December 1880.

THE steam-pump was set to work on the 8th. There were then "18 feet of water in the shaft," and "it took 2 hours 35 minutes to pump dry;" owing, however, to extra framing, &c., being found necessary, actual work of excavation was not recommenced till 13th.

2. On the 15th the undersigned inspected the work. The shaft was down 56 feet, it was in good order and the pump going dead slow was keeping it clear of water.

A layer of clay (chiefly pipe-clay) had just been reached through which water was coming in freely.

The water has for some time past been sensibly affected by variations in the level of the river, which is now low, though not so low as it will be. It is impossible to say whether the one pump will be able to deal with the water which will be met with in the next 100 feet, and it will probably be advisable to have another ready; it could be driven by the same engine and driving machinery.

3. The huts were being moved up to near the shaft.
4. Ninety cubic yards of firewood for the engine have been cut.
5. The health of the party is not good, there are generally one-third or so of the sepoys down with fever, but it does not appear to be of a virulent type.
6. Corporal Fuller, R.E., has now (on 15th) joined the work.
7. No steamer will be able after this to get to Gollagudem, and probably not even to Wuddigudem till next June or July.

ORDER THEREON, No. 38 W., dated 10th January 1881.

THE Government consider that the additional pumping power referred to in paragraph 3 of the foregoing letter should be provided. The Superintendent of Works, Godáviri, will arrange accordingly.

2. The work being unhealthy should be pushed on as rapidly as possible.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 14th January 1881, No. 96 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 7th January 1881, No. 2,927.

Report No. 10 on the progress of works at the Bhadrachalam Coal-field.—16th to 31st December 1880.

- (1.) Shaft deepened by 8 feet to 64 feet.
- (2.) Soil passed through "different kinds of clay."
- (3.) Removal of huts to site of shaft finished.

ORDER THEREON, No. 96 W., dated 14th January 1881.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 25th January 1881, No. 195 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 10th January 1881, No. 2,966.

I HAVE the honor to send herewith a letter from Corporal Nicks, R.E., in charge of the coal operations near Bhadrachalam, reporting the inrush of a large volume of water into the shaft.

2. Till this occurred all seemed to be going on well, though slowly.

3. I have told Corporal Nicks to again rig up the Abyssinian pump and see if with it he cannot get the water down low enough to get at the steam-pump box and again set it going, and then if the two will keep the water down sufficiently low it is possible that by putting in specially prepared cylinders we may be able to get through the treacherous stratum which has led to the present mishap; but if water with our present appliances cannot be kept so low, another pump more powerful than the present one, with machinery and engine to drive it, must be sent up.

4. Such machinery and engine however could not be got to the place before the next season of freshes in the river, say next July, and should it be found quite impossible to deal with the water with the present appliances I would request instructions as to what in the interval is to be done with the Sapper coal party.

From Corporal F. NICKS, R.E., to the Superintendent of Works, Godávári, Dowlaishweram, dated Gollagudem, 5th January 1881, No. 118.

On Tuesday evening we were deep enough for 9th ring, and on Wednesday morning myself and Corporal Fuller started putting in same, as the soil was very treacherous it not being safe to trust sepoys; we had a slip of earth from the north side of shaft at about 11 A.M. We started then to plank that portion, as we had put in on (4) four plining (sic) planks and placed ring, we worked on and had placed four planks in the north quarter; we then noticed the water gradually rise, and the pump would not keep it down. I then sent Corporal Fuller up to ascertain if the engine was under proper steam, he informed me as he was coming down in bucket that steam gauge indicated 25 lb. As I was in the act of guiding the bucket down the water burst in from the south-west side, bringing with it a large quantity of "clay," about one-quarter yard, which knocked me down. Corporal Fuller said to me we had better take all tools up with us, but before he could get out of the bucket the water rose to my waist. I then said, never mind the tools we must get above the water in case the rings in upper work give way, as I had put my arm in where water was rushing from and found a large hole about 6 inches by 2 feet, so the clay could not be more than 1 foot 6 inches thick in front of the hole we had previously left, a berm of 6 inches in other work and considering this work was very dangerous we left a berm of 1 foot 3 inches.

We then cleared out of shaft as soon as possible with the water rising at the rate of 1 foot per minute, leaving all tools at bottom as we could not get at them for the water. I also kept engine at work till 10-25 P.M. making 25 strokes per minute, but the water still kept rising.

Rise of water	4-10 P.M.	No water more than ordinary.	5th January 1881.
Burst in at	4-15 P.M.		
7 feet	4-25 "		
21 feet 3 inches	5-50 "		
26 feet 8 inches	7-50 "		

Whilst taking measurement at 10 P.M. the pump gone out depth of water at the above time 29 feet 4 inches. I then gave orders to engine driver to draw fire, I then emptied boiler as I had been under steam near 400 hours.

At present we cannot get pump clear as working box is under water, the only remedy will be to get another set of top gear pipes and pump rods; if it is the Godávári which is broke in upon us, which I think it is, it will be useless. 11-30 P.M.

I took measurements at 11-35 and found 33 feet 4 inches and at 7 A.M., the 6th, and found 38 feet 8 inches.

Please give me further instruction in answer to this.

ORDER THEREON, No. 195 W., 25th January 1881.

THE Superintendent of Works, Godávári, has already been authorised* to arrange * G.O., No. 38 W., dated 10th January 1881. for the provision of additional pumping power.

2. The Government await a further report before passing orders on the subject of paragraph 4 of the letter above read.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Yanam, 19th January 1881, No. 3,073.

In continuation of my No. 2,966, dated 10th instant, I have the honor to state that Corporal Nicks reports that in spite of all efforts it has been found impossible to raise the pump to get at the upper box and working barrel, and that at noon on the 6th the water had attained the "height of 40 feet" since which it has not varied.

2. It is evident, therefore, that another and more powerful pump must be provided if the work is to be persevered with.

Telegram to the Superintendent of Works, Godávári, Rajahmundry, dated 27th January 1881, No. 193.

MORE powerful pump for coal workings sanctioned. Arrange for one at once.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd February 1881, No. 308 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated 28th January 1881, No. 3,185.

Report No. 11 on the progress of work at the Bhadrachalam Coal-fields.—1st to 15th January 1881.

WORK progressed steadily till 5th, when the shaft was down 69 feet, water in large quantities then came in and overpowered the pump (see letters Nos. 2,966, 10th January 1881, and 3,073, 19th January 1881, to the Chief Engineer), and on the 15th there were 40 feet 4 inches depth of water in the shaft.

2. The Abyssinian pump which had been taken away and put on the barge was again taken to the shaft, and its placing commenced with the hope (a faint one) that with it the water can be so lowered that it may prove possible to get at the steam-pump boxes and set it going again. (See paragraph 3 of letter No. 2,966, 10th January 1881, to Chief Engineer.)

ORDER THEREON, No. 308 W., dated 3rd February 1881.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd February 1881, No. 493 W.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 31st January 1881, No. 3,225.

WITH reference to your telegram of 27th I have the honor to report that I have no means of here arranging for a more powerful pump for the coal shaft, and can only suggest that one may be supplied from the workshops at Madras or obtained from England.

2. Having had no experience in the work for which the pump is required, and having no one here who has had such experience, I cannot state with any certainty what is the nature and power of the pump required, and it seems therefore that it is best for me to explain the conditions of the case and from them possibly some Mining Engineer or manufacturer of mining machinery will be able to decide what is wanted. The conditions are these—

3. (a)—The shaft is 6 feet 3 inches diameter.
- (b)—It is sunk at about 1 mile from the edge of the Godávári.
- (c)—The substrata already passed through (to 69 feet depth) have been almost entirely yellow sandstone, alternating with bands of yellowish and greyish clay, chiefly pipe-clay, and the boring shows that the general character of the strata to be yet passed through will be similar, but with fewer bands of clay, down to about 120 feet, when shale and coal will be met with.

(d)—Down to 55 feet there was but little water, but at that depth the Abyssinian pump could no longer deal with it, and the steam-pump sent up from the Madras Workshops was put up; whilst doing this (it occupied some days) the water rose 18 feet, this the pump when set to work cleared out in 2 hours 35 minutes.

(e)—This pump, driven by an old 8 horse-power engine, kept the water down easily enough till the shaft had reached a depth of 69 feet, when there was a sudden inrush through

• For the first 7 feet came in at the rate of a stratum of pipe-clay and the water rose 29 feet 4 inches in 5½ hours against the pump going 22 strokes a minute. The pump then got choked and

See copy of letter from Corporal Nicks, No. 118, the water rose another 10 feet 8 inches, that is 40 feet

in all (or to 29 below top of shaft) in another 14 hours and at that level it has stood.

(f)—The shaft has to go down to a total depth of about 150 feet.

(g)—The river—the variations in level of which have been noted to affect the water in the shaft—rises in the season of floods (from June to October) from 15 feet to 20 feet or so above its present level, or approximately to from about 10 feet to 15 feet below level of top of shaft.

(h)—As most of the soil to be passed through is sandstone, much sharp sand comes up with the water, and it has been found to rapidly wear away any leather it comes in contact with, such as “buckets,” valves, &c.

4. As already stated in my No. 2,966, 10th January 1881, paragraph 4, machinery or apparatus of any kind, weighing more than could be carried by two coolies, could not be got to the shaft till next July, because it could not be taken by water much if at all beyond Koide, some 34 miles below Gollagudem, and between the two places there is no road, only a jungle track, which in places passes over rocky slopes of hills.

P.S.—As all pumps occasionally get out of order and all engines require to be stopped now and then, it will be highly advisable, if not necessary, to have two pumps and two engines, and it is of course of great convenience that the working parts of the pump should be easily raised or got at.

From the same officer, dated 6th February 1881, No. 3,294.

Report No. 12 on the progress of work at the Bhadrachalam Coal-field.—16th to 31st January 1881.

The Abyssinian pump (see paragraph 2 of last report) was fully rigged up by 19th, and pumping then commenced with it; by 24th the water had been reduced 11 feet, or to 29 feet in depth, and then the working part of the steam-pump was got at.

2. The leather “buckets” which had worn out (they are constantly wearing out owing to the action of the gritty sand, see paragraph 3, (g.), No. 3,225, 31st January 1881), were renewed and the pump was started again on 25th; by the evening of 27th it had reduced the water by 8 feet, or to 21 feet, in depth, below which it could not reduce it, and the leathers having again worn out it had to be stopped for a time, when the water immediately rose against the Abyssinian pump to 30 feet 7 inches depth.

3. It is quite evident that with the present pumping power it will be impossible to recommence sinking operations.

4. There can be little doubt that the water in the shaft is in communication through some permeable stratum with the water in the river, and that enormously powerful machinery and a very great expenditure will be necessary to enable the shaft to be sunk to where it will reach the shale and inferior coal which borings and geological researches have established to exist in small quantities in the locality.

ORDER THEREON, No. 493 W., dated 22nd February 1881.

THE Right Honorable the Governor in Council considers that before any further expenditure is incurred the opinion of an expert in mining matters should be obtained. The Chief Engineer has, it is understood, written to Calcutta to inquire whether the services of any qualified person can be secured.

Meanwhile the work should be suspended.

2. Orders have already been issued to the Superintendent of Works, directing the Sappers to return to their Company.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 542 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 11th February 1881, No. 3,370.

FURTHER information has shown me that I was wrong in supposing that when water burst into the coal shaft at Bhadrachalam it came in at the rate of “630 gallons a minute,” as stated in the margin, paragraph 3, clause (e) of my No. 3,225, 31st January 1881; it came in at the rate approximately of 200 gallons a minute.

2. I would take this opportunity of asking for early orders on paragraph 4 of my No. 2,966, 10th January 1881.

ORDER THEREON, No. 541 W., dated 28th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 541 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 17th February 1881, No. 3,463.

Report No. 13 on Bhadrachalam Coal-field work.—1st to 15th February 1881.

As stated in last report it is quite impossible to proceed with the work, and it therefore has been at a complete stand-still during the last fifteen days.

ORDER THEREON, No. 542 W., dated 28th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th March 1880, No. 698 W.

Read the following paper:—

MINUTE BY HIS GRACE THE GOVERNOR.

THE question of getting access to coal in this Presidency for railway and navigation purposes is a very important one.

2. That coal exists in the Nizam's territory, between the Godáviri and Kistna, is well ascertained, and the quality of that recently obtained and tried, although the results are not yet accurately calculated, show that the coal is of a good, useful description, and reported by the Public Works Workshops as quite equal to the ordinary Indian coal they have in use. It becomes a question of price.

3. Coal is wanted for railway and steam purposes at Madras, for the navigation of the Godáviri and at Cocanada, and will no doubt be also consumed on the canal.

4. It has been ascertained that coal exists on the Godáviri river on the British side, and some coal raised from the dry bed of the river has given "good results" in the Godáviri steamers. The quality of the coal, as tested by boring with small bores, is necessarily uncertain. Some is spoken of as fair, some as inferior; but it is close to the river, and the ground apparently not costly to sink in. If, as estimated by Mr. Vanstavern (who was especially employed upon the coal investigation), the coal seams can be reached by a shaft for an amount of under Rs. 2,000, it would be a matter to be tried at once without doubt; but I would put it higher, and taking the estimate above given, I would make allowance for pumping, ventilating and levelling, say that the trial should be considered as not to be effectually made under a possible Rs. 5,000; say at No. 16 bore, where the coal is within 150 feet from surface and about 18 feet thick, and the shaft only 1 mile from river, but above flood lines.

5. Coal in such a situation ought to be sufficient and economical for all purposes of steam engines on the river and delta and also at Cocanada, as its price must be low from the freight being entirely water and down-stream, so that an extra quantity might be used. How much further it could be carried can only be really known by actual test.

6. The opening of coal at this spot would doubtless stimulate the opening on the Nizam's side.

7. In ordinary times I should not hesitate to recommend the expenditure necessary to reach and test the coal seams, and even in the present times it seems to me desirable to do so. If the coal sufficed only for Godáviri use, the cost would not be wasted.

8. The opening of any coal operation would tend to develop and thus to pacify the country around.

9. The question to be decided then is—

Shall Government endeavour, at a cost which may reach Rs. 5,000, to open the coal already ascertained to exist?

10. If that be agreed then the Chief Engineer should suggest the arrangements, and the co-operation of Mr. Vanstavern should be secured, for his local knowledge and long experience of the district.

11. The working season is from now to June.

5th January 1880.

(Signed) BUCKINGHAM AND CHANDOS.

N.B.—The original maps, sections and memoranda should be returned to Mr. Vanstavern, as they are only lent. I could not trace the copies in Government possession—possibly lost.

ORDER THEREON, No. 698 W., dated 18th March 1880.

THE Revenue Department will arrange to place at the disposal of the Public Works Department the sum of Rs. 5,000 from the accumulated Cattle Trespass Fund for certain experiments on coal-boring operations in the Godáviri district.

2. This amount will be recouped when necessary for the farm purposes later on.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

No. 859.

MEMORANDUM.

HIS GRACE the Governor in Council having decided to make an early commencement with sinking a shaft for working a coal seam, whose existence has been proved at a point midway between Bhadrachalam and Rékapalle on the left bank of the Godáviri, the undersigned is desired to inquire whether His Excellency the Commander-in-Chief thinks that a party consisting of, say, two European Non-Commissioned Officers and a Havildar and Naigue with fourteen Sappers, who are acquainted with mining could conveniently be spared from the Companies of the "Queen's Own" Sappers and Miners which are now attached to the force under the command of Colonel Buck.

2. Their employment in sinking the shaft required might possibly extend to six months.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.
15th March 1880.
To the Secretary to Government, Military Department.

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 20th March 1880, No. 213.

WITH reference to your docket memorandum,* No. 1,771, dated 16th March 1880,
* Herewith returned. I have the honor to inform you that the Officer Commanding, Sappers and Miners at Dowlaiswaram, has been directed to detach two British Non-Commissioned Officers with a Havildar and Naigue and fourteen Sappers for the purpose of sinking a shaft in the Godáviri district.

2. It is of great importance that these men should not be exposed in tents during the hot season, and His Excellency trusts that Government will see the necessity of having thatched huts for the natives, and suitable erections for the shelter of the British Non-Commissioned Officers employed.

No. 1,964.

TRANSFERRED to the Public Works Department, with reference to its memorandum, No. 859, dated 15th March 1880.

(By Order.)

FORT ST. GEORGE, (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
25th March 1880. Acting Secretary to Govt., Mily. Dept.

No. 972.

MEMORANDUM.

THE Chief Engineer has the honor to forward, for the information of the Superintendent of Works, Godáviri, a copy of a Minute by His Grace the Governor regarding coal-boring explorations on the British side of the Godáviri river, with copies of the correspondence that has passed on the subject.

2. On receipt of an intimation from Mr. Vanstavern that he has no objection to the free use of the plans, &c., borings can be commenced. As it is understood that the working season will only last for about two months longer, every exertion should be made.

3. Meanwhile, in accordance with the wishes of His Excellency the Commander-in-Chief, proper shelter for the British Non-Commissioned Officers employed and thatched huts for the natives should at once be provided.

4. Mr. Walch's attention is invited to Lieutenant Baddeley's letter of the 15th March, in case the requisite machinery, &c., cannot be got from the Dowlaiswaram shops.

(Signed) R. H. SANKEY, Col., R.E.,
Chief Engineer, P.W.D.

31st March 1880.

To the Superintendent of Works, Godáviri.

Proceedings of the Madras Government, Public Works Department, dated 14th April 1880, No. 960 W.

Read the following paper :—

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 2nd April 1880, No. 250.

IN continuation of Adjutant-General's letter, No. 213, dated 20th March 1880,

1 Havildar.
1 Naigue.
14 Privates.

I have the honor, by order, to state that the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaiswaram reports that the party, as

per margin, is in readiness to proceed under the orders of the Public Works Department.

2. There are no European Non-Commissioned Officers with the Detachment.

No. 2,117.

TRANSFERRED to the Public Works Department, in continuation of No. 1,964, dated 25th March 1880.

FORT ST. GEORGE, (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
3rd April 1880. Acting Secretary to Govt., Mily. Dept.

ORDER THEREON, No. 960 W., dated 14th April 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 21st April 1880, No. 996-A W.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 6th April 1880, No. 84.

I HAVE the honor to acknowledge the receipt of your memorandum No. 972, dated 31st ultimo.

One Indent in triplicate.

2. As you will have seen from my letter No. 701, dated 31st March 1880, and its enclosure, I have no officer or upper

subordinate whom I can send for the coal operations, and the Officer Commanding the Detachment of the "Queen's Own" Sappers and Miners here has no European Non-Commissioned Officer.

3. In paragraph 10 of the Minute by His Grace the Governor it is said that "the co-operation of Mr. Vanstavern should be secured," and it seems to me that it would be advisable, as he lives not far from where the operations are to be carried on and has had some experience in such work, to employ him on a salary to superintend the work, but I have no authority to open negotiations officially with him on the subject, or to make him any offer.

4. The steamers cannot now go up the river further than Koide (52 miles), and only boats of very small draft can get from there to where the operations are proposed, some 35 miles further.

5. There are no pumps here at all suited for deep shaft sinking, and I enclose an indent for such a pump and machinery to drive it, which, if approved, please send on to the Government workshops, Madras. If the pump be sent it should be accompanied by a Maistry who understands its working.

6. I think if you will consider all the circumstances of the case you will see that there is no probability of the work being done in the "two months" mentioned in paragraph 2 of your memorandum under notice.

From Lieutenant W. L. C. BADDELEY, R.E., General Superintendent of Public Works Workshops and Stores, Madras, to the Secretary to Government, Public Works Department, dated 15th March 1880.

We have two deep well pumps in store which would be suitable for working a shaft 80 feet in depth.

2. The five-inch lift pump which we made for the Ooregum Company is a good pattern for deep shafts, and we could make up these very soon if required.

3. One of the Workshop Maistries would be available to look after the pumping machinery, but there is no one here who understands anything about mining.

4. If Dowlaiswaram cannot provide the engines, we can spare a 4 horse-power portable or any number of Gwynne's or Nasmyth's 4 and 6 horse-power engines and boilers combined. These also could be made fairly portable by fitting them on a stand with wheels.

5. We have no machinery for working or lifting coal, but probably there would be no difficulty in making up any ordinary appliances.

ORDER THEREON, No. 996-A W., dated 21st April 1880.

THE Superintendent of Works, Presidency, will at once direct the General Superintendent, Public Works Workshops, to despatch one of the deep well pumps mentioned by him as suitable for a shaft 80 feet deep to the Superintendent of Works, Godáviri, along with one of the Workshop Maistries for looking after this and such other machinery as it may be found necessary to send for unwatering the coal shaft.

That officer should also be directed to place himself without delay in correspondence with the Superintendent of Works, Godáviri, relative to any steam pumping or other machinery that may be deemed necessary for sinking the shaft below 80 feet.

2. The Superintendent of Works, Godáviri Division, is authorised to make arrangements with Mr. Vanstavern for directing the operations, preferably fixing a definite sum on the shaft being sunk to the bottom of the seam indicated by the borings, and reporting the terms as soon as possible for the information of Government.

3. The original borings having been executed during the monsoon, His Grace, in Council has no reason to suppose that the work need now be subjected to any delay

on account of the season, and as he attaches the greatest importance to the sinking of the shaft, no efforts should be spared to effect that object at the earliest date.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 27th April 1880, No. 1,035 W.

Proceedings of the Madras Government, Military Department, dated 14th April 1880, No. 2,404.

Read the following papers:—

Proceedings of the Madras Government, Public Works Department, dated 7th April 1880, No. 893 W.

Read letter from the Superintendent of Works, Godáviri, dated 30th March 1880, No. 701.

I HAVE the honor to enclose copy of a letter received this day from the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaiswaram, and to request instructions.

2. I would point out that the district is shorthanded, that just at this season there is a great amount of work in connection with the anicut and head works, canals, &c., which has to be compressed into a very short time; and I trust, therefore, that no one will have to be taken away from such work to carry out the "hutting," &c., referred to by Major Hamilton, and which it appears to me the men might carry out themselves.

3. I do not know where the Kottapalle referred to is.

From the Officer Commanding Detachment "Queen's Own" Sappers and Miners, to the Superintendent of Works, Godáviri, dated 29th March 1880, No. 209.

WITH reference to letter, No. 822, dated 20th March, from the Adjutant-General (copy annexed for your information), I have the honor to report that the party, consisting of one Havildar, one Naigue and fourteen Privates, is in readiness to proceed up the river under your orders. There are no European Non-Commissioned Officers with this detachment.

2. I presume that you will supply all necessary tools.

3. The party will have to be hutted by the Public Works Department.

From the Officiating Adjutant-General, to the Officer Commanding "Queen's Own" Sappers and Miners, Dowlaiswaram, dated 20th March 1880, No. 822.

At the request of Government in the Public Works Department the Commander-in-Chief has sanctioned the services of a party of two European Non-Commissioned Officers, a Havildar, Naigue and fourteen Sappers, who are acquainted with mining, from the companies attached to the force under Colonel Buck, for employment in sinking a shaft for working a coal seam between Bhadrachalam and Kottapalle on the left bank of the Godáviri, and you are requested to detach the above party for this purpose.

UNDER the circumstances explained in Mr. Walch's letter, the detachment will provide hutting accommodation for themselves, the usual allowances being granted by the Military Department.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secretary to Govt., P.W.D.

To the Military Department.

ORDER,—Communicated to His Excellency the Commander-in-Chief.

2. Under O.G. (Military), No. 356, dated 30th January 1872, all special charges, including cost of hutting, incurred on account of Sappers employed on purely civil works, form a debit against the Public Works Department.

(True Extract.)

(Signed) H. N. D. PRENDERGAST, Col., R.E.,
Ag. Secretary to Government, Mily. Dept.

ORDER THEREON, No. 1,035 W., dated 27th April 1880.
COMMUNICATED to the Examiner of Public Works Accounts.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Military Department, dated 16th June 1880, No. 3,763.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri District, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 27th May 1880, No. 547.

I HAVE the honor to inform you that immediately on receipt of G.O., No. 996-AW., dated 21st April 1880, I put myself in communication with Mr. Vanstavern, and enclose copy of my last letter* to him to which I have received the enclosed reply, in which I am sorry to say he declines to undertake the superintendence of the coal shaft sinking for the reason which he states in a private letter.

That reason being that he thinks it probable that private affairs may render it necessary for him to leave the country before it would be possible to complete the shaft.

2. I am now at a loss to know how to carry out the wishes of Government as regards the speedy sinking of the shaft. An extra Overseer having come (see my No. 519, of 24th May 1880) I could send him, but he knows nothing of the kind of work, and it is doubtful if the working under him of the Sappers, whom it is proposed to send, would be smooth, and I would recommend that a Non-Commissioned Officer of the Sappers and Miners should be sent for the work.

3. Mr. Vanstavern states that, though borings could be got down during the rains and when the river was high, the difficulties and expense of sinking a shaft would, he is sure from a knowledge of the place, be much greater than in the dry season, as water would be met with at a much higher level and in much greater quantities.

No. 126.

REFERRED to the Military Department, with request that it may be ascertained if the services of any Non-Commissioned Officer of Sappers (European) acquainted with mining or shaft sinking can be placed at the disposal of this department for directing the operations as suggested by Mr. Walch. If such a Non-Commissioned Officer can be found, it is requested that he may be directed to proceed at once to the spot.

(Signed) R. H. SANKEY, Colonel, R.E.,
5th June 1880. Secretary to Government, P.W.D.

From the Adjutant-General, No. 173, dated 14th June 1880.

In returning Military Department memorandum No. 3,561, of the 7th current, I have the honor, by order, to inform you that the services of Corporal Nicks of the

"Queen's Own" Sappers and Miners are available for the Godáviri coal shaft. He is stated to be zealous and by trade a "Fitter."

ORDER,—Ordered that the Adjutant-General's letter be communicated to the Public Works Department.

2. His Excellency the Commander-in-Chief is requested to cause Corporal Nicks to be detailed at once for the duty.

(True Extract.)

(Signed) J. MICHAEL, Col.,
Secy. to Govt., Mily. Dept.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 28th July 1880, No. 1,164.

WITH reference to our inspection of the proposed site for coal shaft on 22nd instant, I have the honor to forward tracing from plan of survey which I then ordered to be made.

2. I append the orders now issued to the Corporal in charge of the party with reference to this survey.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to Corporal F. NICKS, Golagudiem, dated 28th July 1880, No. 1,163.

WITH reference to the accompanying plan a report ought to have been sent stating whether there are any indications that point E., said to have been shown by villagers as site of bore-hole No. 16, is really the site.

2. If there be not any trustworthy indications that it really is so, the shaft is to be sunk at point A., or should that be in a local depression where trouble will be given by surface drainage, at some convenient point between it and D.

NOTE.

WITH reference to the annexed letter No. 1,164, of the 28th July 1880, from the Superintendent of Works, Godáviri, on the subject of the coal sinkings, I beg to offer the following brief remarks, having lately had the opportunity of inspecting the site of the operations in company with Mr. Martindale and Mr. Walch.

2. Leaving Dowlaishweram on morning of the 21st ultimo, Mr. Walch and I taking the new steam launch, *Arthur Cotton*, were enabled to pass very nearly through the Godáviri gorge before anchoring for the night, although the current was strong, 5·3 feet in depth, passing over the crest of the anicut.

3. Next morning picking up Mr. Martindale at Woodagudiem, we arrived at the site of the coal operations about noon, and spent some five or six hours in inspecting the locality and chiefly in endeavouring to find out the precise position of bore-hole No. 16, at which point, owing to the promising results of the previous borings, it had been decided to sink the shaft.

4. We found Corporal Nicks with his fourteen Sappers encamped at Golagudiem (*Golagaram* of the Indian Atlas), the party were well and sufficiently provided with shelter till the new shed 80 feet x 18 feet now sanctioned (and for which corrugated iron sheets have been brought down from the spare stores at Dumagudiem) has been run up, as it will be immediately.

5. In addition to an ample supply of tools of all kinds there was ready a pump which will, I hope, answer all purposes till a depth of 80 feet has been reached, when

one driven by steam now preparing at the Madras workshops will be sent up for unwatering the shaft at greater depths.

6. Twenty horizontal circular frames of angle iron, sufficient if spaced at 5 feet apart to reach to a depth of 100 feet, were also on the ground. If stiff soil or rock be met with, these may be spaced at greater intervals or omitted altogether and answer for 150 feet in depth, but in any case Mr. Walch can readily send up all that is needed in this respect from Dowlaishweram.

7. Mr. Martindale, who takes a kindly interest in the work, will see that the party have ample and good supplies, and if, as I hope, the men only keep their health, the work should progress favorably, though it is at the same time to be feared that, particularly at this season, water may be met with close to the surface, and difficulties on this account may delay operations.

8. Corporal Nicks had explored nearly all the area of previous operations, but had failed to discover the precise location of bore hole No. 16. Most of the sites of the other bore holes as pointed out by the villagers had been marked by a rough block of red sand stone, but in this particular case no indication could be found and it was thus fortunate that we were able to visit the place at this time.

9. From there not being a single definite point or bearing given on the survey whereby to recognise the old holes, and from these having been mere punctures and easily obliterated, it was necessary to fix the point in question by as many approximations as we could. The result is shown by the tracing now sent up by Mr. Walch. Our approximations led us to decide on the point A., and it would now appear from subsequent information received from the villagers (probably those of Totapilly, who we were informed had been engaged on this particular portion of the old work) that the point E. at no great distance from A. is the true point.

10. I feel assured that in no case will the point selected here be much out, though, of course, it would have been very much more satisfactory to find the exact locality.

Mr. Walch's present decision as conveyed to Corporal Nicks may therefore, I think, be safely accepted.

11. The whole country about is rather undulating, clayey, with bushy jungle here and there, and well raised above the river, but showing from the moisture which lodges in the lower portions, that at this season much water may have to be encountered in sinking the shaft.

12. It would, of course, be premature to say much about the results of these operations, but if Mr. Vanstavern (whom I met at Woodagudiem, but who owing to illness was unable to accompany me to the coal field) is to be credited, the coal is likely to turn out very shaley. The best specimen, he informed me, only yielded 30 per cent. of carbon, and the worst 9 per cent.

13. As regards the proper designation of this coal field, there is some doubt. Totapilly, by which it appears to have been first known, though shown on the atlas, is a very insignificant village and at a distance from our present workings. Tiperpenti (Tipurapentaneed of the tracing) is not shown on the atlas, and is also both insignificant and at some distance. If the field is to be called after any of the neighbouring villages, Golagudiem, where the camp is and which is both shown on the atlas and is on the river bank, would be the most appropriate designation.

14. But to the best of my judgment it would be preferable to call it the Bhadrachalam field, as it is sufficiently near to this, which is certainly the best known and most important place in the neighbourhood.

15. If the Government approve, therefore, I would in all future correspondence designate this the Bhadrachalam coal field.

16. The Superintendent of Works has orders to send up fortnightly progress reports of the work done.

9th August 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Chief Engineer, P.W.D.

No. 318.

MEMORANDUM.

THE accompanying note is forwarded to the Superintendent of Works, Godavari, for information.

2. The decision conveyed in his letter No. 1,164, of the 28th July 1880, with reference to the point at which the shaft is to be sunk is accepted.

3. Fortnightly progress reports should be continued in order that His Grace the Governor may be kept advised of the results.

4. This field will in future be designated the Bhadrachalam field in all official documents.

(Signed) R. H. SANKEY, Colonel, R.E.,
14th August 1880. Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 18th August 1880, No. 1,336.

IN continuation of my letter No. 1,164, of the 28th July 1880, I have the honor to forward, herewith, an extract from letter No. 4, of the 5th August 1880, received from Corporal Nicks stating that he is fully convinced that bore hole No. 16 was at the point E. shown on the survey plan, of which copy was sent with my No. 1,164.

Extract of a letter from Corporal F. NICKS, R.E., in charge of Coal Shaft Sinking, to G. T. WALCH, Esq., Superintendent of Works, Godavari, dated 5th August 1880, No. 4.

WITH reference to your docket No. 1,163, dated 28th July 1880, regarding point E as shown by villagers, I am fully convinced it is the actual site of bore hole No. 16. In the first place I was taken to the spot E by two villagers who stated they were employed at the boring. I examined the surface soil and found indications that boring had been done there. I found two different soils, viz., light colored clay and sand stone in layers, the same as would come from an auger after boring.

2. On the 3rd instant I made inquiries at the village of Tipurapentaneed and found a man who was employed from the commencement to the finishing of the borings under Mr. Vanstavern; he also took me to the exact spot marked E as shown on plan and showed me the above soil as mentioned, and states that was what came up with the auger; he also pointed to a tree where they cooked their meals, which is only 10 yards from the spot. I intend to sink the shaft at the place pointed. I have already commenced getting stores on the spot to commence work.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 23rd August 1880, No. 1,434.

Report No. 1 on progress of work at Bhadrachalam coal fields to 14th August 1880.

THE sheds having been erected and necessary machinery moved up to site for shaft, actual sinking was commenced on 12th August, and up to 14th depth gone down to was 4 feet 6 inches.

No. 393, dated 3rd September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 3rd September 1880, No. 1,587.

Report No. 2 on progress of work at Bhadrachalam coal fields from 15th to 28th August 1880.

SHAFT sunk from 4 feet 6 inches to 15 feet; soil passed through chiefly "blue and yellow clay" with kunkur; sand stone just reached; some trouble given by water after heavy storms. Party apparently not working quite satisfactorily. Will be visited soon.

No. 450, dated 17th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated 16th September 1880, No. 1,721.

Report No. 3 on progress of work at Bhadrachalam coal fields from 28th August to 15th September 1880.

SHAFT sunk from 15 to 34 feet; soil passed through chiefly yellow sand stone compact *in situ*, but breaking up easily when dug out. Pump arrangements fixed.

No. 490, dated 30th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 22nd September 1880, No. 1,722.

I HAVE the honor to inform you that I have on 15th, 20th and 21st instant inspected the work at the Bhadrachalam coal fields, and I find that, though going on slowly, it is being well done.

2. The shaft has now been sunk to a depth of 39 feet and water has just been reached.

3. The first 5 feet passed through was ordinary alluvial and vegetable soil; then came for 10 feet yellow clay, about the lower 5 feet of which was mixed with kunkur; then for 14 feet 6 inches yellow sand stone compact and hard *in situ*, but disintegrating when removed to the surface; and below this to the 39 feet depth a light blue clay chiefly "pipe clay" with at 38 feet a stratum of a few inches of sand stone.

4. Through this last thin stratum of sand stone water has commenced to come in slowly. At 4 P.M. on 20th I saw the bottom of the shaft practically cleared of water, and at 6 A.M. (21st) 1 foot 8 inches in depth had accumulated.

5. The Abyssinian pump sent from Madras has been fixed and works well, clearing such water as is now coming in with perfect ease.

6. The party is well housed and has kept in fair health. Corporal Nicks and some of the men have had rheumatism, one or two have had slight fever, and the Naigue who went up with the party has been sent back to Dowlaishweram with bad ulcers on his feet, and he has been replaced by another man.

7. There have been no accidents, and I am quite satisfied with the care taken by Corporal Nicks, who is in immediate charge of the operations. I cannot say I am quite satisfied with the rate at which the work has been carried on, but native Sappers, it appears to me, do not generally work rapidly.

No. 506, dated 5th October 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated 5th October 1880, No. 1,843.

Report No. 4 on progress of work at Bhadrachalam coal fields from 15th to 30th September 1880.

SHAFT sunk from 34 to 44 feet; soil passed through, sand stone, with layers of light blue clay, chiefly pipe clay; water coming in quickly. Pump, "Abyssinian," has now to be worked night and day.

2. The Corporal in charge reports that his detachment is working unsatisfactorily, and that "if the sepoys are required to work in the shaft or at the winch they report themselves sick."

3. It seems likely that these men are behaving as they are with the object of being sent back to their Company, which they think may soon be sent to Bangalore; it would, I think, be well to let them know for certain that they will not be sent away from the work till it is finished, and that if they are sick they will have to go into hospital at Rajahmundry and when discharged return to the work. Eight coolies are now employed to assist the detachment.

No. 2,331.

THE Chief Engineer concurs with the Superintendent of Works that it will be advisable to let the Sappers distinctly understand that they will not, by malingering, be enabled to desert the work which they have been sent up to carry out.

2. When sick they may be sent to the hospital at Rajahmundry as proposed.

(By Order.)

(Signed) J. PENNYCUICK, Major, R.E.,
Deputy Chief Engineer, P.W.D.

18th October 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Yernagudem, 20th October 1880, No. 2,006.

Report No. 5 on progress of work at Bhadrachalam coal fields from 1st to 15th October 1880.

SHAFT sunk from 44 to 50 feet; soil passed through, sand stone, said to be hard, with thin layers of clay.

2. Slow progress due to large quantities of water to be dealt with, and the Corporal reports that the Abyssinian pump can no longer keep the water down, and no further sinking can go on till the steam pump is at work. This is expected daily.

No. 2,422, dated 2nd November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th November 1880, No. 2,641 W.

Proceedings of the Madras Government, Military Department, dated 13th November 1880, No. 7,102.

Telegram from the Superintendent of Works, Godáviri, to the Public Works Department, Madras, dated 26th October 1880.

"Another Non-Commissioned Officer to help Corporal Nicks, often ill, and Dresser for coal party much wanted."

TRANSFERRED to the Military Department, with a request that it may be stated whether any Non-Commissioned Officer can be sent from the "Queen's Own" Sappers and Miners for the purpose.

OOTACAMUND, 29th October 1880. (Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From the Adjutant-General, dated 10th November 1880, No. 499.

With reference to a telegram from the Superintendent of Works, Rajahmundry, dated 26th October 1880, transferred to the Military Department under Public Works Department No. 601 of 26th ultimo, and referred to His Excellency the Commander-in-Chief under Government endorsement memorandum No. 6,887 of 30th idem, herewith returned as requested, I have the honor, by order, to state that there is no objection to the services of Corporal B. Fuller, R.E., being placed at the disposal of Government in the Public Works Department for employment at Rajahmundry.

ORDER.—The Adjutant-General's letter communicated to the Public Works Department.

(True Extract.)

(Signed) J. MICHAEL, Colonel,
Secretary to Government, Mil. Dept.

ORDER THEREON, No. 2,641 W., dated 18th November 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

2. It is requested that the services of Corporal Fuller may be made available as early as possible.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 30th November 1880, No. 2,674.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 4th November 1880, No. 2,254.

Report No. 6 on progress of work at Bhadrachalam coal fields from 16th to 31st October 1880.

SHAFT sunk from 50 feet to 55½ feet; sand stone passed through to 55 feet, then a layer of clay. Below this it has been impossible to go with the Abyssinian pump and the steam* pump must be awaited.

* Arrived at Dowlaishweram, 2nd Nov. 1880.
Despatched by steamer to Golagudiem, 4th November 1880.

Firewood is being collected for the engine.

The Corporal in charge of the party has been suffering from dysentery and fever, and it appears that without his personal presence on the work it does not go on properly; another Non-Commissioned Officer is therefore very necessary, especially as pumping will have to be kept up at night. The unhealthiness of the place at this time of the year and the possibility of accidents make it also highly advisable that a Dresser should be attached to the party. Telegram of 26th October asking for another Non-Commissioned Officer and a Dresser was therefore sent.

Telegram from the Secretary to Government, Public Works Department, Madras, to the Superintendent of Works, Godáviri, Rajahmundry, dated 16th November 1880.

"Does further experience show that a Dresser for the coal party is still essential."

Telegram from Superintendent of Works, Godáviri, Rajahmundry, to the Secretary to Government, Public Works Department, Madras, dated 17th November 1880.

"HEALTH of coal party better, since rain stopped. May do without Dresser."

ORDER THEREON, No. 2,674 W., dated 30th November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd December 1880, No. 2,708.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 18th November 1880, No. 2,401.

Report No. 7 on progress of work at Bhadrachalam coal fields from 1st to 13th November 1880.

THE steam pump arrived at Golagudiem on 6th, and since then the party have been fully occupied in taking it, and the engine to work it, to the shaft and setting it up; the Corporal in charge reports that "the work is proceeding in a satisfactory manner."

2. Lieutenant Gale, R.E., visited the party on the 6th and 7th, and the Corporal in charge reports that since that visit and the change of Havildars which was then made the detachment has been working better than it had been working for some time previously.

3. The health of the party is better than it was, and it is thought that now it may get on without a Dresser, though of course it would be safer to have one on the spot, and another Non-Commissioned Officer to assist Corporal Nicks is very necessary as mentioned in the last report.

ORDER THEREON, No. 2,780, dated 3rd December 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd December 1880, No. 2,934 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 2nd December 1880, No. 2,554.

Report No. 8 on the progress of work at the Bhadrachalam Coal-field.—13th to 30th November 1880.

THE party have been engaged in keeping water down in the shaft with the Abyssinian pump and setting up the steam-pump and its engine.

No further sinking has been possible in the period under notice.

2. The Corporal in charge again reports, "there is a great deal of sickness among the detachment. Fever is very prevalent."

ORDER THEREON, No. 2,934 W., dated 22nd December 1880.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 10th January 1881, No. 38 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Wuddigudem, 16th December 1880, No. 2,751.

Report No. 9 on the progress of work at the Bhadrachalam Coal-field.—1st to 15th December 1880.

THE steam-pump was set to work on the 8th. There were then "18 feet of water in the shaft," and "it took 2 hours 35 minutes to pump dry;" owing, however, to extra framing, &c., being found necessary, actual work of excavation was not recommenced till 13th.

2. On the 15th the undersigned inspected the work. The shaft was down 56 feet, it was in good order and the pump going dead slow was keeping it clear of water.

A layer of clay (chiefly pipe-clay) had just been reached through which water was coming in freely.

The water has for some time past been sensibly affected by variations in the level of the river, which is now low, though not so low as it will be. It is impossible to say whether the one pump will be able to deal with the water which will be met with in the next 100 feet, and it will probably be advisable to have another ready; it could be driven by the same engine and driving machinery.

3. The huts were being moved up to near the shaft.
4. Ninety cubic yards of firewood for the engine have been cut.
5. The health of the party is not good, there are generally one-third or so of the sepoy down with fever, but it does not appear to be of a virulent type.
6. Corporal Fuller, R.E., has now (on 15th) joined the work.
7. No steamer will be able after this to get to Gollagudem, and probably not even to Wuddigudem till next June or July.

ORDER THEREON, No. 38 W., dated 10th January 1881.

THE Government consider that the additional pumping power referred to in paragraph 3 of the foregoing letter should be provided. The Superintendent of Works, Godáviri, will arrange accordingly.

2. The work being unhealthy should be pushed on as rapidly as possible.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 14th January 1881, No. 96 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 7th January 1881, No. 2,927.

Report No. 10 on the progress of works at the Bhadrachalam Coal-field.—16th to 31st December 1880.

- (1) Shaft deepened by 8 feet to 64 feet.
- (2) Soil passed through "different kinds of clay."
- (3) Removal of huts to site of shaft finished.

ORDER THEREON, No. 96 W., dated 14th January 1881.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 25th January 1881, No. 195 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 10th January 1881, No. 2,966.

I HAVE the honor to send herewith a letter from Corporal Nicks, R.E., in charge of the coal operations near Bhadrachalam, reporting the inrush of a large volume of water into the shaft.

2. Till this occurred all seemed to be going on well, though slowly.

3. I have told Corporal Nicks to again rig up the Abyssinian pump and see if with it he cannot get the water down low enough to get at the steam-pump box and again set it going, and then if the two will keep the water down sufficiently low it is possible that by putting in specially prepared cylinders we may be able to get through the treacherous stratum which has led to the present mishap; but if water with our present appliances cannot be kept so low, another pump more powerful than the present one, with machinery and engine to drive it, must be sent up.

4. Such machinery and engine however could not be got to the place before the next season of freshes in the river, say next July, and should it be found quite impossible to deal with the water with the present appliances I would request instructions as to what in the interval is to be done with the Sapper coal party.

From Corporal F. NICKS, R.E., to the Superintendent of Works, Godáviri, Dowlaishweram, dated Gollagudem, 5th January 1881, No. 118.

On Tuesday evening we were deep enough for 9th ring, and on Wednesday morning myself and Corporal Fuller started putting in same, as the soil was very treacherous it not being safe to trust sepoys; we had a slip of earth from the north side of shaft at about 11 A.M. We started then to plank that portion, as we had put in on (4) four plining (*sic*) planks and placed ring, we worked on and had placed four planks in the north quarter; we then noticed the water gradually rise, and the pump would not keep it down. I then sent Corporal Fuller up to ascertain if the engine was under proper steam, he informed me as he was coming down in bucket that steam gauge indicated 25 lb. ☐ As I was in the act of guiding the bucket down the water burst in from the south-west side, bringing with it a large quantity of "clay," about one-quarter yard, which knocked me down. Corporal Fuller said to me we had better take all tools up with us, but before he could get out of the bucket the water rose to my waist. I then said, never mind the tools we must get above the water in case the rings in upper work give way, as I had put my arm in where water was rushing from and found a large hole about 6 inches by 2 feet, so the clay could not be more than 1 foot 6 inches thick in front of the hole we had previously left, a berm of 6 inches in other work and considering this work was very dangerous we left a berm of 1 foot 3 inches.

We then cleared out of shaft as soon as possible with the water rising at the rate of 1 foot per minute, leaving all tools at bottom as we could not get at them for the water. I also kept engine at work till 10-25 P.M. making 25 strokes per minute, but the water still kept rising.

Rise of water	4-10 P.M.	No water more than ordinary.	5th January 1881.
Burst in at	4-15 P.M.		
7 feet	4-25 "		
21 feet 3 inches	5-50 "		
26 feet 8 inches	7-50 "		

Whilst taking measurement at 10 P.M. the pump gone out depth of water at the above time 29 feet 4 inches. I then gave orders to engine driver to draw fire, I then emptied boiler as I had been under steam near 400 hours.

At present we cannot get pump clear as working box is under water, the only remedy will be to get another set of top gear pipes and pump rods; if it is the Godáviri which is broke in upon us, which I think it is, it will be useless. 11-30 P.M.

I took measurements at 11-35 and found 33 feet 4 inches and at 7 A.M., the 6th, and found 38 feet 8 inches.

Please give me further instruction in answer to this.

ORDER THEREON, No. 195 W., 25th January 1881.

THE Superintendent of Works, Godáviri, has already been authorised* to arrange
* G.O., No. 38 W., dated 10th January 1881. for the provision of additional pumping power.

2. The Government await a further report before passing orders on the subject of paragraph 4 of the letter above read.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Yanam, 19th January 1881, No. 3,073.

In continuation of my No. 2,966, dated 10th instant, I have the honor to state that Corporal Nicks reports that in spite of all efforts it has been found impossible to raise the pump to get at the upper box and working barrel, and that at noon on the 6th the water had attained the "height of 40 feet" since which it has not varied.

2. It is evident, therefore, that another and more powerful pump must be provided if the work is to be persevered with.

Telegram to the Superintendent of Works, Godáviri, Rajahmundry, dated 27th January 1881, No. 193.

MORE powerful pump for coal workings sanctioned. Arrange for one at once.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd February 1881, No. 308 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 28th January 1881, No. 3,185.

Report No. 11 on the progress of work at the Bhadrachalam Coal-fields.—1st to 15th January 1881.

WORK progressed steadily till 5th, when the shaft was down 69 feet, water in large quantities then came in and overpowered the pump (see letters Nos. 2,966, 10th January 1881, and 3,073, 19th January 1881, to the Chief Engineer), and on the 15th there were 40 feet 4 inches depth of water in the shaft.

2. The Abyssinian pump which had been taken away and put on the barge was again taken to the shaft, and its placing commenced with the hope (a faint one) that with it the water can be so lowered that it may prove possible to get at the steam-pump boxes and set it going again. (See paragraph 3 of letter No. 2,966, 10th January 1881, to Chief Engineer.)

ORDER THEREON, No. 308 W., dated 3rd February 1881.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd February 1881, No. 493 W.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 31st January 1881, No. 3,225.

WITH reference to your telegram of 27th I have the honor to report that I have no means of here arranging for a more powerful pump for the coal shaft, and can only suggest that one may be supplied from the workshops at Madras or obtained from England.

2. Having had no experience in the work for which the pump is required, and having no one here who has had such experience, I cannot state with any certainty what is the nature and power of the pump required, and it seems therefore that it is best for me to explain the conditions of the case and from them possibly some Mining Engineer or manufacturer of mining machinery will be able to decide what is wanted. The conditions are these—

3. (a)—The shaft is 6 feet 3 inches diameter.
- (b)—It is sunk at about 1 mile from the edge of the Godáviri.
- (c)—The substrata already passed through (to 69 feet depth) have been almost entirely yellow sandstone, alternating with bands of yellowish and greyish clay, chiefly pipe-clay, and the boring shows that the general character of the strata to be yet passed through will be similar, but with fewer bands of clay, down to about 120 feet, when shale and coal will be met with.

(d)—Down to 55 feet there was but little water, but at that depth the Abyssinian pump could no longer deal with it, and the steam-pump sent up from the Madras Workshops was put up; whilst doing this (it occupied some days) the water rose 18 feet, this the pump when set to work cleared out in 2 hours 35 minutes.

(e)—This pump, driven by an old 8 horse-power engine, kept the water down easily enough till the shaft had reached a depth of 69 feet, when there

• For the first 7 feet came in at the rate of a sudden inrush through a stratum of pipe-clay and the water rose* 29 feet 4 inches in 5½ hours against the pump going 22 strokes a minute. The

See copy of letter from Corporal Nicks, No. 118, 5th January 1881, herewith. the pump then got choked and the water rose another 10 feet 8 inches, that is 40 feet

in all (or to 29 below top of shaft) in another 14 hours and at that level it has stood.

(f)—The shaft has to go down to a total depth of about 150 feet.

(g)—The river—the variations in level of which have been noted to affect the water in the shaft—rises in the season of floods (from June to October) from 15 feet to 20 feet or so above its present level, or approximately to from about 10 feet to 15 feet below level of top of shaft.

(h)—As most of the soil to be passed through is sandstone, much sharp sand comes up with the water, and it has been found to rapidly wear away any leather it comes in contact with, such as "buckets," valves, &c.

4. As already stated in my No. 2,966, 10th January 1881, paragraph 4, machinery or apparatus of any kind, weighing more than could be carried by two coolies, could not be got to the shaft till next July, because it could not be taken by water much if at all beyond Koide, some 34 miles below Gollagudem, and between the two places there is no road, only a jungle track, which in places passes over rocky slopes of hills.

P.S.—As all pumps occasionally get out of order and all engines require to be stopped now and then, it will be highly advisable, if not necessary, to have two pumps and two engines, and it is of course of great convenience that the working parts of the pump should be easily raised or got at.

From the same officer, dated 6th February 1881, No. 3,294.

Report No. 12 on the progress of work at the Bhadrachalam Coal-field.—16th to 31st January 1881.

The Abyssinian pump (see paragraph 2 of last report) was fully rigged up by 19th, and pumping then commenced with it; by 24th the water had been reduced 11 feet, or to 29 feet in depth, and then the working part of the steam-pump was got at.

2. The leather "buckets" which had worn out (they are constantly wearing out owing to the action of the gritty sand, see paragraph 3, (g.), No. 3,225, 31st January 1881), were renewed and the pump was started again on 25th; by the evening of 27th it had reduced the water by 8 feet, or to 21 feet, in depth, below which it could not reduce it, and the leathers having again worn out it had to be stopped for a time, when the water immediately rose against the Abyssinian pump to 30 feet 7 inches depth.

3. It is quite evident that with the present pumping power it will be impossible to recommence sinking operations.

4. There can be little doubt that the water in the shaft is in communication through some permeable stratum with the water in the river, and that enormously powerful machinery and a very great expenditure will be necessary to enable the shaft to be sunk to where it will reach the shale and inferior coal which borings and geological researches have established to exist in small quantities in the locality.

ORDER THEREON, No. 493 W., dated 22nd February 1881.

THE Right Honorable the Governor in Council considers that before any further expenditure is incurred the opinion of an expert in mining matters should be obtained. The Chief Engineer has, it is understood, written to Calcutta to inquire whether the services of any qualified person can be secured.

Meanwhile the work should be suspended.

2. Orders have already been issued to the Superintendent of Works, directing the Sappers to return to their Company.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 542 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 11th February 1881, No. 3,370.

FURTHER information has shown me that I was wrong in supposing that when water burst into the coal shaft at Bhadrachalam it came in at the rate of "630 gallons a minute," as stated in the margin, paragraph 3, clause (e) of my No. 3,225, 31st January 1881; it came in at the rate approximately of 200 gallons a minute.

2. I would take this opportunity of asking for early orders on paragraph 4 of my No. 2,966, 10th January 1881.

ORDER THEREON, No. 541 W., dated 23rd February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 541 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 17th February 1881, No. 3,463.

Report No. 13 on Bhadrachalam Coal-field work.—1st to 15th February 1881.

As stated in last report it is quite impossible to proceed with the work, and it therefore has been at a complete stand-still during the last fifteen days.

ORDER THEREON, No. 542 W., dated 28th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th March 1880, No. 698 W.

Read the following paper:—

MINUTE BY HIS GRACE THE GOVERNOR.

THE question of getting access to coal in this Presidency for railway and navigation purposes is a very important one.

2. That coal exists in the Nizam's territory, between the Godáviri and Kistna, is well ascertained, and the quality of that recently obtained and tried, although the results are not yet accurately calculated, show that the coal is of a good, useful description, and reported by the Public Works Workshops as quite equal to the ordinary Indian coal they have in use. It becomes a question of price.

3. Coal is wanted for railway and steam purposes at Madras, for the navigation of the Godáviri and at Cocanada, and will no doubt be also consumed on the canal.

4. It has been ascertained that coal exists on the Godáviri river on the British side, and some coal raised from the dry bed between Bhadrachalam and Rékapalle. of the river has given "good results" in the Godáviri steamers. The quality of

the coal, as tested by boring with small bores, is necessarily uncertain. Some is spoken of as fair, some as inferior; but it is close to the river, and the ground apparently not costly to sink in. If, as estimated by Mr. Vanstavern (who was especially employed upon the coal investigation), the coal seams can be reached by a shaft for an amount of under Rs. 2,000, it would be a matter to be tried at once without doubt; but I would put it higher, and taking the estimate above given, I would make allowance for pumping, ventilating and levelling, say that the trial should be considered as not to be effectually made under a possible Rs. 5,000; say at No. 16 bore, where the coal is within 150 feet from surface and about 18 feet thick, and the shaft only 1 mile from river, but above flood lines.

5. Coal in such a situation ought to be sufficient and economical for all purposes of steam engines on the river and delta and also at Cocanada, as its price must be low from the freight being entirely water and down-stream, so that an extra quantity might be used. How much further it could be carried can only be really known by actual test.

6. The opening of coal at this spot would doubtless stimulate the opening on the Nizam's side.

7. In ordinary times I should not hesitate to recommend the expenditure necessary to reach and test the coal seams, and even in the present times it seems to me desirable to do so. If the coal sufficed only for Godáviri use, the cost would not be wasted.

8. The opening of any coal operation would tend to develop and thus to pacify the country around.

9. The question to be decided then is—

Shall Government endeavour, at a cost which may reach Rs. 5,000, to open the coal already ascertained to exist?

10. If that be agreed then the Chief Engineer should suggest the arrangements, and the co-operation of Mr. Vanstavern should be secured, for his local knowledge and long experience of the district.

11. The working season is from now to June.

5th January 1880.

(Signed) BUCKINGHAM AND CHANDOS.

N.B.—The original maps, sections and memoranda should be returned to Mr. Vanstavern, as they are lent. I could not trace the copies in Government possession—possibly lost.

ORDER THEREON, No. 698 W., dated 18th March 1880.

THE Revenue Department will arrange to place at the disposal of the Public Works Department the sum of Rs. 5,000 from the accumulated Cattle Trespass Fund for certain experiments on coal-boring operations in the Godáviri district.

2. This amount will be recouped when necessary for the farm purposes later on.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

No. 859.

MEMORANDUM.

HIS GRACE the Governor in Council having decided to make an early commencement with sinking a shaft for working a coal seam, whose existence has been proved at a point midway between Bhadrachalam and Rékapalle on the left bank of the Godáviri, the undersigned is desired to inquire whether His Excellency the Commander-in-Chief thinks that a party consisting of, say, two European Non-Commissioned Officers and a Havildar and Naigue with fourteen Sappers, who are acquainted with mining could conveniently be spared from the Companies of the "Queen's Own" Sappers and Miners which are now attached to the force under the command of Colonel Buck.

2. Their employment in sinking the shaft required might possibly extend to six months.

15th March 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

To the Secretary to Government, Military Department.

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 20th March 1880, No. 213.

WITH reference to your docket memorandum, No. 1,771, dated 16th March 1880,

* Herewith returned.

I have the honor to inform you that the Officer Commanding, Sappers and Miners at Dowlaishweram, has been directed to detach two British Non-Commissioned Officers with a Havildar and Naigue and fourteen Sappers for the purpose of sinking a shaft in the Godáviri district.

2. It is of great importance that these men should not be exposed in tents during the hot season, and His Excellency trusts that Government will see the necessity of having thatched huts for the natives, and suitable erections for the shelter of the British Non-Commissioned Officers employed.

No. 1,964.

TRANSFERRED to the Public Works Department, with reference to its memorandum, No. 859, dated 15th March 1880.

(By Order.)

FORT ST. GEORGE,
25th March 1880.

(Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
Acting Secretary to Govt., Mily. Dept.

No. 972.

MEMORANDUM.

THE Chief Engineer has the honor to forward, for the information of the Superintendent of Works, Godáviri, a copy of a Minute by His Grace the Governor regarding coal-boring explorations on the British side of the Godáviri river, with copies of the correspondence that has passed on the subject.

2. On receipt of an intimation from Mr. Vanstavern that he has no objection to the free use of the plans, &c., borings can be commenced. As it is understood that the working season will only last for about two months longer, every exertion should be made.

3. Meanwhile, in accordance with the wishes of His Excellency the Commander-in-Chief, proper shelter for the British Non-Commissioned Officers employed and thatched huts for the natives should at once be provided.

4. Mr. Walch's attention is invited to Lieutenant Baddeley's letter of the 15th March, in case the requisite machinery, &c., cannot be got from the Dowlaishweram shops.

(Signed) R. H. SANKEY, Col., R.E.,
Chief Engineer, P.W.D.

31st March 1880.

To the Superintendent of Works, Godáviri.

Proceedings of the Madras Government, Public Works Department, dated 14th April 1880, No. 960 W.

Read the following paper :—

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 2nd April 1880, No. 250.

IN continuation of Adjutant-General's letter, No. 213, dated 20th March 1880,

1 Havildar.
1 Naigue.
14 Privates.

I have the honor, by order, to state that the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram reports that the party, as

per margin, is in readiness to proceed under the orders of the Public Works Department.

2. There are no European Non-Commissioned Officers with the Detachment.

No. 2,117.

TRANSFERRED to the Public Works Department, in continuation of No. 1,964, dated 25th March 1880.

FORT ST. GEORGE,
3rd April 1880.

(Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
Acting Secretary to Govt., Mily. Dept.

ORDER THEREON, No. 960 W., dated 14th April 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 21st April 1880, No. 996-A W.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 6th April 1880, No. 84.

I HAVE the honor to acknowledge the receipt of your memorandum No. 972, dated 31st ultimo.

One Indent in triplicate.

2. As you will have seen from my letter No. 701, dated 31st March 1880, and its enclosure, I have no officer or upper

subordinate whom I can send for the coal operations, and the Officer Commanding the Detachment of the "Queen's Own" Sappers and Miners here has no European Non-Commissioned Officer.

3. In paragraph 10 of the Minute by His Grace the Governor it is said that "the co-operation of Mr. Vanstavern should be secured," and it seems to me that it would be advisable, as he lives not far from where the operations are to be carried on and has had some experience in such work, to employ him on a salary to superintend the work, but I have no authority to open negotiations officially with him on the subject, or to make him any offer.

4. The steamers cannot now go up the river further than Koide (52 miles), and only boats of very small draft can get from there to where the operations are proposed, some 35 miles further.

5. There are no pumps here at all suited for deep shaft sinking, and I enclose an indent for such a pump and machinery to drive it, which, if approved, please send on to the Government workshops, Madras. If the pump be sent it should be accompanied by a Maistry who understands its working.

6. I think if you will consider all the circumstances of the case you will see that there is no probability of the work being done in the "two months" mentioned in paragraph 2 of your memorandum under notice.

From Lieutenant W. L. C. BADDELEY, R.E., General Superintendent of Public Works Workshops and Stores, Madras, to the Secretary to Government, Public Works Department, dated 15th March 1880.

We have two deep well pumps in store which would be suitable for working a shaft 80 feet in depth.

2. The five-inch lift pump which we made for the Ooregum Company is a good pattern for deep shafts, and we could make up these very soon if required.

3. One of the Workshop Maistries would be available to look after the pumping machinery, but there is no one here who understands anything about mining.

4. If Dowlaiswaram cannot provide the engines, we can spare a 4 horse-power portable or any number of Gwynne's or Nasmyth's 4 and 6 horse-power engines and boilers combined. These also could be made fairly portable by fitting them on a stand with wheels.

5. We have no machinery for working or lifting coal, but probably there would be no difficulty in making up any ordinary appliances.

ORDER THEREON, No. 996-A W., dated 21st April 1880.

THE Superintendent of Works, Presidency, will at once direct the General Superintendent, Public Works Workshops, to despatch one of the deep well pumps mentioned by him as suitable for a shaft 80 feet deep to the Superintendent of Works, Godáviri, along with one of the Workshop Maistries for looking after this and such other machinery as it may be found necessary to send for unwatering the coal shaft.

That officer should also be directed to place himself without delay in correspondence with the Superintendent of Works, Godáviri, relative to any steam pumping or other machinery that may be deemed necessary for sinking the shaft below 80 feet.

2. The Superintendent of Works, Godáviri Division, is authorised to make arrangements with Mr. Vanstavern for directing the operations, preferably fixing a definite sum on the shaft being sunk to the bottom of the seam indicated by the borings, and reporting the terms as soon as possible for the information of Government.

3. The original borings having been executed during the monsoon, His Grace in Council has no reason to suppose that the work need now be subjected to any delay

on account of the season, and as he attaches the greatest importance to the sinking of the shaft, no efforts should be spared to effect that object at the earliest date.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 27th April 1880, No. 1,035 W.

Proceedings of the Madras Government, Military Department, dated 14th April 1880, No. 2,404.

Read the following papers:—

Proceedings of the Madras Government, Public Works Department, dated 7th April 1880, No. 893 W.

Read letter from the Superintendent of Works, Godáviri, dated 30th March 1880, No. 701.

I HAVE the honor to enclose copy of a letter received this day from the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaiswaram, and to request instructions.

2. I would point out that the district is shorthanded, that just at this season there is a great amount of work in connection with the anicut and head works, canals, &c., which has to be compressed into a very short time; and I trust, therefore, that no one will have to be taken away from such work to carry out the "hutting," &c., referred to by Major Hamilton, and which it appears to me the men might carry out themselves.

3. I do not know where the Kottapalle referred to is.

From the Officer Commanding Detachment "Queen's Own" Sappers and Miners, to the Superintendent of Works, Godáviri, dated 29th March 1880, No. 209.

WITH reference to letter, No. 822, dated 20th March, from the Adjutant-General (copy annexed for your information), I have the honor to report that the party, consisting of one Havildar, one Naigue and fourteen Privates, is in readiness to proceed up the river under your orders. There are no European Non-Commissioned Officers with this detachment.

2. I presume that you will supply all necessary tools.

3. The party will have to be hutted by the Public Works Department.

From the Officiating Adjutant-General, to the Officer Commanding "Queen's Own" Sappers and Miners, Dowlaiswaram, dated 20th March 1880, No. 822.

AT the request of Government in the Public Works Department the Commander-in-Chief has sanctioned the services of a party of two European Non-Commissioned Officers, a Havildar, Naigue and fourteen Sappers, who are acquainted with mining, from the companies attached to the force under Colonel Buck, for employment in sinking a shaft for working a coal seam between Bhadrachalam and Kottapalle on the left bank of the Godáviri, and you are requested to detach the above party for this purpose.

UNDER the circumstances explained in Mr. Walch's letter, the detachment will provide hutting accommodation for themselves, the usual allowances being granted by the Military Department.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secretary to Govt., P.W.D.

To the Military Department.

ORDER,—Communicated to His Excellency the Commander-in-Chief.

2. Under O.G. (Military), No. 356, dated 30th January 1872, all special charges, including cost of hutting, incurred on account of Sappers employed on purely civil works, form a debit against the Public Works Department.

(True Extract.)

(Signed) H. N. D. PRENDERGAST, Col., R.E.,
Ag. Secretary to Government, Mily. Dept.

ORDER THEREON, No. 1,035 W., dated 27th April 1880.
COMMUNICATED to the Examiner of Public Works Accounts.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Military Department, dated 16th June 1880, No. 3,763.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri District, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 27th May 1880, No. 547.

I HAVE the honor to inform you that immediately on receipt of G.O., No. 996-AW., dated 21st April 1880, I put myself in communication with Mr. Vanstavern, and enclose copy of my last letter* to him to which I have received the enclosed reply, in which I am sorry to say he declines to undertake the superintendence of the coal shaft sinking for the reason which he states in a private letter.

That reason being that he thinks it probable that private affairs may render it necessary for him to leave the country before it would be possible to complete the shaft.

2. I am now at a loss to know how to carry out the wishes of Government as regards the speedy sinking of the shaft. An extra Overseer having come (see my No. 519, of 24th May 1880) I could send him, but he knows nothing of the kind of work, and it is doubtful if the working under him of the Sappers, whom it is proposed to send, would be smooth, and I would recommend that a Non-Commissioned Officer of the Sappers and Miners should be sent for the work.

3. Mr. Vanstavern states that, though borings could be got down during the rains and when the river was high, the difficulties and expense of sinking a shaft would, he is sure from a knowledge of the place, be much greater than in the dry season, as water would be met with at a much higher level and in much greater quantities.

No. 126.

REFERRED to the Military Department, with request that it may be ascertained if the services of any Non-Commissioned Officer of Sappers (European) acquainted with mining or shaft sinking can be placed at the disposal of this department for directing the operations as suggested by Mr. Walch. If such a Non-Commissioned Officer can be found, it is requested that he may be directed to proceed at once to the spot.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

5th June 1880.

From the Adjutant-General, No. 173, dated 14th June 1880.

In returning Military Department memorandum No. 3,561, of the 7th current, I have the honor, by order, to inform you that the services of Corporal Nicks of the

"Queen's Own" Sappers and Miners are available for the Godáviri coal shaft. He is stated to be zealous and by trade a "Fitter."

ORDER,—Ordered that the Adjutant-General's letter be communicated to the Public Works Department.

2. His Excellency the Commander-in-Chief is requested to cause Corporal Nicks to be detailed at once for the duty.

(True Extract.)

(Signed) J. MICHAEL, Col.,
Secy. to Govt., Mily. Dept.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 28th July 1880, No. 1,164.

WITH reference to our inspection of the proposed site for coal shaft on 22nd instant, I have the honor to forward tracing from plan of survey which I then ordered to be made.

2. I append the orders now issued to the Corporal in charge of the party with reference to this survey.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to Corporal F. NICKS, Golagudiem, dated 28th July 1880, No. 1,163.

WITH reference to the accompanying plan a report ought to have been sent stating whether there are any indications that point E., said to have been shown by villagers as site of bore-hole No. 16, is really the site.

2. If there be not any trustworthy indications that it really is so, the shaft is to be sunk at point A., or should that be in a local depression where trouble will be given by surface drainage, at some convenient point between it and D.

NOTE.

WITH reference to the annexed letter No. 1,164, of the 28th July 1880, from the Superintendent of Works, Godáviri, on the subject of the coal sinkings, I beg to offer the following brief remarks, having lately had the opportunity of inspecting the site of the operations in company with Mr. Martindale and Mr. Walch.

2. Leaving Dowlaishweram on morning of the 21st ultimo, Mr. Walch and I taking the new steam launch, *Arthur Cotton*, were enabled to pass very nearly through the Godáviri gorge before anchoring for the night, although the current was strong, 5-3 feet in depth, passing over the crest of the anicut.

3. Next morning picking up Mr. Martindale at Woodagudiem, we arrived at the site of the coal operations about noon, and spent some five or six hours in inspecting the locality and chiefly in endeavouring to find out the precise position of bore-hole No. 16, at which point, owing to the promising results of the previous borings, it had been decided to sink the shaft.

4. We found Corporal Nicks with his fourteen Sappers encamped at Golagudiem (*Golagaram* of the Indian Atlas), the party were well and sufficiently provided with shelter till the new shed 80 feet x 18 feet now sanctioned (and for which corrugated iron sheets have been brought down from the spare stores at Dumagudiem) has been run up, as it will be immediately.

5. In addition to an ample supply of tools of all kinds there was ready a pump which will, I hope, answer all purposes till a depth of 80 feet has been reached, when

one driven by steam now preparing at the Madras workshops will be sent up for unwatering the shaft at greater depths.

6. Twenty horizontal circular frames of angle iron, sufficient if spaced at 5 feet apart to reach to a depth of 100 feet, were also on the ground. If stiff soil or rock be met with, these may be spaced at greater intervals or omitted altogether and answer for 150 feet in depth, but in any case Mr. Walch can readily send up all that is needed in this respect from Dowlaishweram.

7. Mr. Martindale, who takes a kindly interest in the work, will see that the party have ample and good supplies, and if, as I hope, the men only keep their health, the work should progress favorably, though it is at the same time to be feared that, particularly at this season, water may be met with close to the surface, and difficulties on this account may delay operations.

8. Corporal Nicks had explored nearly all the area of previous operations, but had failed to discover the precise location of bore hole No. 16. Most of the sites of the other bore holes as pointed out by the villagers had been marked by a rough block of red sand stone, but in this particular case no indication could be found and it was thus fortunate that we were able to visit the place at this time.

9. From there not being a single definite point or bearing given on the survey whereby to recognise the old holes, and from these having been mere punctures and easily obliterated, it was necessary to fix the point in question by as many approximations as we could. The result is shown by the tracing now sent up by Mr. Walch. Our approximations led us to decide on the point A., and it would now appear from subsequent information received from the villagers (probably those of Totapilly, who we were informed had been engaged on this particular portion of the old work) that the point E. at no great distance from A. is the true point.

10. I feel assured that in no case will the point selected here be much out, though, of course, it would have been very much more satisfactory to find the exact locality.

Mr. Walch's present decision as conveyed to Corporal Nicks may therefore, I think, be safely accepted.

11. The whole country about is rather undulating, clayey, with bushy jungle here and there, and well raised above the river, but showing from the moisture which lodges in the lower portions, that at this season much water may have to be encountered in sinking the shaft.

12. It would, of course, be premature to say much about the results of these operations, but if Mr. Vanstavern (whom I met at Woodagudiem, but who owing to illness was unable to accompany me to the coal field) is to be credited, the coal is likely to turn out very shaley. The best specimen, he informed me, only yielded 30 per cent. of carbon, and the worst 9 per cent.

13. As regards the proper designation of this coal field, there is some doubt. Totapilly, by which it appears to have been first known, though shown on the atlas, is a very insignificant village and at a distance from our present workings. Tiperpenti (Tipurapentaneed of the tracing) is not shown on the atlas, and is also both insignificant and at some distance. If the field is to be called after any of the neighbouring villages, Golagudiem, where the camp is and which is both shown on the atlas and is on the river bank, would be the most appropriate designation.

14. But to the best of my judgment it would be preferable to call it the Bhadrachalam field, as it is sufficiently near to this, which is certainly the best known and most important place in the neighbourhood.

15. If the Government approve, therefore, I would in all future correspondence designate this the Bhadrachalam coal field.

16. The Superintendent of Works has orders to send up fortnightly progress reports of the work done.

9th August 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Chief Engineer, P.W.D.

No. 318.

MEMORANDUM.

THE accompanying note is forwarded to the Superintendent of Works, Godavari, for information.

2. The decision conveyed in his letter No. 1,164, of the 28th July 1880, with reference to the point at which the shaft is to be sunk is accepted.

3. Fortnightly progress reports should be continued in order that His Grace the Governor may be kept advised of the results.

4. This field will in future be designated the Bhadrachalam field in all official documents.

(Signed) R. H. SANKEY, Colonel, R.E.,
14th August 1880. Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 18th August 1880, No. 1,336.

In continuation of my letter No. 1,164, of the 28th July 1880, I have the honor to forward, herewith, an extract from letter No. 4, of the 5th August 1880, received from Corporal Nicks stating that he is fully convinced that bore hole No. 16 was at the point E. shown on the survey plan, of which copy was sent with my No. 1,164.

Extract of a letter from Corporal F. NICKS, R.E., in charge of Coal Shaft Sinking, to G. T. WALCH, Esq., Superintendent of Works, Godavari, dated 5th August 1880, No. 4.

With reference to your docket No. 1,163, dated 28th July 1880, regarding point E as shown by villagers, I am fully convinced it is the actual site of bore hole No. 16. In the first place I was taken to the spot E by two villagers who stated they were employed at the boring. I examined the surface soil and found indications that boring had been done there. I found two different soils, viz., light colored clay and sand stone in layers, the same as would come from an auger after boring.

2. On the 3rd instant I made inquiries at the village of Tipurapentaneed and found a man who was employed from the commencement to the finishing of the borings under Mr. Vanstavern; he also took me to the exact spot marked E as shown on plan and showed me the above soil as mentioned, and states that was what came up with the auger; he also pointed to a tree where they cooked their meals, which is only 10 yards from the spot. I intend to sink the shaft at the place pointed. I have already commenced getting stores on the spot to commence work.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 23rd August 1880, No. 1,434.

Report No. 1 on progress of work at Bhadrachalam coal fields to 14th August 1880.

THE sheds having been erected and necessary machinery moved up to site for shaft, actual sinking was commenced on 12th August, and up to 14th depth gone down to was 4 feet 6 inches.

No. 393, dated 3rd September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 3rd September 1880, No. 1,587.

Report No. 2 on progress of work at Bhadrachalam coal fields from 15th to 28th August 1880.

SHAFT sunk from 4 feet 6 inches to 15 feet; soil passed through chiefly "blue and yellow clay" with kunkur; sand stone just reached; some trouble given by water after heavy storms. Party apparently not working quite satisfactorily. Will be visited soon.

No. 450, dated 17th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 16th September 1880, No. 1,721.

Report No. 3 on progress of work at Bhadrachalam coal fields from 28th August to 15th September 1880.

SHAFT sunk from 15 to 34 feet; soil passed through chiefly yellow sand stone compact *in situ*, but breaking up easily when dug out. Pump arrangements fixed.

No. 490, dated 30th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 22nd September 1880, No. 1,722.

I HAVE the honor to inform you that I have on 15th, 20th and 21st instant inspected the work at the Bhadrachalam coal fields, and I find that, though going on slowly, it is being well done.

2. The shaft has now been sunk to a depth of 39 feet and water has just been reached.

3. The first 5 feet passed through was ordinary alluvial and vegetable soil; then came for 10 feet yellow clay, about the lower 5 feet of which was mixed with kunkur; then for 14 feet 6 inches yellow sand stone compact and hard *in situ*, but disintegrating when removed to the surface; and below this to the 39 feet depth a light blue clay chiefly "pipe clay" with at 38 feet a stratum of a few inches of sand stone.

4. Through this last thin stratum of sand stone water has commenced to come in slowly. At 4 p.m. on 20th I saw the bottom of the shaft practically cleared of water, and at 6 a.m. (21st) 1 foot 8 inches in depth had accumulated.

5. The Abyssinian pump sent from Madras has been fixed and works well, clearing such water as is now coming in with perfect ease.

6. The party is well housed and has kept in fair health. Corporal Nicks and some of the men have had rheumatism, one or two have had slight fever, and the Naigue who went up with the party has been sent back to Dowlaishweram with bad ulcers on his feet, and he has been replaced by another man.

7. There have been no accidents, and I am quite satisfied with the care taken by Corporal Nicks, who is in immediate charge of the operations. I cannot say I am quite satisfied with the rate at which the work has been carried on, but native Sappers, it appears to me, do not generally work rapidly.

No. 506, dated 5th October 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 5th October 1880, No. 1,843.

Report No. 4 on progress of work at Bhadrachalam coal fields from 15th to 30th September 1880.

SHAFT sunk from 34 to 44 feet; soil passed through, sand stone, with layers of light blue clay, chiefly pipe clay; water coming in quickly. Pump, "Abyssinian," has now to be worked night and day.

2. The Corporal in charge reports that his detachment is working unsatisfactorily, and that "if the sepoy are required to work in the shaft or at the winch they report themselves sick."

3. It seems likely that these men are behaving as they are with the object of being sent back to their Company, which they think may soon be sent to Bangalore; it would, I think, be well to let them know for certain that they will not be sent away from the work till it is finished, and that if they are sick they will have to go into hospital at Rajahmundry and when discharged return to the work. Eight coolies are now employed to assist the detachment.

No. 2,331.

THE Chief Engineer concurs with the Superintendent of Works that it will be advisable to let the Sappers distinctly understand that they will not, by malingering, be enabled to desert the work which they have been sent up to carry out.

2. When sick they may be sent to the hospital at Rajahmundry as proposed.

(By Order.)

(Signed) J. PENNYCUICK, Major, R.E.,
Deputy Chief Engineer, P.W.D.

18th October 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Yernagudem, 20th October 1880, No. 2,006.

Report No. 5 on progress of work at Bhadrachalam coal fields from 1st to 15th October 1880.

SHAFT sunk from 44 to 50 feet; soil passed through, sand stone, said to be hard, with thin layers of clay.

2. Slow progress due to large quantities of water to be dealt with, and the Corporal reports that the Abyssinian pump can no longer keep the water down, and no further sinking can go on till the steam pump is at work. This is expected daily.

No. 2,422, dated 2nd November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th November 1880, No. 2,641 W.

Proceedings of the Madras Government, Military Department, dated 13th November 1880, No. 7,102.

Telegram from the Superintendent of Works, Godáviri, to the Public Works Department, Madras, dated 26th October 1880.

"Another Non-Commissioned Officer to help Corporal Nicks, often ill, and Dresser for coal party much wanted."

TRANSFERRED to the Military Department, with a request that it may be stated whether any Non-Commissioned Officer can be sent from the "Queen's Own" Sappers and Miners for the purpose.

OOTACAMUND,
29th October 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From the Adjutant-General, dated 10th November 1880, No. 499.

With reference to a telegram from the Superintendent of Works, Rajahmundry, dated 26th October 1880, transferred to the Military Department under Public Works Department No. 601 of 26th ultimo, and referred to His Excellency the Commander-in-Chief under Government endorsement memorandum No. 6,887 of 30th idem, herewith returned as requested, I have the honor, by order, to state that there is no objection to the services of Corporal B. Fuller, R.E., being placed at the disposal of Government in the Public Works Department for employment at Rajahmundry.

ORDER.—The Adjutant-General's letter communicated to the Public Works Department.

(True Extract.)

(Signed) J. MICHAEL, Colonel,
Secretary to Government, Milly. Dept.

ORDER THEREON, No. 2,641 W., dated 18th November 1880,

COMMUNICATED to the Superintendent of Works, Godáviri.

2. It is requested that the services of Corporal Fuller may be made available as early as possible.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 30th November 1880, No. 2,674.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 4th November 1880, No. 2,254.

Report No. 6 on progress of work at Bhadrachalam coal fields from 16th to 31st October 1880.

SHAFT sunk from 50 feet to 55½ feet; sand stone passed through to 55 feet, then a layer of clay. Below this it has been impossible to go with the Abyssinian pump and the steam* pump must be awaited.

* Arrived at Dowlaishweram, 2nd Nov. 1880.
Despatched by steamer to Golagudiem, 4th November 1880.

Firewood is being collected for the engine.

The Corporal in charge of the party has been suffering from dysentery and fever, and it appears that without his personal presence on the work it does not go on properly; another Non-Commissioned Officer is therefore very necessary, especially as pumping will have to be kept up at night. The unhealthiness of the place at this time of the year and the possibility of accidents make it also highly advisable that a Dresser should be attached to the party. Telegram of 26th October asking for another Non-Commissioned Officer and a Dresser was therefore sent.

Telegram from the Secretary to Government, Public Works Department, Madras, to the Superintendent of Works, Godáviri, Rajahmundry, dated 16th November 1880.

"Does further experience show that a Dresser for the coal party is still essential."

Telegram from Superintendent of Works, Godáviri, Rajahmundry, to the Secretary to Government, Public Works Department, Madras, dated 17th November 1880.

"HEALTH of coal party better, since rain stopped. May do without Dresser."

ORDER THEREON, No. 2,674 W., dated 30th November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd December 1880, No. 2,708.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 18th November 1880, No. 2,401.

Report No. 7 on progress of work at Bhadrachalam coal fields from 1st to 13th November 1880.

THE steam pump arrived at Golagudiem on 6th, and since then the party have been fully occupied in taking it, and the engine to work it, to the shaft and setting it up; the Corporal in charge reports that "the work is proceeding in a satisfactory manner."

2. Lieutenant Gale, R.E., visited the party on the 6th and 7th, and the Corporal in charge reports that since that visit and the change of Havildars which was then made the detachment has been working better than it had been working for some time previously.

3. The health of the party is better than it was, and it is thought that now it may get on without a Dresser, though of course it would be safer to have one on the spot, and another Non-Commissioned Officer to assist Corporal Nicks is very necessary as mentioned in the last report.

ORDER THEREON, No. 2,780, dated 3rd December 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd December 1880, No. 2,934 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 2nd December 1880, No. 2,554.

Report No. 8 on the progress of work at the Bhadrachalam Coal-field.—13th to 30th November 1880.

THE party have been engaged in keeping water down in the shaft with the Abyssinian pump and setting up the steam-pump and its engine.

No further sinking has been possible in the period under notice.

2. The Corporal in charge again reports, "there is a great deal of sickness among the detachment. Fever is very prevalent."

ORDER THEREON, No. 2,934 W., dated 22nd December 1880.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 10th January 1881, No. 38 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Wuddigudem, 16th December 1880, No. 2,751.

Report No. 9 on the progress of work at the Bhadrachalam Coal-field.—1st to 15th December 1880.

THE steam-pump was set to work on the 8th. There were then "18 feet of water in the shaft," and "it took 2 hours 35 minutes to pump dry;" owing, however, to extra framing, &c., being found necessary, actual work of excavation was not recommenced till 13th.

2. On the 15th the undersigned inspected the work. The shaft was down 56 feet, it was in good order and the pump going dead slow was keeping it clear of water.

A layer of clay (chiefly pipe-clay) had just been reached through which water was coming in freely.

The water has for some time past been sensibly affected by variations in the level of the river, which is now low, though not so low as it will be. It is impossible to say whether the one pump will be able to deal with the water which will be met with in the next 100 feet, and it will probably be advisable to have another ready; it could be driven by the same engine and driving machinery.

3. The huts were being moved up to near the shaft.
4. Ninety cubic yards of firewood for the engine have been cut.
5. The health of the party is not good, there are generally one-third or so of the sepoys down with fever, but it does not appear to be of a virulent type.
6. Corporal Fuller, R.E., has now (on 15th) joined the work.
7. No steamer will be able after this to get to Gollagudem, and probably not even to Wuddigudem till next June or July.

ORDER THEREON, No. 38 W., dated 10th January 1881.

THE Government consider that the additional pumping power referred to in paragraph 3 of the foregoing letter should be provided. The Superintendent of Works, Godáviri, will arrange accordingly.

2. The work being unhealthy should be pushed on as rapidly as possible.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 14th January 1881, No. 96 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 7th January 1881, No. 2,927.

Report No. 10 on the progress of works at the Bhadrachalam Coal-field.—16th to 31st December 1880.

- (1.) Shaft deepened by 8 feet to 64 feet.
- (2.) Soil passed through "different kinds of clay."
- (3.) Removal of huts to site of shaft finished.

ORDER THEREON, No. 96 W., dated 14th January 1881.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 25th January 1881, No. 195 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 10th January 1881, No. 2,966.

I HAVE the honor to send herewith a letter from Corporal Nicks, R.E., in charge of the coal operations near Bhadrachalam, reporting the inrush of a large volume of water into the shaft.

2. Till this occurred all seemed to be going on well, though slowly.

3. I have told Corporal Nicks to again rig up the Abyssinian pump and see if with it he cannot get the water down low enough to get at the steam-pump box and again set it going, and then if the two will keep the water down sufficiently low it is possible that by putting in specially prepared cylinders we may be able to get through the treacherous stratum which has led to the present mishap; but if water with our present appliances cannot be kept so low, another pump more powerful than the present one, with machinery and engine to drive it, must be sent up.

4. Such machinery and engine however could not be got to the place before the next season of freshes in the river, say next July, and should it be found quite impossible to deal with the water with the present appliances I would request instructions as to what in the interval is to be done with the Sapper coal party.

From Corporal F. NICKS, R.E., to the Superintendent of Works, Godáviri, Dowlaishweram, dated Gollagudem, 5th January 1881, No. 118.

On Tuesday evening we were deep enough for 9th ring, and on Wednesday morning myself and Corporal Fuller started putting in same, as the soil was very treacherous it not being safe to trust sepoys; we had a slip of earth from the north side of shaft at about 11 A.M. We started then to plank that portion, as we had put in on (4) four plining (*sic*) planks and placed ring, we worked on and had placed four planks in the north quarter; we then noticed the water gradually rise, and the pump would not keep it down. I then sent Corporal Fuller up to ascertain if the engine was under proper steam, he informed me as he was coming down in *bucket* that steam gauge indicated 25 lb. ☐ As I was in the act of guiding the bucket down the water burst in from the *south-west* side, bringing with it a large quantity of "clay," about one-quarter yard, which knocked me down. Corporal Fuller said to me we had better take all tools up with us, but before he could get out of the bucket the water rose to my waist. I then said, never mind the tools we must get above the water in case the rings in upper work give way, as I had put my arm in where water was rushing from and found a large hole about 6 inches by 2 feet, so the clay could not be more than 1 foot 6 inches thick in front of the hole we had previously left, a berm of 6 inches in other work and considering this work was very dangerous we left a berm of 1 foot 3 inches.

We then cleared out of shaft as soon as possible with the water rising at the rate of 1 foot per minute, leaving all tools at bottom as we could not get at them for the water. I also kept engine at work till 10-25 P.M. making 25 strokes per minute, but the water still kept rising.

Rise of water	4-10 P.M.	No water more than ordinary.	5th January 1881.
Burst in at	4-15 P.M.		
7 feet	4-25 "		
21 feet 3 inches	5-50 "		
26 feet 8 inches	7-50 "		

Whilst taking measurement at 10 P.M. the pump gone out depth of water at the above time 29 feet 4 inches. I then gave orders to engine driver to draw fire, I then emptied boiler as I had been under steam near 400 hours.

At present we cannot get pump clear as working box is under water, the only remedy will be to get another set of top gear pipes and pump rods; if it is the Godáviri which is broke in upon us, which I think it is, it will be useless. 11-30 P.M.

I took measurements at 11-35 and found 33 feet 4 inches and at 7 A.M., the 6th, and found 38 feet 8 inches.

Please give me further instruction in answer to this.

ORDER THEREON, No. 195 W., 25th January 1881.

THE Superintendent of Works, Godáviri, has already been authorised* to arrange
* G.O., No. 38 W., dated 10th January 1881. for the provision of additional pumping power.

2. The Government await a further report before passing orders on the subject of paragraph 4 of the letter above read.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Yanam, 19th January 1881, No. 3,073.

In continuation of my No. 2,966, dated 10th instant, I have the honor to state that Corporal Nicks reports that in spite of all efforts it has been found impossible to raise the pump to get at the upper box and working barrel, and that at noon on the 6th the water had attained the "height of 40 feet" since which it has not varied.

2. It is evident, therefore, that another and more powerful pump must be provided if the work is to be persevered with.

Telegram to the Superintendent of Works, Godáviri, Rajahmundry, dated 27th January 1881, No. 193.

MORE powerful pump for coal workings sanctioned. Arrange for one at once.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd February 1881, No. 308 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 28th January 1881, No. 3,185.

Report No. 11 on the progress of work at the Bhadrachalam Coal-fields.—1st to 15th January 1881.

Work progressed steadily till 5th, when the shaft was down 69 feet, water in large quantities then came in and overpowered the pump (see letters Nos. 2,966, 10th January 1881, and 3,073, 19th January 1881, to the Chief Engineer), and on the 15th there were 40 feet 4 inches depth of water in the shaft.

2. The Abyssinian pump which had been taken away and put on the barge was again taken to the shaft, and its placing commenced with the hope (a faint one) that with it the water can be so lowered that it may prove possible to get at the steam-pump boxes and set it going again. (See paragraph 3 of letter No. 2,966, 10th January 1881, to Chief Engineer.)

ORDER THEREON, No. 308 W., dated 3rd February 1881.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd February 1881, No. 493 W.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 31st January 1881, No. 3,225.

With reference to your telegram of 27th I have the honor to report that I have no means of here arranging for a more powerful pump for the coal shaft, and can only suggest that one may be supplied from the workshops at Madras or obtained from England.

2. Having had no experience in the work for which the pump is required, and having no one here who has had such experience, I cannot state with any certainty what is the nature and power of the pump required, and it seems therefore that it is best for me to explain the conditions of the case and from them possibly some Mining Engineer or manufacturer of mining machinery will be able to decide what is wanted. The conditions are these—

3. (a)—The shaft is 6 feet 3 inches diameter.
- (b)—It is sunk at about 1 mile from the edge of the Godáviri.
- (c)—The substrata already passed through (to 69 feet depth) have been almost entirely yellow sandstone, alternating with bands of yellowish and greyish clay, chiefly pipe-clay, and the boring shows that the general character of the strata to be yet passed through will be similar, but with fewer bands of clay, down to about 120 feet, when shale and coal will be met with.

- (d)—Down to 55 feet there was but little water, but at that depth the Abyssinian pump could no longer deal with it, and the steam-pump sent up from the Madras Workshops was put up; whilst doing this (it occupied some days) the water rose 18 feet, this the pump when set to work cleared out in 2 hours 35 minutes.
- (e)—This pump, driven by an old 8 horse-power engine, kept the water down easily enough till the shaft had reached a depth of 69 feet, when there was a sudden inrush through a stratum of pipe-clay and the water rose 29 feet 4 inches in 5½ hours against the pump going 22 strokes a minute. The pump then got choked and the water rose another 10 feet 8 inches, that is 40 feet in all (or to 29 below top of shaft) in another 14 hours and at that level it has stood.
- (f)—The shaft has to go down to a total depth of about 150 feet.
- (g)—The river—the variations in level of which have been noted to affect the water in the shaft—rises in the season of floods (from June to October) from 15 feet to 20 feet or so above its present level, or approximately to from about 10 feet to 15 feet below level of top of shaft.
- (h)—As most of the soil to be passed through is sandstone, much sharp sand comes up with the water, and it has been found to rapidly wear away any leather it comes in contact with, such as "buckets," valves, &c.

4. As already stated in my No. 2,966, 10th January 1881, paragraph 4, machinery or apparatus of any kind, weighing more than could be carried by two coolies, could not be got to the shaft till next July, because it could not be taken by water much if at all beyond Koide, some 34 miles below Gollagudem, and between the two places there is no road, only a jungle track, which in places passes over rocky slopes of hills.

P.S.—As all pumps occasionally get out of order and all engines require to be stopped now and then, it will be highly advisable, if not necessary, to have two pumps and two engines, and it is of course of great convenience that the working parts of the pump should be easily raised or got at.

From the same officer, dated 6th February 1881, No. 3,294.

Report No. 12 on the progress of work at the Bhadrachalam Coal-field.—16th to 31st January 1881.

The Abyssinian pump (see paragraph 2 of last report) was fully rigged up by 19th, and pumping then commenced with it; by 24th the water had been reduced 11 feet, or to 29 feet in depth, and then the working part of the steam-pump was got at.

2. The leather "buckets" which had worn out (they are constantly wearing out owing to the action of the gritty sand, see paragraph 3, (g.), No. 3,225, 31st January 1881), were renewed and the pump was started again on 25th; by the evening of 27th it had reduced the water by 8 feet, or to 21 feet, in depth, below which it could not reduce it, and the leathers having again worn out it had to be stopped for a time, when the water immediately rose against the Abyssinian pump to 30 feet 7 inches depth.

3. It is quite evident that with the present pumping power it will be impossible to recommence sinking operations.

4. There can be little doubt that the water in the shaft is in communication through some permeable stratum with the water in the river, and that enormously powerful machinery and a very great expenditure will be necessary to enable the shaft to be sunk to where it will reach the shale and inferior coal which borings and geological researches have established to exist in small quantities in the locality.

ORDER THEREON, No. 493 W., dated 22nd February 1881.

THE Right Honorable the Governor in Council considers that before any further expenditure is incurred the opinion of an expert in mining matters should be obtained. The Chief Engineer has, it is understood, written to Calcutta to inquire whether the services of any qualified person can be secured.

Meanwhile the work should be suspended.

2. Orders have already been issued to the Superintendent of Works, directing the Sappers to return to their Company.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 542 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 11th February 1881, No. 3,370.

FURTHER information has shown me that I was wrong in supposing that when water burst into the coal shaft at Bhadrachalam it came in at the rate of "630 gallons a minute," as stated in the margin, paragraph 3, clause (e) of my No. 3,225, 31st January 1881; it came in at the rate approximately of 200 gallons a minute.

2. I would take this opportunity of asking for early orders on paragraph 4 of my No. 2,966, 10th January 1881.

ORDER THEREON, No. 541 W., dated 23rd February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 541 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 17th February 1881, No. 3,463.

Report No. 13 on Bhadrachalam Coal-field work.—1st to 15th February 1881.

As stated in last report it is quite impossible to proceed with the work, and it therefore has been at a complete stand-still during the last fifteen days.

ORDER THEREON, No. 542 W., dated 28th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th March 1880, No. 698 W.

Read the following paper:—

MINUTE BY HIS GRACE THE GOVERNOR.

THE question of getting access to coal in this Presidency for railway and navigation purposes is a very important one.

2. That coal exists in the Nizam's territory, between the Godáviri and Kistna, is well ascertained, and the quality of that recently obtained and tried, although the results are not yet accurately calculated, show that the coal is of a good, useful description, and reported by the Public Works Workshops as quite equal to the ordinary Indian coal they have in use. It becomes a question of price.

3. Coal is wanted for railway and steam purposes at Madras, for the navigation of the Godáviri and at Cocanada, and will no doubt be also consumed on the canal.

4. It has been ascertained that coal exists on the Godáviri river on the British side, and some coal raised from the dry bed of the river has given "good results" in the Godáviri steamers. The quality of the coal, as tested by boring with small bores, is necessarily uncertain. Some is spoken of as fair, some as inferior; but it is close to the river, and the ground apparently not costly to sink in. If, as estimated by Mr. Vanstavern (who was especially employed upon the coal investigation), the coal seams can be reached by a shaft for an amount of under Rs. 2,000, it would be a matter to be tried at once without doubt; but I would put it higher, and taking the estimate above given, I would make allowance for pumping, ventilating and levelling, say that the trial should be considered as not to be effectually made under a possible Rs. 5,000; say at No. 16 bore, where the coal is within 150 feet from surface and about 18 feet thick, and the shaft only 1 mile from river, but above flood lines.

5. Coal in such a situation ought to be sufficient and economical for all purposes of steam engines on the river and delta and also at Cocanada, as its price must be low from the freight being entirely water and down-stream, so that an extra quantity might be used. How much further it could be carried can only be really known by actual test.

6. The opening of coal at this spot would doubtless stimulate the opening on the Nizam's side.

7. In ordinary times I should not hesitate to recommend the expenditure necessary to reach and test the coal seams, and even in the present times it seems to me desirable to do so. If the coal sufficed only for Godáviri use, the cost would not be wasted.

8. The opening of any coal operation would tend to develope and thus to pacify the country around.

9. The question to be decided then is—

Shall Government endeavour, at a cost which may reach Rs. 5,000, to open the coal already ascertained to exist?

10. If that be agreed then the Chief Engineer should suggest the arrangements, and the co-operation of Mr. Vanstavern should be secured, for his local knowledge and long experience of the district.

11. The working season is from now to June.

5th January 1880.

(Signed) BUCKINGHAM AND CHANDOS.

N.B.—The original maps, sections and memoranda should be returned to Mr. Vanstavern, as they are only lent. I could not trace the copies in Government possession—possibly lost.

ORDER THEREON, No. 698 W., dated 18th March 1880.

THE Revenue Department will arrange to place at the disposal of the Public Works Department the sum of Rs. 5,000 from the accumulated Cattle Trespass Fund for certain experiments on coal-boring operations in the Godáviri district.

2. This amount will be recouped when necessary for the farm purposes later on.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

No. 859.

MEMORANDUM.

HIS GRACE the Governor in Council having decided to make an early commencement with sinking a shaft for working a coal seam, whose existence has been proved at a point midway between Bhadrachalam and Rékapalle on the left bank of the Godáviri, the undersigned is desired to inquire whether His Excellency the Commander-in-Chief thinks that a party consisting of, say, two European Non-Commissioned Officers and a Havildar and Naigue with fourteen Sappers, who are acquainted with mining could conveniently be spared from the Companies of the "Queen's Own" Sappers and Miners which are now attached to the force under the command of Colonel Buck.

2. Their employment in sinking the shaft required might possibly extend to six months.

(Signed) R. H. SANKEY, Colonel, R.E.,
15th March 1880. Secretary to Government, P.W.D.

To the Secretary to Government, Military Department.

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 20th March 1880, No. 213.

WITH reference to your docket memorandum, No. 1,771, dated 16th March 1880,

* Herewith returned.

I have the honor to inform you that the Officer Commanding, Sappers and Miners at Dowlaishweram, has been directed to detach two British Non-Commissioned Officers with a Havildar and Naigue and fourteen Sappers for the purpose of sinking a shaft in the Godáviri district.

2. It is of great importance that these men should not be exposed in tents during the hot season, and His Excellency trusts that Government will see the necessity of having thatched huts for the natives, and suitable erections for the shelter of the British Non-Commissioned Officers employed.

No. 1,964.

TRANSFERRED to the Public Works Department, with reference to its memorandum, No. 859, dated 15th March 1880.

(By Order.)

FORT ST. GEORGE, (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
25th March 1880. Acting Secretary to Govt., Mily. Dept.

No. 972.

MEMORANDUM.

THE Chief Engineer has the honor to forward, for the information of the Superintendent of Works, Godáviri, a copy of a Minute by His Grace the Governor regarding coal-boring explorations on the British side of the Godáviri river, with copies of the correspondence that has passed on the subject.

2. On receipt of an intimation from Mr. Vanstavern that he has no objection to the free use of the plans, &c., borings can be commenced. As it is understood that the working season will only last for about two months longer, every exertion should be made.

3. Meanwhile, in accordance with the wishes of His Excellency the Commander-in-Chief, proper shelter for the British Non-Commissioned Officers employed and thatched huts for the natives should at once be provided.

4. Mr. Walch's attention is invited to Lieutenant Baddeley's letter of the 15th March, in case the requisite machinery, &c., cannot be got from the Dowlaishweram shops.

(Signed) R. H. SANKEY, Col., R.E.,
31st March 1880. Chief Engineer, P.W.D.

To the Superintendent of Works, Godáviri.

Proceedings of the Madras Government, Public Works Department, dated 14th April 1880, No. 960 W.

Read the following paper :—

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 2nd April 1880, No. 250.

IN continuation of Adjutant-General's letter, No. 213, dated 20th March 1880,

1 Havildar.
1 Naigue.
14 Privates.

I have the honor, by order, to state that the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram reports that the party, as

per margin, is in readiness to proceed under the orders of the Public Works Department.

2. There are no European Non-Commissioned Officers with the Detachment.

No. 2,117.

TRANSFERRED to the Public Works Department, in continuation of No. 1,964, dated 25th March 1880,

FORT ST. GEORGE, (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
3rd April 1880. Acting Secretary to Govt., Mily. Dept.

ORDER THEREON, No. 960 W., dated 14th April 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 21st April 1880, No. 996-A W.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 6th April 1880, No. 84.

I HAVE the honor to acknowledge the receipt of your memorandum No. 972, dated 31st ultimo.

One Indent in triplicate.

2. As you will have seen from my letter No. 701, dated 31st March 1880, and its enclosure, I have no officer or upper

subordinate whom I can send for the coal operations, and the Officer Commanding the Detachment of the "Queen's Own" Sappers and Miners here has no European Non-Commissioned Officer.

3. In paragraph 10 of the Minute by His Grace the Governor it is said that "the co-operation of Mr. Vanstavern should be secured," and it seems to me that it would be advisable, as he lives not far from where the operations are to be carried on and has had some experience in such work, to employ him on a salary to superintend the work, but I have no authority to open negotiations officially with him on the subject, or to make him any offer.

4. The steamers cannot now go up the river further than Koide (52 miles), and only boats of very small draft can get from there to where the operations are proposed, some 35 miles further.

5. There are no pumps here at all suited for deep shaft sinking, and I enclose an indent for such a pump and machinery to drive it, which, if approved, please send on to the Government workshops, Madras. If the pump be sent it should be accompanied by a Maistry who understands its working.

6. I think if you will consider all the circumstances of the case you will see that there is no probability of the work being done in the "two months" mentioned in paragraph 2 of your memorandum under notice.

From Lieutenant W. L. C. BADDELEY, R.E., General Superintendent of Public Works Workshops and Stores, Madras, to the Secretary to Government, Public Works Department, dated 15th March 1880.

We have two deep well pumps in store which would be suitable for working a shaft 80 feet in depth.

2. The five-inch lift pump which we made for the Ooregum Company is a good pattern for deep shafts, and we could make up these very soon if required.

3. One of the Workshop Maistries would be available to look after the pumping machinery, but there is no one here who understands anything about mining.

4. If Dowlaishweram cannot provide the engines, we can spare a 4 horse-power portable or any number of Gwynne's or Nasmyth's 4 and 6 horse-power engines and boilers combined. These also could be made fairly portable by fitting them on a stand with wheels.

5. We have no machinery for working or lifting coal, but probably there would be no difficulty in making up any ordinary appliances.

ORDER THEREON, No. 996-A W., dated 21st April 1880.

THE Superintendent of Works, Presidency, will at once direct the General Superintendent, Public Works Workshops, to despatch one of the deep well pumps mentioned by him as suitable for a shaft 80 feet deep to the Superintendent of Works, Godáviri, along with one of the Workshop Maistries for looking after this and such other machinery as it may be found necessary to send for unwatering the coal shaft.

That officer should also be directed to place himself without delay in correspondence with the Superintendent of Works, Godáviri, relative to any steam pumping or other machinery that may be deemed necessary for sinking the shaft below 80 feet.

2. The Superintendent of Works, Godáviri Division, is authorised to make arrangements with Mr. Vanstavern for directing the operations, preferably fixing a definite sum on the shaft being sunk to the bottom of the seam indicated by the borings, and reporting the terms as soon as possible for the information of Government.

3. The original borings having been executed during the monsoon, His Grace in Council has no reason to suppose that the work need now be subjected to any delay

on account of the season, and as he attaches the greatest importance to the sinking of the shaft, no efforts should be spared to effect that object at the earliest date.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 27th April 1880, No. 1,035 W.

Proceedings of the Madras Government, Military Department, dated 14th April 1880, No. 2,404.

Read the following papers:—

Proceedings of the Madras Government, Public Works Department, dated 7th April 1880, No. 893 W.

Read letter from the Superintendent of Works, Godáviri, dated 30th March 1880, No. 701.

I HAVE the honor to enclose copy of a letter received this day from the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram, and to request instructions.

2. I would point out that the district is shorthanded, that just at this season there is a great amount of work in connection with the anicut and head works, canals, &c., which has to be compressed into a very short time; and I trust, therefore, that no one will have to be taken away from such work to carry out the "hutting," &c., referred to by Major Hamilton, and which it appears to me the men might carry out themselves.

3. I do not know where the Kottapalle referred to is.

From the Officer Commanding Detachment "Queen's Own" Sappers and Miners, to the Superintendent of Works, Godáviri, dated 29th March 1880, No. 209.

WITH reference to letter, No. 822, dated 20th March, from the Adjutant-General (copy annexed for your information), I have the honor to report that the party, consisting of one Havildar, one Naigue and fourteen Privates, is in readiness to proceed up the river under your orders. There are no European Non-Commissioned Officers with this detachment.

2. I presume that you will supply all necessary tools.

3. The party will have to be hutted by the Public Works Department.

From the Officiating Adjutant-General, to the Officer Commanding "Queen's Own" Sappers and Miners, Dowlaishweram, dated 20th March 1880, No. 822.

At the request of Government in the Public Works Department the Commander-in-Chief has sanctioned the services of a party of two European Non-Commissioned Officers, a Havildar, Naigue and fourteen Sappers, who are acquainted with mining, from the companies attached to the force under Colonel Buck, for employment in sinking a shaft for working a coal seam between Bhadrachalam and Kottapalle on the left bank of the Godáviri, and you are requested to detach the above party for this purpose.

UNDER the circumstances explained in Mr. Walch's letter, the detachment will provide hutting accommodation for themselves, the usual allowances being granted by the Military Department.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secretary to Govt., P.W.D.

To the Military Department.

ORDER,—Communicated to His Excellency the Commander-in-Chief.

2. Under O.G. (Military), No. 356, dated 30th January 1872, all special charges, including cost of hutting, incurred on account of Sappers employed on purely civil works, form a debit against the Public Works Department.

(True Extract.)

(Signed) H. N. D. PRENDERGAST, Col., R.E.,
Ag. Secretary to Government, Milly. Dept.

ORDER THEREON, No. 1,035 W., dated 27th April 1880.
COMMUNICATED to the Examiner of Public Works Accounts.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Military Department, dated 16th June 1880, No. 3,763.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri District, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 27th May 1880, No. 547.

I HAVE the honor to inform you that immediately on receipt of G.O., No. 996-AW., dated 21st April 1880, I put myself in communication with Mr. Vanstavern, and enclose copy of my last letter* to him to which I have received the enclosed reply, in which I am sorry to say he declines to undertake the superintendence of the coal shaft sinking for the reason which he states in a private letter.

That reason being that he thinks it probable that private affairs may render it necessary for him to leave the country before it would be possible to complete the shaft.

2. I am now at a loss to know how to carry out the wishes of Government as regards the speedy sinking of the shaft. An extra Overseer having come (see my No. 519, of 24th May 1880) I could send him, but he knows nothing of the kind of work, and it is doubtful if the working under him of the Sappers, whom it is proposed to send, would be smooth, and I would recommend that a Non-Commissioned Officer of the Sappers and Miners should be sent for the work.

3. Mr. Vanstavern states that, though borings could be got down during the rains and when the river was high, the difficulties and expense of sinking a shaft would, he is sure from a knowledge of the place, be much greater than in the dry season, as water would be met with at a much higher level and in much greater quantities.

No. 126.

REFERRED to the Military Department, with request that it may be ascertained if the services of any Non-Commissioned Officer of Sappers (European) acquainted with mining or shaft sinking can be placed at the disposal of this department for directing the operations as suggested by Mr. Walch. If such a Non-Commissioned Officer can be found, it is requested that he may be directed to proceed at once to the spot.

(Signed) R. H. SANKEY, Colonel, R.E.,
5th June 1880. Secretary to Government, P.W.D.

From the Adjutant-General, No. 173, dated 14th June 1880.

In returning Military Department memorandum No. 3,561, of the 7th current, I have the honor, by order, to inform you that the services of Corporal Nicks of the

"Queen's Own" Sappers and Miners are available for the Godáviri coal shaft. He is stated to be zealous and by trade a "Fitter."

ORDER,—Ordered that the Adjutant-General's letter be communicated to the Public Works Department.

2. His Excellency the Commander-in-Chief is requested to cause Corporal Nicks to be detailed at once for the duty.

(True Extract.)

(Signed) J. MICHAEL, Col.,
Secy. to Govt., Milly. Dept.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 28th July 1880, No. 1,164.

WITH reference to our inspection of the proposed site for coal shaft on 22nd instant, I have the honor to forward tracing from plan of survey which I then ordered to be made.

2. I append the orders now issued to the Corporal in charge of the party with reference to this survey.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to Corporal F. NICKS, Golagudiem, dated 28th July 1880, No. 1,163.

WITH reference to the accompanying plan a report ought to have been sent stating whether there are any indications that point E., said to have been shown by villagers as site of bore-hole No. 16, is really the site.

2. If there be not any trustworthy indications that it really is so, the shaft is to be sunk at point A., or should that be in a local depression where trouble will be given by surface drainage, at some convenient point between it and D.

NOTE.

WITH reference to the annexed letter No. 1,164, of the 28th July 1880, from the Superintendent of Works, Godáviri, on the subject of the coal sinkings, I beg to offer the following brief remarks, having lately had the opportunity of inspecting the site of the operations in company with Mr. Martindale and Mr. Walch.

2. Leaving Dowlaishweram on morning of the 21st ultimo, Mr. Walch and I taking the new steam launch, *Arthur Cotton*, were enabled to pass very nearly through the Godáviri gorge before anchoring for the night, although the current was strong, 5.3 feet in depth, passing over the crest of the anicut.

3. Next morning picking up Mr. Martindale at Woodagudiem, we arrived at the site of the coal operations about noon, and spent some five or six hours in inspecting the locality and chiefly in endeavouring to find out the precise position of bore-hole No. 16, at which point, owing to the promising results of the previous borings, it had been decided to sink the shaft.

4. We found Corporal Nicks with his fourteen Sappers encamped at Golagudiem (*Golagaram* of the Indian Atlas), the party were well and sufficiently provided with shelter till the new shed 80 feet x 18 feet now sanctioned (and for which corrugated iron sheets have been brought down from the spare stores at Dumagudiem) has been run up, as it will be immediately.

5. In addition to an ample supply of tools of all kinds there was ready a pump which will, I hope, answer all purposes till a depth of 80 feet has been reached, when

one driven by steam now preparing at the Madras workshops will be sent up for unwatering the shaft at greater depths.

6. Twenty horizontal circular frames of angle iron, sufficient if spaced at 5 feet apart to reach to a depth of 100 feet, were also on the ground. If stiff soil or rock be met with, these may be spaced at greater intervals or omitted altogether and answer for 150 feet in depth, but in any case Mr. Walch can readily send up all that is needed in this respect from Dowlaisweram.

7. Mr. Martindale, who takes a kindly interest in the work, will see that the party have ample and good supplies, and if, as I hope, the men only keep their health, the work should progress favorably, though it is at the same time to be feared that, particularly at this season, water may be met with close to the surface, and difficulties on this account may delay operations.

8. Corporal Nicks had explored nearly all the area of previous operations, but had failed to discover the precise location of bore hole No. 16. Most of the sites of the other bore holes as pointed out by the villagers had been marked by a rough block of red sand stone, but in this particular case no indication could be found and it was thus fortunate that we were able to visit the place at this time.

9. From there not being a single definite point or bearing given on the survey whereby to recognise the old holes, and from these having been mere punctures and easily obliterated, it was necessary to fix the point in question by as many approximations as we could. The result is shown by the tracing now sent up by Mr. Walch. Our approximations led us to decide on the point A., and it would now appear from subsequent information received from the villagers (probably those of Totapilly, who we were informed had been engaged on this particular portion of the old work) that the point E. at no great distance from A. is the true point.

10. I feel assured that in no case will the point selected here be much out, though, of course, it would have been very much more satisfactory to find the exact locality.

Mr. Walch's present decision as conveyed to Corporal Nicks may therefore, I think, be safely accepted.

11. The whole country about is rather undulating, clayey, with bushy jungle here and there, and well raised above the river, but showing from the moisture which lodges in the lower portions, that at this season much water may have to be encountered in sinking the shaft.

12. It would, of course, be premature to say much about the results of these operations, but if Mr. Vanstavern (whom I met at Woodagudiem, but who owing to illness was unable to accompany me to the coal field) is to be credited, the coal is likely to turn out very shaley. The best specimen, he informed me, only yielded 30 per cent. of carbon, and the worst 9 per cent.

13. As regards the proper designation of this coal field, there is some doubt. Totapilly, by which it appears to have been first known, though shown on the atlas, is a very insignificant village and at a distance from our present workings. Tiperpenti (Tipurapentaneed of the tracing) is not shown on the atlas, and is also both insignificant and at some distance. If the field is to be called after any of the neighbouring villages, Golagudiem, where the camp is and which is both shown on the atlas and is on the river bank, would be the most appropriate designation.

14. But to the best of my judgment it would be preferable to call it the Bhadrachalam field, as it is sufficiently near to this, which is certainly the best known and most important place in the neighbourhood.

15. If the Government approve, therefore, I would in all future correspondence designate this the Bhadrachalam coal field.

16. The Superintendent of Works has orders to send up fortnightly progress reports of the work done.

9th August 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Chief Engineer, P.W.D.

No. 318.

MEMORANDUM.

THE accompanying note is forwarded to the Superintendent of Works, Godavari, for information.

2. The decision conveyed in his letter No. 1,164, of the 28th July 1880, with reference to the point at which the shaft is to be sunk is accepted.

3. Fortnightly progress reports should be continued in order that His Grace the Governor may be kept advised of the results.

4. This field will in future be designated the Bhadrachalam field in all official documents.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

14th August 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaisweram, 18th August 1880, No. 1,336.

IN continuation of my letter No. 1,164, of the 28th July 1880, I have the honor to forward, herewith, an extract from letter No. 4, of the 5th August 1880, received from Corporal Nicks stating that he is fully convinced that bore hole No. 16 was at the point E. shown on the survey plan, of which copy was sent with my No. 1,164.

Extract of a letter from Corporal F. NICKS, R.E., in charge of Coal Shaft Sinking, to G. T. WALCH, Esq., Superintendent of Works, Godavari, dated 5th August 1880, No. 4.

WITH reference to your docket No. 1,163, dated 28th July 1880, regarding point E as shown by villagers, I am fully convinced it is the actual site of bore hole No. 16. In the first place I was taken to the spot E by two villagers who stated they were employed at the boring. I examined the surface soil and found indications that boring had been done there. I found two different soils, viz., light colored clay and sand stone in layers, the same as would come from an auger after boring.

2. On the 3rd instant I made inquiries at the village of Tipurapentaneed and found a man who was employed from the commencement to the finishing of the borings under Mr. Vanstavern; he also took me to the exact spot marked E as shown on plan and showed me the above soil as mentioned, and states that was what came up with the auger; he also pointed to a tree where they cooked their meals, which is only 10 yards from the spot. I intend to sink the shaft at the place pointed. I have already commenced getting stores on the spot to commence work.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 23rd August 1880, No. 1,434.

Report No. 1 on progress of work at Bhadrachalam coal fields to 14th August 1880.

THE sheds having been erected and necessary machinery moved up to site for shaft, actual sinking was commenced on 12th August, and up to 14th depth gone down to was 4 feet 6 inches.

No. 393, dated 3rd September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 3rd September 1880, No. 1,587.

Report No. 2 on progress of work at Bhadrachalam coal fields from 15th to 28th August 1880.

SHAFT sunk from 4 feet 6 inches to 15 feet; soil passed through chiefly "blue and yellow clay" with kunkur; sand stone just reached; some trouble given by water after heavy storms. Party apparently not working quite satisfactorily. Will be visited soon.

No. 450, dated 17th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 16th September 1880, No. 1,721.

Report No. 3 on progress of work at Bhadrachalam coal fields from 28th August to 15th September 1880.

SHAFT sunk from 15 to 34 feet; soil passed through chiefly yellow sand stone compact *in situ*, but breaking up easily when dug out. Pump arrangements fixed.

No. 490, dated 30th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 22nd September 1880, No. 1,722.

I HAVE the honor to inform you that I have on 15th, 20th and 21st instant inspected the work at the Bhadrachalam coal fields, and I find that, though going on slowly, it is being well done.

2. The shaft has now been sunk to a depth of 39 feet and water has just been reached.

3. The first 5 feet passed through was ordinary alluvial and vegetable soil; then came for 10 feet yellow clay, about the lower 5 feet of which was mixed with kunkur; then for 14 feet 6 inches yellow sand stone compact and hard *in situ*, but disintegrating when removed to the surface; and below this to the 39 feet depth a light blue clay chiefly "pipe clay" with at 38 feet a stratum of a few inches of sand stone.

4. Through this last thin stratum of sand stone water has commenced to come in slowly. At 4 P.M. on 20th I saw the bottom of the shaft practically cleared of water, and at 6 A.M. (21st) 1 foot 8 inches in depth had accumulated.

5. The Abyssinian pump sent from Madras has been fixed and works well, clearing such water as is now coming in with perfect ease.

6. The party is well housed and has kept in fair health. Corporal Nicks and some of the men have had rheumatism, one or two have had slight fever, and the Naigue who went up with the party has been sent back to Dowlaishweram with bad ulcers on his feet, and he has been replaced by another man.

7. There have been no accidents, and I am quite satisfied with the care taken by Corporal Nicks, who is in immediate charge of the operations. I cannot say I am quite satisfied with the rate at which the work has been carried on, but native Sappers, it appears to me, do not generally work rapidly.

No. 506, dated 5th October 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 5th October 1880, No. 1,843.

Report No. 4 on progress of work at Bhadrachalam coal fields from 15th to 30th September 1880.

SHAFT sunk from 34 to 44 feet; soil passed through, sand stone, with layers of light blue clay, chiefly pipe clay; water coming in quickly. Pump, "Abyssinian," has now to be worked night and day.

2. The Corporal in charge reports that his detachment is working unsatisfactorily, and that "if the sepoys are required to work in the shaft or at the winch they report themselves sick."

3. It seems likely that these men are behaving as they are with the object of being sent back to their Company, which they think may soon be sent to Bangalore; it would, I think, be well to let them know for certain that they will not be sent away from the work till it is finished, and that if they are sick they will have to go into hospital at Rajahmundry and when discharged return to the work. Eight coolies are now employed to assist the detachment.

No. 2,331.

THE Chief Engineer concurs with the Superintendent of Works that it will be advisable to let the Sappers distinctly understand that they will not, by malingering, be enabled to desert the work which they have been sent up to carry out.

2. When sick they may be sent to the hospital at Rajahmundry as proposed.

(By Order.)

(Signed) J. PENNYCUICK, Major, R.E.,
Deputy Chief Engineer, P.W.D.

18th October 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Yernagudem, 20th October 1880, No. 2,006.

Report No. 5 on progress of work at Bhadrachalam coal fields from 1st to 15th October 1880.

SHAFT sunk from 44 to 50 feet; soil passed through, sand stone, said to be hard, with thin layers of clay.

2. Slow progress due to large quantities of water to be dealt with, and the Corporal reports that the Abyssinian pump can no longer keep the water down, and no further sinking can go on till the steam pump is at work. This is expected daily.

No. 2,422, dated 2nd November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th November 1880, No. 2,641 W.

Proceedings of the Madras Government, Military Department, dated 13th November 1880, No. 7,102.

Telegram from the Superintendent of Works, Godáviri, to the Public Works Department, Madras, dated 26th October 1880.

"Another Non-Commissioned Officer to help Corporal Nicks, often ill, and Dresser for coal party much wanted."

TRANSFERRED to the Military Department, with a request that it may be stated whether any Non-Commissioned Officer can be sent from the "Queen's Own" Sappers and Miners for the purpose.

OOTACAMUND,
29th October 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From the Adjutant-General, dated 10th November 1880, No. 499.

WITH reference to a telegram from the Superintendent of Works, Rajahmundry, dated 26th October 1880, transferred to the Military Department under Public Works Department No. 601 of 26th ultimo, and referred to His Excellency the Commander-in-Chief under Government endorsement memorandum No. 6,887 of 30th idem, herewith returned as requested, I have the honor, by order, to state that there is no objection to the services of Corporal B. Fuller, R.E., being placed at the disposal of Government in the Public Works Department for employment at Rajahmundry.

ORDER.—The Adjutant-General's letter communicated to the Public Works Department.

(True Extract.)

(Signed) J. MICHAEL, Colonel,
Secretary to Government, Mil. Dept.

ORDER THEREON, No. 2,641 W., dated 18th November 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

2. It is requested that the services of Corporal Fuller may be made available as early as possible.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 30th November 1880, No. 2,674.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 4th November 1880, No. 2,254.

Report No. 6 on progress of work at Bhadrachalam coal fields from 16th to 31st October 1880.

SHAFT sunk from 50 feet to 55½ feet; sand stone passed through to 55 feet, then a layer of clay. Below this it has been impossible to go with the Abyssinian pump and the steam* pump must be awaited.

* Arrived at Dowlashweram, 2nd Nov. 1880.

Despatched by steamer to Golagudiem, 4th November 1880.

Firewood is being collected for the engine.

The Corporal in charge of the party has been suffering from dysentery and fever, and it appears that without his personal presence on the work it does not go on properly; another Non-Commissioned Officer is therefore very necessary, especially as pumping will have to be kept up at night. The unhealthiness of the place at this time of the year and the possibility of accidents make it also highly advisable that a Dresser should be attached to the party. Telegram of 26th October asking for another Non-Commissioned Officer and a Dresser was therefore sent.

Telegram from the Secretary to Government, Public Works Department, Madras, to the Superintendent of Works, Godáviri, Rajahmundry, dated 16th November 1880.

"Does further experience show that a Dresser for the coal party is still essential."

Telegram from Superintendent of Works, Godáviri, Rajahmundry, to the Secretary to Government, Public Works Department, Madras, dated 17th November 1880.

"HEALTH of coal party better, since rain stopped. May do without Dresser."

ORDER THEREON, No. 2,674 W., dated 30th November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd December 1880, No. 2,708.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 18th November 1880, No. 2,401.

Report No. 7 on progress of work at Bhadrachalam coal fields from 1st to 13th November 1880.

THE steam pump arrived at Golagudiem on 6th, and since then the party have been fully occupied in taking it, and the engine to work it, to the shaft and setting it up; the Corporal in charge reports that "the work is proceeding in a satisfactory manner."

2. Lieutenant Gale, R.E., visited the party on the 6th and 7th, and the Corporal in charge reports that since that visit and the change of Havildars which was then made the detachment has been working better than it had been working for some time previously.

3. The health of the party is better than it was, and it is thought that now it may get on without a Dresser, though of course it would be safer to have one on the spot, and another Non-Commissioned Officer to assist Corporal Nicks is very necessary as mentioned in the last report.

ORDER THEREON, No. 2,780, dated 3rd December 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd December 1880, No. 2,934 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 2nd December 1880, No. 2,554.

Report No. 8 on the progress of work at the Bhadrachalam Coal-field.—13th to 30th November 1880.

THE party have been engaged in keeping water down in the shaft with the Abyssinian pump and setting up the steam-pump and its engine.

No further sinking has been possible in the period under notice.

2. The Corporal in charge again reports, "there is a great deal of sickness among the detachment. Fever is very prevalent."

ORDER THEREON, No. 2,934 W., dated 22nd December 1880.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 10th January 1881, No. 38 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Wuddigudem, 16th December 1880, No. 2,751.

Report No. 9 on the progress of work at the Bhadrachalam Coal-field.—1st to 15th December 1880.

THE steam-pump was set to work on the 8th. There were then "18 feet of water in the shaft," and "it took 2 hours 35 minutes to pump dry;" owing, however, to extra framing, &c., being found necessary, actual work of excavation was not recommenced till 13th.

2. On the 15th the undersigned inspected the work. The shaft was down 56 feet, it was in good order and the pump going dead slow was keeping it clear of water.

A layer of clay (chiefly pipe-clay) had just been reached through which water was coming in freely.

The water has for some time past been sensibly affected by variations in the level of the river, which is now low, though not so low as it will be. It is impossible to say whether the one pump will be able to deal with the water which will be met with in the next 100 feet, and it will probably be advisable to have another ready; it could be driven by the same engine and driving machinery.

3. The huts were being moved up to near the shaft.

4. Ninety cubic yards of firewood for the engine have been cut.

5. The health of the party is not good, there are generally one-third or so of the sepoys down with fever, but it does not appear to be of a virulent type.

6. Corporal Fuller, R.E., has now (on 15th) joined the work.

7. No steamer will be able after this to get to Gollagudem, and probably not even to Wuddigudem till next June or July.

ORDER THEREON, No. 38 W., dated 10th January 1881.

THE Government consider that the additional pumping power referred to in paragraph 3 of the foregoing letter should be provided. The Superintendent of Works, Godáviri, will arrange accordingly.

2. The work being unhealthy should be pushed on as rapidly as possible.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 14th January 1881, No. 96 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 7th January 1881, No. 2,927.

Report No. 10 on the progress of works at the Bhadrachalam Coal-field.—16th to 31st December 1880.

(1.) Shaft deepened by 8 feet to 64 feet.

(2.) Soil passed through "different kinds of clay."

(3.) Removal of huts to site of shaft finished.

ORDER THEREON, No. 96 W., dated 14th January 1881.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 25th January 1881, No. 195 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 10th January 1881, No. 2,966.

I HAVE the honor to send herewith a letter from Corporal Nicks, R.E., in charge of the coal operations near Bhadrachalam, reporting the inrush of a large volume of water into the shaft.

2. Till this occurred all seemed to be going on well, though slowly.

3. I have told Corporal Nicks to again rig up the Abyssinian pump and see if with it he cannot get the water down low enough to get at the steam-pump box and again set it going, and then if the two will keep the water down sufficiently low it is possible that by putting in specially prepared cylinders we may be able to get through the treacherous stratum which has led to the present mishap; but if water with our present appliances cannot be kept so low, another pump more powerful than the present one, with machinery and engine to drive it, must be sent up.

4. Such machinery and engine however could not be got to the place before the next season of freshes in the river, say next July, and should it be found quite impossible to deal with the water with the present appliances I would request instructions as to what in the interval is to be done with the Sapper coal party.

From Corporal F. NICKS, R.E., to the Superintendent of Works, Godáviri, Dowlaishweram, dated Gollagudem, 5th January 1881, No. 118.

On Tuesday evening we were deep enough for 9th ring, and on Wednesday morning myself and Corporal Fuller started putting in same, as the soil was very treacherous it not being safe to trust sepoys; we had a slip of earth from the north side of shaft at about 11 A.M. We started then to plank that portion, as we had put in on (4) four plining (*sic*) planks and placed ring, we worked on and had placed four planks in the north quarter; we then noticed the water gradually rise, and the pump would not keep it down. I then sent Corporal Fuller up to ascertain if the engine was under proper steam, he informed me as he was coming down in bucket that steam gauge indicated 25 lb. As I was in the act of guiding the bucket down the water burst in from the south-west side, bringing with it a large quantity of "clay," about one-quarter yard, which knocked me down. Corporal Fuller said to me we had better take all tools up with us, but before he could get out of the bucket the water rose to my waist. I then said, never mind the tools we must get above the water in case the rings in upper work give way, as I had put my arm in where water was rushing from and found a large hole about 6 inches by 2 feet, so the clay could not be more than 1 foot 6 inches thick in front of the hole we had previously left, a berm of 6 inches in other work and considering this work was very dangerous we left a berm of 1 foot 3 inches.

We then cleared out of shaft as soon as possible with the water rising at the rate of 1 foot per minute, leaving all tools at bottom as we could not get at them for the water. I also kept engine at work till 10-25 P.M. making 25 strokes per minute, but the water still kept rising.

Rise of water	4-10 P.M.	No water more than ordinary.	5th January 1881.
Burst in at	4-15 P.M.		
7 feet	4-25 "		
21 feet 3 inches	5-50 "		
26 feet 8 inches	7-50 "		

Whilst taking measurement at 10 P.M. the pump gone out depth of water at the above time 29 feet 4 inches. I then gave orders to engine driver to draw fire, I then emptied boiler as I had been under steam near 400 hours.

At present we cannot get pump clear as working box is under water, the only remedy will be to get another set of top gear pipes and pump rods; if it is the Godáviri which is broke in upon us, which I think it is, it will be useless. 11-30 P.M.

I took measurements at 11-35 and found 33 feet 4 inches and at 7 A.M., the 6th, and found 38 feet 8 inches.

Please give me further instruction in answer to this.

ORDER THEREON, No. 195 W., 25th January 1881.

The Superintendent of Works, Godáviri, has already been authorised* to arrange
* G.O., No. 38 W., dated 10th January 1881. for the provision of additional pumping power.

2. The Government await a further report before passing orders on the subject of paragraph 4 of the letter above read.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Yanam, 19th January 1881, No. 3,073.

In continuation of my No. 2,966, dated 10th instant, I have the honor to state that Corporal Nicks reports that in spite of all efforts it has been found impossible to raise the pump to get at the upper box and working barrel, and that at noon on the 6th the water had attained the "height of 40 feet" since which it has not varied.

2. It is evident, therefore, that another and more powerful pump must be provided if the work is to be persevered with.

Telegram to the Superintendent of Works, Godáviri, Rajahmundry, dated 27th January 1881, No. 193.

MORE powerful pump for coal workings sanctioned. Arrange for one at once.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd February 1881, No. 308 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 28th Jan. 1881, No. 3,185.

Report No. 11 on the progress of work at the Bhadrachalam Coal-fields.—1st to 15th January 1881.

WORK progressed steadily till 5th, when the shaft was down 69 feet, water in large quantities then came in and overpowered the pump (see letters Nos. 2,966, 10th January 1881, and 3,073, 19th January 1881, to the Chief Engineer), and on the 15th there were 40 feet 4 inches depth of water in the shaft.

2. The Abyssinian pump which had been taken away and put on the barge was again taken to the shaft, and its placing commenced with the hope (a faint one) that with it the water can be so lowered that it may prove possible to get at the steam-pump boxes and set it going again. (See paragraph 3 of letter No. 2,966, 10th January 1881, to Chief Engineer.)

ORDER THEREON, No. 308 W., dated 3rd February 1881.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd February 1881, No. 493 W.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 31st January 1881, No. 3,225.

WITH reference to your telegram of 27th I have the honor to report that I have no means of here arranging for a more powerful pump for the coal shaft, and can only suggest that one may be supplied from the workshops at Madras or obtained from England.

2. Having had no experience in the work for which the pump is required, and having no one here who has had such experience, I cannot state with any certainty what is the nature and power of the pump required, and it seems therefore that it is best for me to explain the conditions of the case and from them possibly some Mining Engineer or manufacturer of mining machinery will be able to decide what is wanted. The conditions are these—

3. (a)—The shaft is 6 feet 3 inches diameter.
- (b)—It is sunk at about 1 mile from the edge of the Godáviri.
- (c)—The substrata already passed through (to 69 feet depth) have been almost entirely yellow sandstone, alternating with bands of yellowish and greyish clay, chiefly pipe-clay, and the boring shows that the general character of the strata to be yet passed through will be similar, but with fewer bands of clay, down to about 120 feet, when shale and coal will be met with.

(d)—Down to 55 feet there was but little water, but at that depth the Abyssinian pump could no longer deal with it, and the steam-pump sent up from the Madras Workshops was put up; whilst doing this (it occupied some days) the water rose 18 feet, this the pump when set to work cleared out in 2 hours 35 minutes.

(e)—This pump, driven by an old 8 horse-power engine, kept the water down easily enough till the shaft had reached a depth of 69 feet, when there

• For the first 7 feet came in at the rate of a stratum of pipe-clay and the water rose 29 feet 4 inches in 5½ hours against the pump going 22 strokes a minute. The pump then got choked and

See copy of report from Corporal Nicks, No. 118, 5th Jan. 1881, herewith. the water rose another 10 feet 8 inches, that is 40 feet in all (or to 29 below top of shaft) in another 14 hours and at that level it has stood.

(f)—The shaft has to go down to a total depth of about 150 feet.

(g)—The river—the variations in level of which have been noted to affect the water in the shaft—rises in the season of floods (from June to October) from 15 feet to 20 feet or so above its present level, or approximately to from about 10 feet to 15 feet below level of top of shaft.

(h)—As most of the soil to be passed through is sandstone, much sharp sand comes up with the water, and it has been found to rapidly wear away any leather it comes in contact with, such as "buckets," valves, &c.

4. As already stated in my No. 2,966, 10th January 1881, paragraph 4, machinery or apparatus of any kind, weighing more than could be carried by two coolies, could not be got to the shaft till next July, because it could not be taken by water much if at all beyond Koide, some 34 miles below Gollagudem, and between the two places there is no road, only a jungle track, which in places passes over rocky slopes of hills.

P.S.—As all pumps occasionally get out of order and all engines require to be stopped now and then, it will be highly advisable, if not necessary, to have two pumps and two engines, and it is of course of great convenience that the working parts of the pump should be easily raised or got at.

From the same officer, dated 6th February 1881, No. 3,294.

Report No. 12 on the progress of work at the Bhadrachalam Coal-field.—16th to 31st January 1881.

The Abyssinian pump (see paragraph 2 of last report) was fully rigged up by 19th, and pumping then commenced with it; by 24th the water had been reduced 11 feet, or to 29 feet in depth, and then the working part of the steam-pump was got at.

2. The leather "buckets" which had worn out (they are constantly wearing out owing to the action of the gritty sand, see paragraph 3, (g.), No. 3,225, 31st January 1881), were renewed and the pump was started again on 25th; by the evening of 27th it had reduced the water by 8 feet, or to 21 feet, in depth, below which it could not reduce it, and the leathers having again worn out it had to be stopped for a time, when the water immediately rose against the Abyssinian pump to 30 feet 7 inches depth.

3. It is quite evident that with the present pumping power it will be impossible to recommence sinking operations.

4. There can be little doubt that the water in the shaft is in communication through some permeable stratum with the water in the river, and that enormously powerful machinery and a very great expenditure will be necessary to enable the shaft to be sunk to where it will reach the shale and inferior coal which borings and geological researches have established to exist in small quantities in the locality.

ORDER THEREON, No. 493 W., dated 22nd February 1881.

THE Right Honorable the Governor in Council considers that before any further expenditure is incurred the opinion of an expert in mining matters should be obtained. The Chief Engineer has, it is understood, written to Calcutta to inquire whether the services of any qualified person can be secured.

Meanwhile the work should be suspended.

2. Orders have already been issued to the Superintendent of Works, directing the Sappers to return to their Company.

(True Extract.)

(Signed)

NICK, Major, R.E.,
Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 542 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 11th February 1881, No. 3,370.

FURTHER information has shown me that I was wrong in supposing that when water burst into the coal shaft at Bhadrachalam it came in at the rate of "630 gallons a minute," as stated in the margin, paragraph 3, clause (e) of my No. 3,225, 31st January 1881; it came in at the rate approximately of 200 gallons a minute.

2. I would take this opportunity of asking for early orders on paragraph 4 of my No. 2,966, 10th January 1881.

ORDER THEREON, No. 541 W., dated 23rd February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed)

J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 541 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 17th February 1881, No. 3,463.

Report No. 13 on Bhadrachalam Coal-field work.—1st to 15th February 1881.

As stated in last report it is quite impossible to proceed with the work, and it therefore has been at a complete stand-still during the last fifteen days.

ORDER THEREON, No. 542 W., dated 23rd February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed)

J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th March 1880, No. 698 W.

Read the following paper:—

MINUTE BY HIS GRACE THE GOVERNOR.

THE question of getting access to coal in this Presidency for railway and navigation purposes is a very important one.

2. That coal exists in the Nizam's territory, between the Godávári and Kistna, is well ascertained, and the quality of that recently obtained and tried, although the results are not yet accurately calculated, show that the coal is of a good, useful description, and reported by the Public Works Workshops as quite equal to the ordinary Indian coal they have in use. It becomes a question of price.

3. Coal is wanted for railway and steam purposes at Madras, for the navigation of the Godávári and at Cocanada, and will no doubt be also consumed on the canal.

4. It has been ascertained that coal exists on the Godávári river on the British side, and some coal raised from the dry bed of the river has given "good results" in the Godávári steamers. The quality of the coal, as tested by boring with small bores, is necessarily uncertain. Some is spoken of as fair, some as inferior; but it is close to the river, and the ground apparently not costly to sink in. If, as estimated by Mr. Vanstavern (who was especially employed upon the coal investigation), the coal seams can be reached by a shaft for an amount of under Rs. 2,000, it would be a matter to be tried at once without doubt; but I would put it higher, and taking the estimate above given, I would make allowance for pumping, ventilating and levelling, say that the trial should be considered as not to be effectually made under a possible Rs. 5,000; say at No. 16 bore, where the coal is within 150 feet from surface and about 18 feet thick, and the shaft only 1 mile from river, but above flood lines.

5. Coal in such a situation ought to be sufficient and economical for all purposes of steam engines on the river and delta and also at Cocanada, as its price must be low from the freight being entirely water and down-stream, so that an extra quantity might be used. How much further it could be carried can only be really known by actual test.

6. The opening of coal at this spot would doubtless stimulate the opening on the Nizam's side.

7. In ordinary times I should not hesitate to recommend the expenditure necessary to reach and test the coal seams, and even in the present times it seems to me desirable to do so. If the coal sufficed only for Godávári use, the cost would not be wasted.

8. The opening of any coal operation would tend to develop and thus to pacify the country around.

9. The question to be decided then is—

Shall Government endeavour, at a cost which may reach Rs. 5,000, to open the coal already ascertained to exist?

10. If that be agreed then the Chief Engineer should suggest the arrangements, and the co-operation of Mr. Vanstavern should be secured, for his local knowledge and long experience of the district.

11. The working season is from now to June.

5th January 1880. (Signed) BUCKINGHAM AND CHANDOS.

N.B.—The original maps, sections and memoranda should be returned to Mr. Vanstavern, as they are only lent. I could not trace the copies in Government possession—possibly lost.

ORDER THEREON, No. 698 W., dated 18th March 1880.

THE Revenue Department will arrange to place at the disposal of the Public Works Department the sum of Rs. 5,000 from the accumulated Cattle Trespass Fund for certain experiments on coal-boring operations in the Godáviri district.

2. This amount will be recouped when necessary for the farm purposes later on.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

No. 859.

MEMORANDUM.

HIS GRACE the Governor in Council having decided to make an early commencement with sinking a shaft for working a coal seam, whose existence has been proved at a point midway between Bhadrachalam and Rékapalle on the left bank of the Godáviri, the undersigned is desired to inquire whether His Excellency the Commander-in-Chief thinks that a party consisting of, say, two European Non-Commissioned Officers and a Havildar and Naigue with fourteen Sappers, who are acquainted with mining could conveniently be spared from the Companies of the "Queen's Own" Sappers and Miners which are now attached to the force under the command of Colonel Buck.

2. Their employment in sinking the shaft required might possibly extend to six months.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.
15th March 1880.
To the Secretary to Government, Military Department.

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 20th March 1880, No. 213.

WITH reference to your docket memorandum, No. 1,771, dated 16th March 1880,

* Herewith returned.

I have the honor to inform you that the Officer Commanding, Sappers and Miners at Dowlaishweram, has been directed to detach two British Non-Commissioned Officers with a Havildar and Naigue and fourteen Sappers for the purpose of sinking a shaft in the Godáviri district.

2. It is of great importance that these men should not be exposed in tents during the hot season, and His Excellency trusts that Government will see the necessity of having thatched huts for the natives, and suitable erections for the shelter of the British Non-Commissioned Officers employed.

No. 1,964.

TRANSFERRED to the Public Works Department, with reference to its memorandum, No. 859, dated 15th March 1880.

(By Order.)

(Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
Acting Secretary to Govt., Mily. Dept.
FORT ST. GEORGE,
25th March 1880.

No. 972.

MEMORANDUM.

THE Chief Engineer has the honor to forward, for the information of the Superintendent of Works, Godáviri, a copy of a Minute by His Grace the Governor regarding coal-boring explorations on the British side of the Godáviri river, with copies of the correspondence that has passed on the subject.

2. On receipt of an intimation from Mr. Vanstavern that he has no objection to the free use of the plans, &c., borings can be commenced. As it is understood that the working season will only last for about two months longer, every exertion should be made.

3. Meanwhile, in accordance with the wishes of His Excellency the Commander-in-Chief, proper shelter for the British Non-Commissioned Officers employed and thatched huts for the natives should at once be provided.

4. Mr. Walch's attention is invited to Lieutenant Baddeley's letter of the 15th March, in case the requisite machinery, &c., cannot be got from the Dowlaishweram shops.

(Signed) R. H. SANKEY, Col., R.E.,
Chief Engineer, P.W.D.
31st March 1880.

To the Superintendent of Works, Godáviri.

Proceedings of the Madras Government, Public Works Department, dated 14th April 1880, No. 960 W.

Read the following paper :—

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 2nd April 1880, No. 250.

IN continuation of Adjutant-General's letter, No. 213, dated 20th March 1880,

1 Havildar.
1 Naigue.
14 Privates.

I have the honor, by order, to state that the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram reports that the party, as

per margin, is in readiness to proceed under the orders of the Public Works Department.

2. There are no European Non-Commissioned Officers with the Detachment.

No. 2,117.

TRANSFERRED to the Public Works Department, in continuation of No. 1,964, dated 25th March 1880.

(Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
Acting Secretary to Govt., Mily. Dept.
FORT ST. GEORGE,
3rd April 1880.

ORDER THEREON, No. 960 W., dated 14th April 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 21st April 1880, No. 996-A W.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 6th April 1880, No. 84.

I HAVE the honor to acknowledge the receipt of your memorandum No. 972, dated 31st ultimo.

One Indent in triplicate.

2. As you will have seen from my letter No. 701, dated 31st March 1880, and its enclosure, I have no officer or upper

subordinate whom I can send for the coal operations, and the Officer Commanding the Detachment of the "Queen's Own" Sappers and Miners here has no European Non-Commissioned Officer.

3. In paragraph 10 of the Minute by His Grace the Governor it is said that "the co-operation of Mr. Vanstavern should be secured," and it seems to me that it would be advisable, as he lives not far from where the operations are to be carried on and has had some experience in such work, to employ him on a salary to superintend the work, but I have no authority to open negotiations officially with him on the subject, or to make him any offer.

4. The steamers cannot now go up the river further than Koide (52 miles), and only boats of very small draft can get from there to where the operations are proposed, some 35 miles further.

5. There are no pumps here at all suited for deep shaft sinking, and I enclose an indent for such a pump and machinery to drive it, which, if approved, please send on to the Government workshops, Madras. If the pump be sent it should be accompanied by a Maistry who understands its working.

6. I think if you will consider all the circumstances of the case you will see that there is no probability of the work being done in the "two months" mentioned in paragraph 2 of your memorandum under notice.

From Lieutenant W. L. C. BADDELEY, R.E., General Superintendent of Public Works Workshops and Stores, Madras, to the Secretary to Government, Public Works Department, dated 15th March 1880.

We have two deep well pumps in store which would be suitable for working a shaft 80 feet in depth.

2. The five-inch lift pump which we made for the Ooregum Company is a good pattern for deep shafts, and we could make up these very soon if required.

3. One of the Workshop Maistries would be available to look after the pumping machinery, but there is no one here who understands anything about mining.

4. If Dowlaishweram cannot provide the engines, we can spare a 4 horse-power portable or any number of Gwynne's or Nasmyth's 4 and 6 horse-power engines and boilers combined. These also could be made fairly portable by fitting them on a stand with wheels.

5. We have no machinery for working or lifting coal, but probably there would be no difficulty in making up any ordinary appliances.

ORDER THEREON, No. 996-A W., dated 21st April 1880.

THE Superintendent of Works, Presidency, will at once direct the General Superintendent, Public Works Workshops, to despatch one of the deep well pumps mentioned by him as suitable for a shaft 80 feet deep to the Superintendent of Works, Godáviri, along with one of the Workshop Maistries for looking after this and such other machinery as it may be found necessary to send for unwatering the coal shaft.

That officer should also be directed to place himself without delay in correspondence with the Superintendent of Works, Godáviri, relative to any steam pumping or other machinery that may be deemed necessary for sinking the shaft below 80 feet.

2. The Superintendent of Works, Godáviri Division, is authorised to make arrangements with Mr. Vanstavern for directing the operations, preferably fixing a definite sum on the shaft being sunk to the bottom of the seam indicated by the borings, and reporting the terms as soon as possible for the information of Government.

3. The original borings having been executed during the monsoon, His Grace in Council has no reason to suppose that the work need now be subjected to any delay

on account of the season, and as he attaches the greatest importance to the sinking of the shaft, no efforts should be spared to effect that object at the earliest date.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 27th April 1880, No. 1,035 W.

Proceedings of the Madras Government, Military Department, dated 14th April 1880, No. 2,404.

Read the following papers:—

Proceedings of the Madras Government, Public Works Department, dated 7th April 1880, No. 893 W.

Read letter from the Superintendent of Works, Godáviri, dated 30th March 1880, No. 701.

I HAVE the honor to enclose copy of a letter received this day from the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram, and to request instructions.

2. I would point out that the district is shorthanded, that just at this season there is a great amount of work in connection with the anicut and head works, canals, &c., which has to be compressed into a very short time; and I trust, therefore, that no one will have to be taken away from such work to carry out the "hutting," &c., referred to by Major Hamilton, and which it appears to me the men might carry out themselves.

3. I do not know where the Kottapalle referred to is.

From the Officer Commanding Detachment "Queen's Own" Sappers and Miners, to the Superintendent of Works, Godáviri, dated 29th March 1880, No. 209.

WITH reference to letter, No. 822, dated 20th March, from the Adjutant-General (copy annexed for your information), I have the honor to report that the party, consisting of one Havildar, one Naigue and fourteen Privates, is in readiness to proceed up the river under your orders. There are no European Non-Commissioned Officers with this detachment.

2. I presume that you will supply all necessary tools.

3. The party will have to be hutted by the Public Works Department.

From the Officiating Adjutant-General, to the Officer Commanding "Queen's Own" Sappers and Miners, Dowlaishweram, dated 20th March 1880, No. 822.

At the request of Government in the Public Works Department the Commander-in-Chief has sanctioned the services of a party of two European Non-Commissioned Officers, a Havildar, Naigue and fourteen Sappers, who are acquainted with mining, from the companies attached to the force under Colonel Buck, for employment in sinking a shaft for working a coal seam between Bhadrachalam and Kottapalle on the left bank of the Godáviri, and you are requested to detach the above party for this purpose.

UNDER the circumstances explained in Mr. Walch's letter, the detachment will provide hutting accommodation for themselves, the usual allowances being granted by the Military Department.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secretary to Govt., P.W.D.

To the Military Department.

ORDER,—Communicated to His Excellency the Commander-in-Chief.

2. Under O.G. (Military), No. 356, dated 30th January 1872, all special charges, including cost of hutting, incurred on account of Sappers employed on purely civil works, form a debit against the Public Works Department.

(True Extract.)

(Signed) H. N. D. PRENDERGAST, Col., R.E.,
Ag. Secretary to Government, Mily. Dept.

ORDER THEREON, No. 1,035 W., dated 27th April 1880.
COMMUNICATED to the Examiner of Public Works Accounts.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Military Department, dated 16th June 1880, No. 3,763.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri District, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 27th May 1880, No. 547.

I HAVE the honor to inform you that immediately on receipt of G.O., No. 996-AW., dated 21st April 1880, I put myself in communication with Mr. Vanstavern, and enclose copy of my last letter* to him to which I have received the enclosed reply, in which I am sorry to say he declines to undertake the superintendence of the coal shaft sinking for the reason which he states in a private letter.

That reason being that he thinks it probable that private affairs may render it necessary for him to leave the country before it would be possible to complete the shaft.

2. I am now at a loss to know how to carry out the wishes of Government as regards the speedy sinking of the shaft. An extra Overseer having come (see my No. 519, of 24th May 1880) I could send him, but he knows nothing of the kind of work, and it is doubtful if the working under him of the Sappers, whom it is proposed to send, would be smooth, and I would recommend that a Non-Commissioned Officer of the Sappers and Miners should be sent for the work.

3. Mr. Vanstavern states that, though borings could be got down during the rains and when the river was high, the difficulties and expense of sinking a shaft would, he is sure from a knowledge of the place, be much greater than in the dry season, as water would be met with at a much higher level and in much greater quantities.

No. 126.

REFERRED to the Military Department, with request that it may be ascertained if the services of any Non-Commissioned Officer of Sappers (European) acquainted with mining or shaft sinking can be placed at the disposal of this department for directing the operations as suggested by Mr. Walch. If such a Non-Commissioned Officer can be found, it is requested that he may be directed to proceed at once to the spot.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

5th June 1880.

From the Adjutant-General, No. 173, dated 14th June 1880.

In returning Military Department memorandum No. 3,561, of the 7th current, I have the honor, by order, to inform you that the services of Corporal Nicks of the

"Queen's Own" Sappers and Miners are available for the Godáviri coal shaft. He is stated to be zealous and by trade a "Fitter."

ORDER,—Ordered that the Adjutant-General's letter be communicated to the Public Works Department.

2. His Excellency the Commander-in-Chief is requested to cause Corporal Nicks to be detailed at once for the duty.

(True Extract.)

(Signed) J. MICHAEL, Col.,
Secy. to Govt., Mily. Dept.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 28th July 1880, No. 1,164.

WITH reference to our inspection of the proposed site for coal shaft on 22nd instant, I have the honor to forward tracing from plan of survey which I then ordered to be made.

2. I append the orders now issued to the Corporal in charge of the party with reference to this survey.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to Corporal F. NICKS, Golagudiem, dated 28th July 1880, No. 1,163.

WITH reference to the accompanying plan a report ought to have been sent stating whether there are any indications that point E., said to have been shown by villagers as site of bore-hole No. 16, is really the site.

2. If there be not any trustworthy indications that it really is so, the shaft is to be sunk at point A., or should that be in a local depression where trouble will be given by surface drainage, at some convenient point between it and D.

NOTE.

WITH reference to the annexed letter No. 1,164, of the 28th July 1880, from the Superintendent of Works, Godáviri, on the subject of the coal sinkings, I beg to offer the following brief remarks, having lately had the opportunity of inspecting the site of the operations in company with Mr. Martindale and Mr. Walch.

2. Leaving Dowlaishweram on morning of the 21st ultimo, Mr. Walch and I taking the new steam launch, *Arthur Cotton*, were enabled to pass very nearly through the Godáviri gorge before anchoring for the night, although the current was strong, 5.3 feet in depth, passing over the crest of the anicut.

3. Next morning picking up Mr. Martindale at Woodagudiem, we arrived at the site of the coal operations about noon, and spent some five or six hours in inspecting the locality and chiefly in endeavouring to find out the precise position of bore-hole No. 16, at which point, owing to the promising results of the previous borings, it had been decided to sink the shaft.

4. We found Corporal Nicks with his fourteen Sappers encamped at Golagudiem (*Golagaram* of the Indian Atlas), the party were well and sufficiently provided with shelter till the new shed 80 feet x 18 feet now sanctioned (and for which corrugated iron sheets have been brought down from the spare stores at Dumagudiem) has been run up, as it will be immediately.

5. In addition to an ample supply of tools of all kinds there was ready a pump which will, I hope, answer all purposes till a depth of 80 feet has been reached, when

one driven by steam now preparing at the Madras workshops will be sent up for unwatering the shaft at greater depths.

6. Twenty horizontal circular frames of angle iron, sufficient if spaced at 5 feet apart to reach to a depth of 100 feet, were also on the ground. If stiff soil or rock be met with, these may be spaced at greater intervals or omitted altogether and answer for 150 feet in depth, but in any case Mr. Walch can readily send up all that is needed in this respect from Dowlaishweram.

7. Mr. Martindale, who takes a kindly interest in the work, will see that the party have ample and good supplies, and if, as I hope, the men only keep their health, the work should progress favorably, though it is at the same time to be feared that, particularly at this season, water may be met with close to the surface, and difficulties on this account may delay operations.

8. Corporal Nicks had explored nearly all the area of previous operations, but had failed to discover the precise location of bore hole No. 16. Most of the sites of the other bore holes as pointed out by the villagers had been marked by a rough block of red sand stone, but in this particular case no indication could be found and it was thus fortunate that we were able to visit the place at this time.

9. From there not being a single definite point or bearing given on the survey whereby to recognise the old holes, and from these having been mere punctures and easily obliterated, it was necessary to fix the point in question by as many approximations as we could. The result is shown by the tracing now sent up by Mr. Walch. Our approximations led us to decide on the point A., and it would now appear from subsequent information received from the villagers (probably those of Totapilly, who we were informed had been engaged on this particular portion of the old work) that the point E. at no great distance from A. is the true point.

10. I feel assured that in no case will the point selected here be much out, though, of course, it would have been very much more satisfactory to find the exact locality.

Mr. Walch's present decision as conveyed to Corporal Nicks may therefore, I think, be safely accepted.

11. The whole country about is rather undulating, clayey, with bushy jungle here and there, and well raised above the river, but showing from the moisture which lodges in the lower portions, that at this season much water may have to be encountered in sinking the shaft.

12. It would, of course, be premature to say much about the results of these operations, but if Mr. Vanstavern (whom I met at Woodagudiem, but who owing to illness was unable to accompany me to the coal field) is to be credited, the coal is likely to turn out very shaley. The best specimen, he informed me, only yielded 30 per cent. of carbon, and the worst 9 per cent.

13. As regards the proper designation of this coal field, there is some doubt. Totapilly, by which it appears to have been first known, though shown on the atlas, is a very insignificant village and at a distance from our present workings. Tiperpenti (Tipurapentaneed of the tracing) is not shown on the atlas, and is also both insignificant and at some distance. If the field is to be called after any of the neighbouring villages, Golagudiem, where the camp is and which is both shown on the atlas and is on the river bank, would be the most appropriate designation.

14. But to the best of my judgment it would be preferable to call it the Bhadrachalam field, as it is sufficiently near to this, which is certainly the best known and most important place in the neighbourhood.

15. If the Government approve, therefore, I would in all future correspondence designate this the Bhadrachalam coal field.

16. The Superintendent of Works has orders to send up fortnightly progress reports of the work done.

(Signed) R. H. SANKEY, Colonel, R.E.,
Chief Engineer, P.W.D.

9th August 1880.

No. 318.

MEMORANDUM.

THE accompanying note is forwarded to the Superintendent of Works, Godavari, for information.

2. The decision conveyed in his letter No. 1,164, of the 28th July 1880, with reference to the point at which the shaft is to be sunk is accepted.

3. Fortnightly progress reports should be continued in order that His Grace the Governor may be kept advised of the results.

4. This field will in future be designated the Bhadrachalam field in all official documents.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

14th August 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 18th August 1880, No. 1,336.

In continuation of my letter No. 1,164, of the 28th July 1880, I have the honor to forward, herewith, an extract from letter No. 4, of the 5th August 1880, received from Corporal Nicks stating that he is fully convinced that bore hole No. 16 was at the point E. shown on the survey plan, of which copy was sent with my No. 1,164.

Extract of a letter from Corporal F. NICKS, R.E., in charge of Coal Shaft Sinking, to G. T. WALCH, Esq., Superintendent of Works, Godavari, dated 5th August 1880, No. 4.

With reference to your docket No. 1,163, dated 28th July 1880, regarding point E as shown by villagers, I am fully convinced it is the actual site of bore hole No. 16. In the first place I was taken to the spot E by two villagers who stated they were employed at the boring. I examined the surface soil and found indications that boring had been done there. I found two different soils, viz., light colored clay and sand stone in layers, the same as would come from an auger after boring.

2. On the 3rd instant I made inquiries at the village of Tipurapentaneed and found a man who was employed from the commencement to the finishing of the borings under Mr. Vanstavern; he also took me to the exact spot marked E as shown on plan and showed me the above soil as mentioned, and states that was what came up with the auger; he also pointed to a tree where they cooked their meals, which is only 10 yards from the spot. I intend to sink the shaft at the place pointed. I have already commenced getting stores on the spot to commence work.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 23rd August 1880, No. 1,434.

Report No. 1 on progress of work at Bhadrachalam coal fields to 14th August 1880.

THE sheds having been erected and necessary machinery moved up to site for shaft, actual sinking was commenced on 12th August, and up to 14th depth gone down to was 4 feet 6 inches.

No. 393, dated 3rd September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Dowlashweram, 3rd September 1880, No. 1,587.

Report No. 2 on progress of work at Bhadrachalam coal fields from 15th to 28th August 1880.

SHAFT sunk from 4 feet 6 inches to 15 feet; soil passed through chiefly "blue and yellow clay" with kunkur; sand stone just reached; some trouble given by water after heavy storms. Party apparently not working quite satisfactorily. Will be visited soon.

No. 450, dated 17th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated 16th September 1880, No. 1,721.

Report No. 3 on progress of work at Bhadrachalam coal fields from 28th August to 15th September 1880.

SHAFT sunk from 15 to 34 feet; soil passed through chiefly yellow sand stone compact *in situ*, but breaking up easily when dug out. Pump arrangements fixed.

No. 490, dated 30th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Dowlashweram, 22nd September 1880, No. 1,722.

I HAVE the honor to inform you that I have on 15th, 20th and 21st instant inspected the work at the Bhadrachalam coal fields, and I find that, though going on slowly, it is being well done.

2. The shaft has now been sunk to a depth of 39 feet and water has just been reached.

3. The first 5 feet passed through was ordinary alluvial and vegetable soil; then came for 10 feet yellow clay, about the lower 5 feet of which was mixed with kunkur; then for 14 feet 6 inches yellow sand stone compact and hard *in situ*, but disintegrating when removed to the surface; and below this to the 39 feet depth a light blue clay chiefly "pipe clay" with at 38 feet a stratum of a few inches of sand stone.

4. Through this last thin stratum of sand stone water has commenced to come in slowly. At 4 P.M. on 20th I saw the bottom of the shaft practically cleared of water, and at 6 A.M. (21st) 1 foot 8 inches in depth had accumulated.

5. The Abyssinian pump sent from Madras has been fixed and works well, clearing such water as is now coming in with perfect ease.

6. The party is well housed and has kept in fair health. Corporal Nicks and some of the men have had rheumatism, one or two have had slight fever, and the Naigue who went up with the party has been sent back to Dowlashweram with bad ulcers on his feet, and he has been replaced by another man.

7. There have been no accidents, and I am quite satisfied with the care taken by Corporal Nicks, who is in immediate charge of the operations. I cannot say I am quite satisfied with the rate at which the work has been carried on, but native Sappers, it appears to me, do not generally work rapidly.

No. 506, dated 5th October 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated 5th October 1880, No. 1,843.

Report No. 4 on progress of work at Bhadrachalam coal fields from 15th to 30th September 1880.

SHAFT sunk from 34 to 44 feet; soil passed through, sand stone, with layers of light blue clay, chiefly pipe clay; water coming in quickly. Pump, "Abyssinian," has now to be worked night and day.

2. The Corporal in charge reports that his detachment is working unsatisfactorily, and that "if the sepoys are required to work in the shaft or at the winch they report themselves sick."

3. It seems likely that these men are behaving as they are with the object of being sent back to their Company, which they think may soon be sent to Bangalore; it would, I think, be well to let them know for certain that they will not be sent away from the work till it is finished, and that if they are sick they will have to go into hospital at Rajahmundry and when discharged return to the work. Eight coolies are now employed to assist the detachment.

No. 2,331.

THE Chief Engineer concurs with the Superintendent of Works that it will be advisable to let the Sappers distinctly understand that they will not, by malingering, be enabled to desert the work which they have been sent up to carry out.

2. When sick they may be sent to the hospital at Rajahmundry as proposed.

(By Order.)

(Signed) J. PENNYCUICK, Major, R.E.,
Deputy Chief Engineer, P.W.D.
18th October 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Yernagudem, 20th October 1880, No. 2,006.

Report No. 5 on progress of work at Bhadrachalam coal fields from 1st to 15th October 1880.

SHAFT sunk from 44 to 50 feet; soil passed through, sand stone, said to be hard, with thin layers of clay.

2. Slow progress due to large quantities of water to be dealt with, and the Corporal reports that the Abyssinian pump can no longer keep the water down, and no further sinking can go on till the steam pump is at work. This is expected daily.

No. 2,422, dated 2nd November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th November 1880, No. 2,641 W.

Proceedings of the Madras Government, Military Department, dated 13th November 1880, No. 7,102.

Telegram from the Superintendent of Works, Godáviri, to the Public Works Department, Madras, dated 26th October 1880.

"Another Non-Commissioned Officer to help Corporal Nicks, often ill, and Dresser for coal party much wanted."

TRANSFERRED to the Military Department, with a request that it may be stated whether any Non-Commissioned Officer can be sent from the "Queen's Own" Sappers and Miners for the purpose.

OOTACAMUND, 29th October 1880. (Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From the Adjutant-General, dated 10th November 1880, No. 499.

WITH reference to a telegram from the Superintendent of Works, Rajahmundry, dated 26th October 1880, transferred to the Military Department under Public Works Department No. 601 of 26th ultimo, and referred to His Excellency the Commander-in-Chief under Government endorsement memorandum No. 6,887 of 30th idem, herewith returned as requested, I have the honor, by order, to state that there is no objection to the services of Corporal B. Fuller, R.E., being placed at the disposal of Government in the Public Works Department for employment at Rajahmundry.

ORDER.—The Adjutant-General's letter communicated to the Public Works Department.

(True Extract.)

(Signed) J. MICHAEL, Colonel,
Secretary to Government, Milly. Dept.

ORDER THEREON, No. 2,641 W., dated 18th November 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

2. It is requested that the services of Corporal Fuller may be made available as early as possible.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 30th November 1880, No. 2,674.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 4th November 1880, No. 2,254.

Report No. 6 on progress of work at Bhadrachalam coal fields from 16th to 31st October 1880.

SHAFT sunk from 50 feet to 55½ feet; sand stone passed through to 55 feet, then a layer of clay. Below this it has been impossible to go with the Abyssinian pump and the steam* pump must be awaited.

* Arrived at Dowlaishweram, 2nd Nov. 1880.
Despatched by steamer to Golagudiem, 4th November 1880.

Firewood is being collected for the engine.

The Corporal in charge of the party has been suffering from dysentery and fever, and it appears that without his personal presence on the work it does not go on properly; another Non-Commissioned Officer is therefore very necessary, especially as pumping will have to be kept up at night. The unhealthiness of the place at this time of the year and the possibility of accidents make it also highly advisable that a Dresser should be attached to the party. Telegram of 26th October asking for another Non-Commissioned Officer and a Dresser was therefore sent.

Telegram from the Secretary to Government, Public Works Department, Madras, to the Superintendent of Works, Godáviri, Rajahmundry, dated 16th November 1880.

"Does further experience show that a Dresser for the coal party is still essential."

Telegram from Superintendent of Works, Godáviri, Rajahmundry, to the Secretary to Government, Public Works Department, Madras, dated 17th November 1880.

"HEALTH of coal party better, since rain stopped. May do without Dresser."

ORDER THEREON, No. 2,674 W., dated 30th November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd December 1880, No. 2,708.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 18th November 1880, No. 2,401.

Report No. 7 on progress of work at Bhadrachalam coal fields from 1st to 13th November 1880.

THE steam pump arrived at Golagudiem on 6th, and since then the party have been fully occupied in taking it, and the engine to work it, to the shaft and setting it up; the Corporal in charge reports that "the work is proceeding in a satisfactory manner."

2. Lieutenant Gale, R.E., visited the party on the 6th and 7th, and the Corporal in charge reports that since that visit and the change of Havildars which was then made the detachment has been working better than it had been working for some time previously.

3. The health of the party is better than it was, and it is thought that now it may get on without a Dresser, though of course it would be safer to have one on the spot, and another Non-Commissioned Officer to assist Corporal Nicks is very necessary as mentioned in the last report.

ORDER THEREON, No. 2,780, dated 3rd December 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd December 1880, No. 2,934 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 2nd December 1880, No. 2,554.

Report No. 8 on the progress of work at the Bhadrachalam Coal-field.—13th to 30th November 1880.

THE party have been engaged in keeping water down in the shaft with the Abyssinian pump and setting up the steam-pump and its engine.

No further sinking has been possible in the period under notice.

2. The Corporal in charge again reports, "there is a great deal of sickness among the detachment. Fever is very prevalent."

ORDER THEREON, No. 2,934 W., dated 22nd December 1880.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 10th January 1881, No. 38 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Wuddigudem, 16th December 1880, No. 2,751.

Report No. 9 on the progress of work at the Bhadrachalam Coal-field.—1st to 15th December 1880.

THE steam-pump was set to work on the 8th. There were then "18 feet of water in the shaft," and "it took 2 hours 35 minutes to pump dry;" owing, however, to extra framing, &c., being found necessary, actual work of excavation was not recommenced till 13th.

2. On the 15th the undersigned inspected the work. The shaft was down 56 feet, it was in good order and the pump going dead slow was keeping it clear of water.

A layer of clay (chiefly pipe-clay) had just been reached through which water was coming in freely.

The water has for some time past been sensibly affected by variations in the level of the river, which is now low, though not so low as it will be. It is impossible to say whether the one pump will be able to deal with the water which will be met with in the next 100 feet, and it will probably be advisable to have another ready; it could be driven by the same engine and driving machinery.

3. The huts were being moved up to near the shaft.

4. Ninety cubic yards of firewood for the engine have been cut.

5. The health of the party is not good, there are generally one-third or so of the sepoys down with fever, but it does not appear to be of a virulent type.

6. Corporal Fuller, R.E., has now (on 15th) joined the work.

7. No steamer will be able after this to get to Gollagudem, and probably not even to Wuddigudem till next June or July.

ORDER THEREON, No. 38 W., dated 10th January 1881.

THE Government consider that the additional pumping power referred to in paragraph 3 of the foregoing letter should be provided. The Superintendent of Works, Godáviri, will arrange accordingly.

2. The work being unhealthy should be pushed on as rapidly as possible.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 14th January 1881, No. 96 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 7th January 1881, No. 2,927.

Report No. 10 on the progress of works at the Bhadrachalam Coal-field.—16th to 31st December 1880.

(1.) Shaft deepened by 8 feet to 64 feet.

(2.) Soil passed through "different kinds of clay."

(3.) Removal of huts to site of shaft finished.

ORDER THEREON, No. 96 W., dated 14th January 1881.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 25th January 1881, No. 195 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 10th January 1881, No. 2,966.

I HAVE the honor to send herewith a letter from Corporal Nicks, R.E., in charge of the coal operations near Bhadrachalam, reporting the inrush of a large volume of water into the shaft.

2. Till this occurred all seemed to be going on well, though slowly.

3. I have told Corporal Nicks to again rig up the Abyssinian pump and see if with it he cannot get the water down low enough to get at the steam-pump box and again set it going, and then if the two will keep the water down sufficiently low it is possible that by putting in specially prepared cylinders we may be able to get through the treacherous stratum which has led to the present mishap; but if water with our present appliances cannot be kept so low, another pump more powerful than the present one, with machinery and engine to drive it, must be sent up.

4. Such machinery and engine however could not be got to the place before the next season of freshes in the river, say next July, and should it be found quite impossible to deal with the water with the present appliances I would request instructions as to what in the interval is to be done with the Sapper coal party.

From Corporal F. NICKS, R.E., to the Superintendent of Works, Godávári, Dowlaishweram, dated Gollagudem, 5th January 1881, No. 118.

On Tuesday evening we were deep enough for 9th ring, and on Wednesday morning myself and Corporal Fuller started putting in same, as the soil was very treacherous it not being safe to trust sepoys; we had a slip of earth from the north side of shaft at about 11 A.M. We started then to plank that portion, as we had put in on (4) four plining (*sic*) planks and placed ring, we worked on and had placed four planks in the north quarter; we then noticed the water gradually rise, and the pump would not keep it down. I then sent Corporal Fuller up to ascertain if the engine was under proper steam, he informed me as he was coming down in bucket that steam gauge indicated 25 lb. ☐ As I was in the act of guiding the bucket down the water burst in from the south-west side, bringing with it a large quantity of "clay," about one-quarter yard, which knocked me down. Corporal Fuller said to me we had better take all tools up with us, but before he could get out of the bucket the water rose to my waist. I then said, never mind the tools we must get above the water in case the rings in upper work give way, as I had put my arm in where water was rushing from and found a large hole about 6 inches by 2 feet, so the clay could not be more than 1 foot 6 inches thick in front of the hole we had previously left, a berm of 6 inches in other work and considering this work was very dangerous we left a berm of 1 foot 3 inches.

We then cleared out of shaft as soon as possible with the water rising at the rate of 1 foot per minute, leaving all tools at bottom as we could not get at them for the water. I also kept engine at work till 10-25 P.M. making 25 strokes per minute, but the water still kept rising.

Rise of water	4-10 P.M.	No water more than ordinary.	5th January 1881.
Burst in at	4-15 P.M.		
7 feet	4-25 "		
21 feet 3 inches	5-50 "		
26 feet 8 inches	7-50 "		

Whilst taking measurement at 10 P.M. the pump gone out depth of water at the above time 29 feet 4 inches. I then gave orders to engine driver to draw fire, I then emptied boiler as I had been under steam near 400 hours.

At present we cannot get pump clear as working box is under water, the only remedy will be to get another set of top gear pipes and pump rods; if it is the Godávári which is broke in upon us, which I think it is, it will be useless. 11-30 P.M.

I took measurements at 11-35 and found 33 feet 4 inches and at 7 A.M., the 6th, and found 38 feet 8 inches.

Please give me further instruction in answer to this.

ORDER THEREON, No. 195 W., 25th January 1881.

The Superintendent of Works, Godávári, has already been authorised* to arrange
* G.O., No. 38 W., dated 10th January 1881. for the provision of additional pumping power.

2. The Government await a further report before passing orders on the subject of paragraph 4 of the letter above read.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Yanam, 19th January 1881, No. 3,073.

In continuation of my No. 2,966, dated 10th instant, I have the honor to state that Corporal Nicks reports that in spite of all efforts it has been found impossible to raise the pump to get at the upper box and working barrel, and that at noon on the 6th the water had attained the "height of 40 feet" since which it has not varied.

2. It is evident, therefore, that another and more powerful pump must be provided if the work is to be persevered with.

Telegram to the Superintendent of Works, Godávári, Rajahmundry, dated 27th January 1881, No. 193.

More powerful pump for coal workings sanctioned. Arrange for one at once.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd February 1881, No. 308 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated 28th January 1881, No. 3,185.

Report No. 11 on the progress of work at the Bhadrachalam Coal-fields.—1st to 15th January 1881.

Work progressed steadily till 5th, when the shaft was down 69 feet, water in large quantities then came in and overpowered the pump (see letters Nos. 2,966, 10th January 1881, and 3,073, 19th January 1881, to the Chief Engineer), and on the 15th there were 40 feet 4 inches depth of water in the shaft.

2. The Abyssinian pump which had been taken away and put on the barge was again taken to the shaft, and its placing commenced with the hope (a faint one) that with it the water can be so lowered that it may prove possible to get at the steam-pump boxes and set it going again. (See paragraph 3 of letter No. 2,966, 10th January 1881, to Chief Engineer.)

ORDER THEREON, No. 308 W., dated 3rd February 1881.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd February 1881, No. 493 W.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 31st January 1881, No. 3,225.

With reference to your telegram of 27th I have the honor to report that I have no means of here arranging for a more powerful pump for the coal shaft, and can only suggest that one may be supplied from the workshops at Madras or obtained from England.

2. Having had no experience in the work for which the pump is required, and having no one here who has had such experience, I cannot state with any certainty what is the nature and power of the pump required, and it seems therefore that it is best for me to explain the conditions of the case and from them possibly some Mining Engineer or manufacturer of mining machinery will be able to decide what is wanted. The conditions are these—

3. (a)—The shaft is 6 feet 3 inches diameter.
- (b)—It is sunk at about 1 mile from the edge of the Godávári.
- (c)—The substrata already passed through (to 69 feet depth) have been almost entirely yellow sandstone, alternating with bands of yellowish and greyish clay, chiefly pipe-clay, and the boring shows that the general character of the strata to be yet passed through will be similar, but with fewer bands of clay, down to about 120 feet, when shale and coal will be met with.

(d)—Down to 55 feet there was but little water, but at that depth the Abyssinian pump could no longer deal with it, and the steam-pump sent up from the Madras Workshops was put up; whilst doing this (it occupied some days) the water rose 18 feet, this the pump when set to work cleared out in 2 hours 35 minutes.

(e)—This pump, driven by an old 8 horse-power engine, kept the water down easily enough till the shaft had reached a depth of 69 feet, when there

• For the first 7 feet came in at the rate of about 630 gallons a minute. a stratum of pipe-clay and the water rose* 29 feet 4

inches in 5½ hours against the pump going 22 strokes a minute. The

See copy of letter from Corporal Nicks, No. 118, 5th January 1881, herewith. pump then got choked and the water rose another 10 feet 8 inches, that is 40 feet

in all (or to 29 below top of shaft) in another 14 hours and at that level it has stood.

(f)—The shaft has to go down to a total depth of about 150 feet.

(g)—The river—the variations in level of which have been noted to affect the water in the shaft—rises in the season of floods (from June to October) from 15 feet to 20 feet or so above its present level, or approximately to from about 10 feet to 15 feet below level of top of shaft.

(h)—As most of the soil to be passed through is sandstone, much sharp sand comes up with the water, and it has been found to rapidly wear away any leather it comes in contact with, such as "buckets," valves, &c.

4. As already stated in my No. 2,966, 10th January 1881, paragraph 4, machinery or apparatus of any kind, weighing more than could be carried by two coolies, could not be got to the shaft till next July, because it could not be taken by water much if at all beyond Koide, some 34 miles below Gollagudem, and between the two places there is no road, only a jungle track, which in places passes over rocky slopes of hills.

P.S.—As all pumps occasionally get out of order and all engines require to be stopped now and then, it will be highly advisable, if not necessary, to have two pumps and two engines, and it is of course of great convenience that the working parts of the pump should be easily raised or got at.

From the same officer, dated 6th February 1881, No. 3,294.

Report No. 12 on the progress of work at the Bhadrachalam Coal-field.—16th to 31st January 1881.

The Abyssinian pump (see paragraph 2 of last report) was fully rigged up by 19th, and pumping then commenced with it; by 24th the water had been reduced 11 feet, or to 29 feet in depth, and then the working part of the steam-pump was got at.

2. The leather "buckets" which had worn out (they are constantly wearing out owing to the action of the gritty sand, see paragraph 3, (g.), No. 3,225, 31st January 1881), were renewed and the pump was started again on 25th; by the evening of 27th it had reduced the water by 8 feet, or to 21 feet, in depth, below which it could not reduce it, and the leathers having again worn out it had to be stopped for a time, when the water immediately rose against the Abyssinian pump to 30 feet 7 inches depth.

3. It is quite evident that with the present pumping power it will be impossible to recommence sinking operations.

4. There can be little doubt that the water in the shaft is in communication through some permeable stratum with the water in the river, and that enormously powerful machinery and a very great expenditure will be necessary to enable the shaft to be sunk to where it will reach the shale and inferior coal which borings and geological researches have established to exist in small quantities in the locality.

ORDER THEREON, No. 493 W., dated 22nd February 1881.

THE Right Honorable the Governor in Council considers that before any further expenditure is incurred the opinion of an expert in mining matters should be obtained. The Chief Engineer has, it is understood, written to Calcutta to inquire whether the services of any qualified person can be secured.

Meanwhile the work should be suspended.

2. Orders have already been issued to the Superintendent of Works, directing the Sappers to return to their Company.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 542 W.

Read the following paper :—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 11th February 1881, No. 3,370.

FURTHER information has shown me that I was wrong in supposing that when water burst into the coal shaft at Bhadrachalam it came in at the rate of "630 gallons a minute," as stated in the margin, paragraph 3, clause (e) of my No. 3,225, 31st January 1881; it came in at the rate approximately of 200 gallons a minute.

2. I would take this opportunity of asking for early orders on paragraph 4 of my No. 2,966, 10th January 1881.

ORDER THEREON, No. 541 W., dated 28th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 541 W.

Read the following paper :—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 17th February 1881, No. 3,463.

Report No. 13 on Bhadrachalam Coal-field work.—1st to 15th February 1881.

As stated in last report it is quite impossible to proceed with the work, and it therefore has been at a complete stand-still during the last fifteen days.

ORDER THEREON, No. 542 W., dated 28th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th March 1880, No. 698 W.

Read the following paper:—

MINUTE BY HIS GRACE THE GOVERNOR.

THE question of getting access to coal in this Presidency for railway and navigation purposes is a very important one.

2. That coal exists in the Nizam's territory, between the Godáviri and Kistna, is well ascertained, and the quality of that recently obtained and tried, although the results are not yet accurately calculated, show that the coal is of a good, useful description, and reported by the Public Works Workshops as quite equal to the ordinary Indian coal they have in use. It becomes a question of price.

3. Coal is wanted for railway and steam purposes at Madras, for the navigation of the Godáviri and at Cocanada, and will no doubt be also consumed on the canal.

4. It has been ascertained that coal exists on the Godáviri river on the British side, and some coal raised from the dry bed between Bhadrachalam and Rékapalle. of the river has given "good results" in the Godáviri steamers. The quality of the coal, as tested by boring with small bores, is necessarily uncertain. Some is spoken of as fair, some as inferior; but it is close to the river, and the ground apparently not costly to sink in. If, as estimated by Mr. Vanstavern (who was especially employed upon the coal investigation), the coal seams can be reached by a shaft for an amount of under Rs. 2,000, it would be a matter to be tried at once without doubt; but I would put it higher, and taking the estimate above given, I would make allowance for pumping, ventilating and levelling, say that the trial should be considered as not to be effectually made under a possible Rs. 5,000; say at No. 16 bore, where the coal is within 150 feet from surface and about 18 feet thick, and the shaft only 1 mile from river, but above flood lines.

5. Coal in such a situation ought to be sufficient and economical for all purposes of steam engines on the river and delta and also at Cocanada, as its price must be low from the freight being entirely water and down-stream, so that an extra quantity might be used. How much further it could be carried can only be really known by actual test.

6. The opening of coal at this spot would doubtless stimulate the opening on the Nizam's side.

7. In ordinary times I should not hesitate to recommend the expenditure necessary to reach and test the coal seams, and even in the present times it seems to me desirable to do so. If the coal sufficed only for Godáviri use, the cost would not be wasted.

8. The opening of any coal operation would tend to develope and thus to pacify the country around.

9. The question to be decided then is—

Shall Government endeavour, at a cost which may reach Rs. 5,000, to open the coal already ascertained to exist?

10. If that be agreed then the Chief Engineer should suggest the arrangements, and the co-operation of Mr. Vanstavern should be secured, for his local knowledge and long experience of the district.

11. The working season is from now to June.

5th January 1880.

(Signed) BUCKINGHAM AND CHANDOS.

N.B.—The original maps, sections and memoranda should be returned to Mr. Vanstavern, as they are only lent. I could not trace the copies in Government possession—possibly lost.

ORDER THEREON, No. 698 W., dated 18th March 1880.

THE Revenue Department will arrange to place at the disposal of the Public Works Department the sum of Rs. 5,000 from the accumulated Cattle Trespass Fund for certain experiments on coal-boring operations in the Godáviri district.

2. This amount will be recouped when necessary for the farm purposes later on.
(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

No. 859.

MEMORANDUM.

HIS GRACE the Governor in Council having decided to make an early commencement with sinking a shaft for working a coal seam, whose existence has been proved at a point midway between Bhadrachalam and Rékapalle on the left bank of the Godáviri, the undersigned is desired to inquire whether His Excellency the Commander-in-Chief thinks that a party consisting of, say, two European Non-Commissioned Officers and a Havildar and Naigue with fourteen Sappers, who are acquainted with mining could conveniently be spared from the Companies of the "Queen's Own" Sappers and Miners which are now attached to the force under the command of Colonel Buck.

2. Their employment in sinking the shaft required might possibly extend to six months.

15th March 1880.
(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.
To the Secretary to Government, Military Department.

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 20th March 1880, No. 213.

WITH reference to your docket memorandum, No. 1,771, dated 16th March 1880,

* Herewith returned.

I have the honor to inform you that the Officer Commanding, Sappers and Miners at Dowlaishweram, has been directed to detach two British Non-Commissioned Officers with a Havildar and Naigue and fourteen Sappers for the purpose of sinking a shaft in the Godáviri district.

2. It is of great importance that these men should not be exposed in tents during the hot season, and His Excellency trusts that Government will see the necessity of having thatched huts for the natives, and suitable erections for the shelter of the British Non-Commissioned Officers employed.

No. 1,964.

TRANSFERRED to the Public Works Department, with reference to its memorandum, No. 859, dated 15th March 1880.

(By Order.)

FORT ST. GEORGE, 25th March 1880. (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
Acting Secretary to Govt., Mily. Dept.

No. 972.

MEMORANDUM.

THE Chief Engineer has the honor to forward, for the information of the Superintendent of Works, Godáviri, a copy of a Minute by His Grace the Governor regarding coal-boring explorations on the British side of the Godáviri river, with copies of the correspondence that has passed on the subject.

2. On receipt of an intimation from Mr. Vanstavern that he has no objection to the free use of the plans, &c., borings can be commenced. As it is understood that the working season will only last for about two months longer, every exertion should be made.

3. Meanwhile, in accordance with the wishes of His Excellency the Commander-in-Chief, proper shelter for the British Non-Commissioned Officers employed and thatched huts for the natives should at once be provided.

4. Mr. Walch's attention is invited to Lieutenant Baddeley's letter of the 15th March, in case the requisite machinery, &c., cannot be got from the Dowlaishweram shops.

31st March 1880. (Signed) R. H. SANKEY, Col., R.E.,
Chief Engineer, P.W.D.

To the Superintendent of Works, Godáviri.

Proceedings of the Madras Government, Public Works Department, dated 14th April 1880, No. 960 W.

Read the following paper :—

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 2nd April 1880, No. 250.

IN continuation of Adjutant-General's letter, No. 213, dated 20th March 1880,

1 Havildar.
1 Naigue.
14 Privates.

I have the honor, by order, to state that the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram reports that the party, as

per margin, is in readiness to proceed under the orders of the Public Works Department.

2. There are no European Non-Commissioned Officers with the Detachment.

No. 2,117.

TRANSFERRED to the Public Works Department, in continuation of No. 1,964, dated 25th March 1880.

FORT ST. GEORGE, 3rd April 1880. (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
Acting Secretary to Govt., Mily. Dept.

ORDER THEREON, No. 960 W., dated 14th April 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 21st April 1880, No. 996-A W.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 6th April 1880, No. 84.

I HAVE the honor to acknowledge the receipt of your memorandum No. 972, dated 31st ultimo.

One Indent in triplicate.

2. As you will have seen from my letter No. 701, dated 31st March 1880, and its enclosure, I have no officer or upper

subordinate whom I can send for the coal operations, and the Officer Commanding the Detachment of the "Queen's Own" Sappers and Miners here has no European Non-Commissioned Officer.

3. In paragraph 10 of the Minute by His Grace the Governor it is said that "the co-operation of Mr. Vanstavern should be secured," and it seems to me that it would be advisable, as he lives not far from where the operations are to be carried on and has had some experience in such work, to employ him on a salary to superintend the work, but I have no authority to open negotiations officially with him on the subject, or to make him any offer.

4. The steamers cannot now go up the river further than Koide (52 miles), and only boats of very small draft can get from there to where the operations are proposed, some 35 miles further.

5. There are no pumps here at all suited for deep shaft sinking, and I enclose an indent for such a pump and machinery to drive it, which, if approved, please send on to the Government workshops, Madras. If the pump be sent it should be accompanied by a Maistry who understands its working.

6. I think if you will consider all the circumstances of the case you will see that there is no probability of the work being done in the "two months" mentioned in paragraph 2 of your memorandum under notice.

From Lieutenant W. L. C. BADDELEY, R.E., General Superintendent of Public Works Workshops and Stores, Madras, to the Secretary to Government, Public Works Department, dated 15th March 1880.

We have two deep well pumps in store which would be suitable for working a shaft 80 feet in depth.

2. The five-inch lift pump which we made for the Ooregum Company is a good pattern for deep shafts, and we could make up these very soon if required.

3. One of the Workshop Maistries would be available to look after the pumping machinery, but there is no one here who understands anything about mining.

4. If Dowlaishweram cannot provide the engines, we can spare a 4 horse-power portable or any number of Gwynne's or Nasmyth's 4 and 6 horse-power engines and boilers combined. These also could be made fairly portable by fitting them on a stand with wheels.

5. We have no machinery for working or lifting coal, but probably there would be no difficulty in making up any ordinary appliances.

ORDER THEREON, No. 996-A W., dated 21st April 1880.

THE Superintendent of Works, Presidency, will at once direct the General Superintendent, Public Works Workshops, to despatch one of the deep well pumps mentioned by him as suitable for a shaft 80 feet deep to the Superintendent of Works, Godáviri, along with one of the Workshop Maistries for looking after this and such other machinery as it may be found necessary to send for unwatering the coal shaft.

That officer should also be directed to place himself without delay in correspondence with the Superintendent of Works, Godáviri, relative to any steam pumping or other machinery that may be deemed necessary for sinking the shaft below 80 feet.

2. The Superintendent of Works, Godáviri Division, is authorised to make arrangements with Mr. Vanstavern for directing the operations, preferably fixing a definite sum on the shaft being sunk to the bottom of the seam indicated by the borings, and reporting the terms as soon as possible for the information of Government.

3. The original borings having been executed during the monsoon, His Grace in Council has no reason to suppose that the work need now be subjected to any delay

on account of the season, and as he attaches the greatest importance to the sinking of the shaft, no efforts should be spared to effect that object at the earliest date.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 27th April 1880, No. 1,035 W.

Proceedings of the Madras Government, Military Department, dated 14th April 1880, No. 2,404.

Read the following papers:—

Proceedings of the Madras Government, Public Works Department, dated 7th April 1880, No. 893 W.

Read letter from the Superintendent of Works, Godáviri, dated 30th March 1880, No. 701.

I HAVE the honor to enclose copy of a letter received this day from the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram, and to request instructions.

2. I would point out that the district is shorthanded, that just at this season there is a great amount of work in connection with the anicut and head works, canals, &c., which has to be compressed into a very short time; and I trust, therefore, that no one will have to be taken away from such work to carry out the "hutting," &c., referred to by Major Hamilton, and which it appears to me the men might carry out themselves.

3. I do not know where the Kottapalle referred to is.

From the Officer Commanding Detachment "Queen's Own" Sappers and Miners, to the Superintendent of Works, Godáviri, dated 29th March 1880, No. 209.

WITH reference to letter, No. 822, dated 20th March, from the Adjutant-General (copy annexed for your information), I have the honor to report that the party, consisting of one Havildar, one Naigue and fourteen Privates, is in readiness to proceed up the river under your orders. There are no European Non-Commissioned Officers with this detachment.

2. I presume that you will supply all necessary tools.

3. The party will have to be huttied by the Public Works Department.

From the Officiating Adjutant-General, to the Officer Commanding "Queen's Own" Sappers and Miners, Dowlaishweram, dated 20th March 1880, No. 822.

At the request of Government in the Public Works Department the Commander-in-Chief has sanctioned the services of a party of two European Non-Commissioned Officers, a Havildar, Naigue and fourteen Sappers, who are acquainted with mining, from the companies attached to the force under Colonel Buck, for employment in sinking a shaft for working a coal seam between Bhadrachalam and Kottapalle on the left bank of the Godáviri, and you are requested to detach the above party for this purpose.

UNDER the circumstances explained in Mr. Walch's letter, the detachment will provide hutting accommodation for themselves, the usual allowances being granted by the Military Department.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secretary to Govt., P.W.D.

To the Military Department.

ORDER,—Communicated to His Excellency the Commander-in-Chief.

2. Under O.G. (Military), No. 356, dated 30th January 1872, all special charges, including cost of hutting, incurred on account of Sappers employed on purely civil works, form a debit against the Public Works Department.

(True Extract.)

(Signed) H. N. D. PRENDERGAST, Col., R.E.,
Ag. Secretary to Government, Mily. Dept.

ORDER THEREON, No. 1,035 W., dated 27th April 1880.
COMMUNICATED to the Examiner of Public Works Accounts.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Military Department, dated 16th June 1880, No. 3,763.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri District, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 27th May 1880, No. 547.

I HAVE the honor to inform you that immediately on receipt of G.O., No. 996-AW., dated 21st April 1880, I put myself in communication with Mr. Vanstavern, and enclose copy of my last letter* to him to which I have received the enclosed reply, in which I am sorry to say he declines to undertake the superintendence of the coal shaft sinking for the reason which he states in a private letter.

That reason being that he thinks it probable that private affairs may render it necessary for him to leave the country before it would be possible to complete the shaft.

2. I am now at a loss to know how to carry out the wishes of Government as regards the speedy sinking of the shaft. An extra Overseer having come (see my No. 519, of 24th May 1880) I could send him, but he knows nothing of the kind of work, and it is doubtful if the working under him of the Sappers, whom it is proposed to send, would be smooth, and I would recommend that a Non-Commissioned Officer of the Sappers and Miners should be sent for the work.

3. Mr. Vanstavern states that, though borings could be got down during the rains and when the river was high, the difficulties and expense of sinking a shaft would, he is sure from a knowledge of the place, be much greater than in the dry season, as water would be met with at a much higher level and in much greater quantities.

No. 126.

REFERRED to the Military Department, with request that it may be ascertained if the services of any Non-Commissioned Officer of Sappers (European) acquainted with mining or shaft sinking can be placed at the disposal of this department for directing the operations as suggested by Mr. Walch. If such a Non-Commissioned Officer can be found, it is requested that he may be directed to proceed at once to the spot.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

5th June 1880.

From the Adjutant-General, No. 173, dated 14th June 1880.

In returning Military Department memorandum No. 3,561, of the 7th current, I have the honor, by order, to inform you that the services of Corporal Nicks of the

"Queen's Own" Sappers and Miners are available for the Godáviri coal shaft. He is stated to be zealous and by trade a "Fitter."

ORDER,—Ordered that the Adjutant-General's letter be communicated to the Public Works Department.

2. His Excellency the Commander-in-Chief is requested to cause Corporal Nicks to be detailed at once for the duty.

(True Extract.)

(Signed) J. MICHAEL, Col.,
Secy. to Govt., Mily. Dept.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 28th July 1880, No. 1,164.

WITH reference to our inspection of the proposed site for coal shaft on 22nd instant, I have the honor to forward tracing from plan of survey which I then ordered to be made.

2. I append the orders now issued to the Corporal in charge of the party with reference to this survey.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to Corporal F. NICKS, Golagudiem, dated 28th July 1880, No. 1,163.

WITH reference to the accompanying plan a report ought to have been sent stating whether there are any indications that point E., said to have been shown by villagers as site of bore-hole No. 16, is really the site.

2. If there be not any trustworthy indications that it really is so, the shaft is to be sunk at point A., or should that be in a local depression where trouble will be given by surface drainage, at some convenient point between it and D.

NOTE.

WITH reference to the annexed letter No. 1,164, of the 28th July 1880, from the Superintendent of Works, Godáviri, on the subject of the coal sinkings, I beg to offer the following brief remarks, having lately had the opportunity of inspecting the site of the operations in company with Mr. Martindale and Mr. Walch.

2. Leaving Dowlaishweram on morning of the 21st ultimo, Mr. Walch and I taking the new steam launch, *Arthur Cotton*, were enabled to pass very nearly through the Godáviri gorge before anchoring for the night, although the current was strong, 5-3 feet in depth, passing over the crest of the anicut.

3. Next morning picking up Mr. Martindale at Woodagudiem, we arrived at the site of the coal operations about noon, and spent some five or six hours in inspecting the locality and chiefly in endeavouring to find out the precise position of bore-hole No. 16, at which point, owing to the promising results of the previous borings, it had been decided to sink the shaft.

4. We found Corporal Nicks with his fourteen Sappers encamped at Golagudiem (*Golagaram* of the Indian Atlas), the party were well and sufficiently provided with shelter till the new shed 80 feet x 18 feet now sanctioned (and for which corrugated iron sheets have been brought down from the spare stores at Dumagudiem) has been run up, as it will be immediately.

5. In addition to an ample supply of tools of all kinds there was ready a pump which will, I hope, answer all purposes till a depth of 80 feet has been reached, when

one driven by steam now preparing at the Madras workshops will be sent up for unwatering the shaft at greater depths.

6. Twenty horizontal circular frames of angle iron, sufficient if spaced at 5 feet apart to reach to a depth of 100 feet, were also on the ground. If stiff soil or rock be met with, these may be spaced at greater intervals or omitted altogether and answer for 150 feet in depth, but in any case Mr. Walch can readily send up all that is needed in this respect from Dowlaisheram.

7. Mr. Martindale, who takes a kindly interest in the work, will see that the party have ample and good supplies, and if, as I hope, the men only keep their health, the work should progress favorably, though it is at the same time to be feared that, particularly at this season, water may be met with close to the surface, and difficulties on this account may delay operations.

8. Corporal Nicks had explored nearly all the area of previous operations, but had failed to discover the precise location of bore hole No. 16. Most of the sites of the other bore holes as pointed out by the villagers had been marked by a rough block of red sand stone, but in this particular case no indication could be found and it was thus fortunate that we were able to visit the place at this time.

9. From there not being a single definite point or bearing given on the survey whereby to recognise the old holes, and from these having been mere punctures and easily obliterated, it was necessary to fix the point in question by as many approximations as we could. The result is shown by the tracing now sent up by Mr. Walch. Our approximations led us to decide on the point A., and it would now appear from subsequent information received from the villagers (probably those of Totapilly, who we were informed had been engaged on this particular portion of the old work) that the point E. at no great distance from A. is the true point.

10. I feel assured that in no case will the point selected here be much out, though, of course, it would have been very much more satisfactory to find the exact locality.

Mr. Walch's present decision as conveyed to Corporal Nicks may therefore, I think, be safely accepted.

11. The whole country about is rather undulating, clayey, with bushy jungle here and there, and well raised above the river, but showing from the moisture which lodges in the lower portions, that at this season much water may have to be encountered in sinking the shaft.

12. It would, of course, be premature to say much about the results of these operations, but if Mr. Vanstavern (whom I met at Woodagudiem, but who owing to illness was unable to accompany me to the coal field) is to be credited, the coal is likely to turn out very shaley. The best specimen, he informed me, only yielded 30 per cent. of carbon, and the worst 9 per cent.

13. As regards the proper designation of this coal field, there is some doubt. Totapilly, by which it appears to have been first known, though shown on the atlas, is a very insignificant village and at a distance from our present workings. Tiperpenti (Tipurapentaneed of the tracing) is not shown on the atlas, and is also both insignificant and at some distance. If the field is to be called after any of the neighbouring villages, Golagudiem, where the camp is and which is both shown on the atlas and is on the river bank, would be the most appropriate designation.

14. But to the best of my judgment it would be preferable to call it the Bhadrachalam field, as it is sufficiently near to this, which is certainly the best known and most important place in the neighbourhood.

15. If the Government approve, therefore, I would in all future correspondence designate this the Bhadrachalam coal field.

16. The Superintendent of Works has orders to send up fortnightly progress reports of the work done.

(Signed) R. H. SANKEY, Colonel, R.E.,
Chief Engineer, P.W.D.

9th August 1880.

No. 318.

MEMORANDUM.

THE accompanying note is forwarded to the Superintendent of Works, Godavari, for information.

2. The decision conveyed in his letter No. 1,164, of the 28th July 1880, with reference to the point at which the shaft is to be sunk is accepted.

3. Fortnightly progress reports should be continued in order that His Grace the Governor may be kept advised of the results.

4. This field will in future be designated the Bhadrachalam field in all official documents.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

14th August 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaisheram, 18th August 1880, No. 1,336.

IN continuation of my letter No. 1,164, of the 28th July 1880, I have the honor to forward, herewith, an extract from letter No. 4, of the 5th August 1880, received from Corporal Nicks stating that he is fully convinced that bore hole No. 16 was at the point E. shown on the survey plan, of which copy was sent with my No. 1,164.

Extract of a letter from Corporal F. NICKS, R.E., in charge of Coal Shaft Sinking, to G. T. WALCH, Esq., Superintendent of Works, Godavari, dated 5th August 1880, No. 4.

WITH reference to your docket No. 1,163, dated 28th July 1880, regarding point E as shown by villagers, I am fully convinced it is the actual site of bore hole No. 16. In the first place I was taken to the spot E by two villagers who stated they were employed at the boring. I examined the surface soil and found indications that boring had been done there. I found two different soils, viz., light colored clay and sand stone in layers, the same as would come from an auger after boring.

2. On the 3rd instant I made inquiries at the village of Tipurapentaneed and found a man who was employed from the commencement to the finishing of the borings under Mr. Vanstavern; he also took me to the exact spot marked E as shown on plan and showed me the above soil as mentioned, and states that was what came up with the auger; he also pointed to a tree where they cooked their meals, which is only 10 yards from the spot. I intend to sink the shaft at the place pointed. I have already commenced getting stores on the spot to commence work.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 23rd August 1880, No. 1,434.

Report No. 1 on progress of work at Bhadrachalam coal fields to 14th August 1880.

THE sheds having been erected and necessary machinery moved up to site for shaft, actual sinking was commenced on 12th August, and up to 14th depth gone down to was 4 feet 6 inches.

No. 393, dated 3rd September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 3rd September 1880, No. 1,587.

Report No. 2 on progress of work at Bhadrachalam coal fields from 15th to 28th August 1880.

SHAFT sunk from 4 feet 6 inches to 15 feet; soil passed through chiefly "blue and yellow clay" with kunkur; sand stone just reached; some trouble given by water after heavy storms. Party apparently not working quite satisfactorily. Will be visited soon.

No. 450, dated 17th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 16th September 1880, No. 1,721.

Report No. 3 on progress of work at Bhadrachalam coal fields from 28th August to 15th September 1880.

SHAFT sunk from 15 to 34 feet; soil passed through chiefly yellow sand stone compact *in situ*, but breaking up easily when dug out. Pump arrangements fixed.

No. 490, dated 30th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 22nd September 1880, No. 1,722.

I HAVE the honor to inform you that I have on 15th, 20th and 21st instant inspected the work at the Bhadrachalam coal fields, and I find that, though going on slowly, it is being well done.

2. The shaft has now been sunk to a depth of 39 feet and water has just been reached.

3. The first 5 feet passed through was ordinary alluvial and vegetable soil; then came for 10 feet yellow clay, about the lower 5 feet of which was mixed with kunkur; then for 14 feet 6 inches yellow sand stone compact and hard *in situ*, but disintegrating when removed to the surface; and below this to the 39 feet depth a light blue clay chiefly "pipe clay" with at 38 feet a stratum of a few inches of sand stone.

4. Through this last thin stratum of sand stone water has commenced to come in slowly. At 4 P.M. on 20th I saw the bottom of the shaft practically cleared of water, and at 6 A.M. (21st) 1 foot 8 inches in depth had accumulated.

5. The Abyssinian pump sent from Madras has been fixed and works well, clearing such water as is now coming in with perfect ease.

6. The party is well housed and has kept in fair health. Corporal Nicks and some of the men have had rheumatism, one or two have had slight fever, and the Naigue who went up with the party has been sent back to Dowlaishweram with bad ulcers on his feet, and he has been replaced by another man.

7. There have been no accidents, and I am quite satisfied with the care taken by Corporal Nicks, who is in immediate charge of the operations. I cannot say I am quite satisfied with the rate at which the work has been carried on, but native Sappers, it appears to me, do not generally work rapidly.

No. 506, dated 5th October 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 5th October 1880, No. 1,843.

Report No. 4 on progress of work at Bhadrachalam coal fields from 15th to 30th September 1880.

SHAFT sunk from 34 to 44 feet; soil passed through, sand stone, with layers of light blue clay, chiefly pipe clay; water coming in quickly. Pump, "Abyssinian," has now to be worked night and day.

2. The Corporal in charge reports that his detachment is working unsatisfactorily, and that "if the sepoys are required to work in the shaft or at the winch they report themselves sick."

3. It seems likely that these men are behaving as they are with the object of being sent back to their Company, which they think may soon be sent to Bangalore; it would, I think, be well to let them know for certain that they will not be sent away from the work till it is finished, and that if they are sick they will have to go into hospital at Rajahmundry and when discharged return to the work. Eight coolies are now employed to assist the detachment.

No. 2,331.

THE Chief Engineer concurs with the Superintendent of Works that it will be advisable to let the Sappers distinctly understand that they will not, by malingering, be enabled to desert the work which they have been sent up to carry out.

2. When sick they may be sent to the hospital at Rajahmundry as proposed.

(By Order.)

(Signed) J. PENNYCUICK, Major, R.E.,
Deputy Chief Engineer, P.W.D.

18th October 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Yernagudem, 20th October 1880, No. 2,006.

Report No. 5 on progress of work at Bhadrachalam coal fields from 1st to 15th October 1880.

SHAFT sunk from 44 to 50 feet; soil passed through, sand stone, said to be hard, with thin layers of clay.

2. Slow progress due to large quantities of water to be dealt with, and the Corporal reports that the Abyssinian pump can no longer keep the water down, and no further sinking can go on till the steam pump is at work. This is expected daily.

No. 2,422, dated 2nd November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th November 1880, No. 2,641 W.

Proceedings of the Madras Government, Military Department, dated 13th November 1880, No. 7,102.

Telegram from the Superintendent of Works, Godáviri, to the Public Works Department, Madras, dated 26th October 1880.

"Another Non-Commissioned Officer to help Corporal Nicks, often ill, and Dresser for coal party much wanted."

TRANSFERRED to the Military Department, with a request that it may be stated whether any Non-Commissioned Officer can be sent from the "Queen's Own" Sappers and Miners for the purpose.

OOTACAMUND,
29th October 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From the Adjutant-General, dated 10th November 1880, No. 499.

WITH reference to a telegram from the Superintendent of Works, Rajahmundry, dated 26th October 1880, transferred to the Military Department under Public Works Department No. 601 of 26th ultimo, and referred to His Excellency the Commander-in-Chief under Government endorsement memorandum No. 6,887 of 30th idem, herewith returned as requested, I have the honor, by order, to state that there is no objection to the services of Corporal B. Fuller, R.E., being placed at the disposal of Government in the Public Works Department for employment at Rajahmundry.

ORDER.—The Adjutant-General's letter communicated to the Public Works Department.

(True Extract.)

(Signed) J. MICHAEL, Colonel,
Secretary to Government, Mily. Dept.

ORDER THEREON, No. 2,641 W., dated 18th November 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

2. It is requested that the services of Corporal Fuller may be made available as early as possible.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 30th November 1880, No. 2,674.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 4th November 1880, No. 2,254.

Report No. 6 on progress of work at Bhadrachalam coal fields from 16th to 31st October 1880.

SHAFT sunk from 50 feet to 55½ feet; sand stone passed through to 55 feet, then a layer of clay. Below this it has been impossible to go with the Abyssinian pump and the steam* pump must be awaited.

Firewood is being collected for the engine.

The Corporal in charge of the party has been suffering from dysentery and fever, and it appears that without his personal presence on the work it does not go on properly; another Non-Commissioned Officer is therefore very necessary, especially as pumping will have to be kept up at night. The unhealthiness of the place at this time of the year and the possibility of accidents make it also highly advisable that a Dresser should be attached to the party. Telegram of 26th October asking for another Non-Commissioned Officer and a Dresser was therefore sent.

Telegram from the Secretary to Government, Public Works Department, Madras, to the Superintendent of Works, Godáviri, Rajahmundry, dated 16th November 1880.

"Does further experience show that a Dresser for the coal party is still essential."

Telegram from Superintendent of Works, Godáviri, Rajahmundry, to the Secretary to Government, Public Works Department, Madras, dated 17th November 1880.

"HEALTH of coal party better, since rain stopped. May do without Dresser."

ORDER THEREON, No. 2,674 W., dated 30th November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd December 1880, No. 2,708.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 18th November 1880, No. 2,401.

Report No. 7 on progress of work at Bhadrachalam coal fields from 1st to 13th November 1880.

THE steam pump arrived at Golagudiem on 6th, and since then the party have been fully occupied in taking it, and the engine to work it, to the shaft and setting it up; the Corporal in charge reports that "the work is proceeding in a satisfactory manner."

2. Lieutenant Gale, R.E., visited the party on the 6th and 7th, and the Corporal in charge reports that since that visit and the change of Havildars which was then made the detachment has been working better than it had been working for some time previously.

4. Such machinery and engine however could not be got to the place before the next season of freshes in the river, say next July, and should it be found quite impossible to deal with the water with the present appliances I would request instructions as to what in the interval is to be done with the Sapper coal party.

From Corporal F. NICKS, R.E., to the Superintendent of Works, Godávári, Dowlaishweram, dated Gollagudem, 5th January 1881, No. 118.

On Tuesday evening we were deep enough for 9th ring, and on Wednesday morning myself and Corporal Fuller started putting in same, as the soil was very treacherous it not being safe to trust sepoys; we had a slip of earth from the north side of shaft at about 11 A.M. We started then to plank that portion, as we had put in on (4) four plining (*sic*) planks and placed ring, we worked on and had placed four planks in the north quarter; we then noticed the water gradually rise, and the pump would not keep it down. I then sent Corporal Fuller up to ascertain if the engine was under proper steam, he informed me as he was coming down in bucket that steam gauge indicated 25 lb. ☐ As I was in the act of guiding the bucket down the water burst in from the south-west side, bringing with it a large quantity of "clay," about one-quarter yard, which knocked me down. Corporal Fuller said to me we had better take all tools up with us, but before he could get out of the bucket the water rose to my waist. I then said, never mind the tools we must get above the water in case the rings in upper work give way, as I had put my arm in where water was rushing from and found a large hole about 6 inches by 2 feet, so the clay could not be more than 1 foot 6 inches thick in front of the hole we had previously left, a berm of 6 inches in other work and considering this work was very dangerous we left a berm of 1 foot 3 inches.

We then cleared out of shaft as soon as possible with the water rising at the rate of 1 foot per minute, leaving all tools at bottom as we could not get at them for the water. I also kept engine at work till 10-25 P.M. making 25 strokes per minute, but the water still kept rising.

Rise of water	4-10 P.M.	No water more than ordinary.	5th January 1881.
Burst in at	4-15 P.M.		
7 feet	4-25 "		
21 feet 3 inches	5-50 "		
26 feet 8 inches	7-50 "		

Whilst taking measurement at 10 P.M. the pump gone out depth of water at the above time 29 feet 4 inches. I then gave orders to engine driver to draw fire, I then emptied boiler as I had been under steam near 400 hours.

At present we cannot get pump clear as working box is under water, the only remedy will be to get another set of top gear pipes and pump rods; if it is the Godávári which is broke in upon us, which I think it is, it will be useless. 11-30 P.M.

I took measurements at 11-35 and found 33 feet 4 inches and at 7 A.M., the 6th, and found 38 feet 8 inches.

Please give me further instruction in answer to this.

ORDER THEREON, No. 195 W., 25th January 1881.

THE Superintendent of Works, Godávári, has already been authorised* to arrange
* G.O., No. 38 W., dated 10th January 1881. for the provision of additional pumping power.

2. The Government await a further report before passing orders on the subject of paragraph 4 of the letter above read.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Yanam, 19th January 1881, No. 3,073.

In continuation of my No. 2,966, dated 10th instant, I have the honor to state that Corporal Nicks reports that in spite of all efforts it has been found impossible to raise the pump to get at the upper box and working barrel, and that at noon on the 6th the water had attained the "height of 40 feet" since which it has not varied.

2. It is evident, therefore, that another and more powerful pump must be provided if the work is to be persevered with.

Telegram to the Superintendent of Works, Godávári, Rajahmundry, dated 27th January 1881, No. 193.

MORE powerful pump for coal workings sanctioned. Arrange for one at once.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd February 1881, No. 308 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated 28th January 1881, No. 3,185.

Report No. 11 on the progress of work at the Bhadrachalam Coal-fields.—1st to 15th January 1881.

WORK progressed steadily till 5th, when the shaft was down 69 feet, water in large quantities then came in and overpowered the pump (see letters Nos. 2,966, 10th January 1881, and 3,073, 19th January 1881, to the Chief Engineer), and on the 15th there were 40 feet 4 inches depth of water in the shaft.

2. The Abyssinian pump which had been taken away and put on the barge was again taken to the shaft, and its placing commenced with the hope (a faint one) that with it the water can be so lowered that it may prove possible to get at the steam-pump boxes and set it going again. (See paragraph 3 of letter No. 2,966, 10th January 1881, to Chief Engineer.)

ORDER THEREON, No. 308 W., dated 3rd February 1881.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd February 1881, No. 493 W.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godávári, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 31st January 1881, No. 3,225.

With reference to your telegram of 27th I have the honor to report that I have no means of here arranging for a more powerful pump for the coal shaft, and can only suggest that one may be supplied from the workshops at Madras or obtained from England.

2. Having had no experience in the work for which the pump is required, and having no one here who has had such experience, I cannot state with any certainty what is the nature and power of the pump required, and it seems therefore that it is best for me to explain the conditions of the case and from them possibly some Mining Engineer or manufacturer of mining machinery will be able to decide what is wanted. The conditions are these—

3. (a)—The shaft is 6 feet 3 inches diameter.
- (b)—It is sunk at about 1 mile from the edge of the Godávári.
- (c)—The substrata already passed through (to 69 feet depth) have been almost entirely yellow sandstone, alternating with bands of yellowish and greyish clay, chiefly pipe-clay, and the boring shows that the general character of the strata to be yet passed through will be similar, but with fewer bands of clay, down to about 120 feet, when shale and coal will be met with.

(d)—Down to 55 feet there was but little water, but at that depth the Abyssinian pump could no longer deal with it, and the steam-pump sent up from the Madras Workshops was put up; whilst doing this (it occupied some days) the water rose 18 feet, this the pump when set to work cleared out in 2 hours 35 minutes.

(e)—This pump, driven by an old 8 horse-power engine, kept the water down easily enough till the shaft had reached a depth of 69 feet, when there

• For the first 7 feet came in at the rate of a stratum of pipe-clay and about 630 gallons a minute. the water rose* 29 feet 4

inches in 5½ hours against the pump going 22 strokes a minute. The

See copy of letter from Corporal Nicks, No. 118, 5th January 1881, herewith. pump then got choked and the water rose another 10

feet 8 inches, that is 40 feet in all (or to 29 below top of shaft) in another 14 hours and at that level it has stood.

(f)—The shaft has to go down to a total depth of about 150 feet.

(g)—The river—the variations in level of which have been noted to affect the water in the shaft—rises in the season of floods (from June to October) from 15 feet to 20 feet or so above its present level, or approximately to from about 10 feet to 15 feet below level of top of shaft.

(h)—As most of the soil to be passed through is sandstone, much sharp sand comes up with the water, and it has been found to rapidly wear away any leather it comes in contact with, such as "buckets," valves, &c.

4. As already stated in my No. 2,966, 10th January 1881, paragraph 4, machinery or apparatus of any kind, weighing more than could be carried by two coolies, could not be got to the shaft till next July, because it could not be taken by water much if at all beyond Koide, some 34 miles below Gollagudem, and between the two places there is no road, only a jungle track, which in places passes over rocky slopes of hills.

P.S.—As all pumps occasionally get out of order and all engines require to be stopped now and then, it will be highly advisable, if not necessary, to have two pumps and two engines, and it is of course of great convenience that the working parts of the pump should be easily raised or got at.

From the same officer, dated 6th February 1881, No. 3,294.

Report No. 12 on the progress of work at the Bhadrachalam Coal-field.—16th to 31st January 1881.

The Abyssinian pump (see paragraph 2 of last report) was fully rigged up by 19th, and pumping then commenced with it; by 24th the water had been reduced 11 feet, or to 29 feet in depth, and then the working part of the steam-pump was got at.

2. The leather "buckets" which had worn out (they are constantly wearing out owing to the action of the gritty sand, see paragraph 3, (g.), No. 3,225, 31st January 1881), were renewed and the pump was started again on 25th; by the evening of 27th it had reduced the water by 8 feet, or to 21 feet, in depth, below which it could not reduce it, and the leathers having again worn out it had to be stopped for a time, when the water immediately rose against the Abyssinian pump to 30 feet 7 inches depth.

3. It is quite evident that with the present pumping power it will be impossible to recommence sinking operations.

4. There can be little doubt that the water in the shaft is in communication through some permeable stratum with the water in the river, and that enormously powerful machinery and a very great expenditure will be necessary to enable the shaft to be sunk to where it will reach the shale and inferior coal which borings and geological researches have established to exist in small quantities in the locality.

ORDER THEREON, No. 493 W., dated 22nd February 1881.

THE Right Honorable the Governor in Council considers that before any further expenditure is incurred the opinion of an expert in mining matters should be obtained. The Chief Engineer has, it is understood, written to Calcutta to inquire whether the services of any qualified person can be secured.

Meanwhile the work should be suspended.

2. Orders have already been issued to the Superintendent of Works, directing the Sappers to return to their Company.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 542 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaiswaram, 11th February 1881, No. 3,370.

FURTHER information has shown me that I was wrong in supposing that when water burst into the coal shaft at Bhadrachalam it came in at the rate of "630 gallons a minute," as stated in the margin, paragraph 3, clause (e) of my No. 3,225, 31st January 1881; it came in at the rate approximately of 200 gallons a minute.

2. I would take this opportunity of asking for early orders on paragraph 4 of my No. 2,966, 10th January 1881.

ORDER THEREON, No. 541 W., dated 23th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 541 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 17th February 1881, No. 3,463.

Report No. 13 on Bhadrachalam Coal-field work.—1st to 15th February 1881.

As stated in last report it is quite impossible to proceed with the work, and it therefore has been at a complete stand-still during the last fifteen days.

ORDER THEREON, No. 542 W., dated 23th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th March 1880, No. 698 W.

Read the following paper:—

MINUTE BY HIS GRACE THE GOVERNOR.

The question of getting access to coal in this Presidency for railway and navigation purposes is a very important one.

2. That coal exists in the Nizam's territory, between the Godáviri and Kistna, is well ascertained, and the quality of that recently obtained and tried, although the results are not yet accurately calculated, show that the coal is of a good, useful description, and reported by the Public Works Workshops as quite equal to the ordinary Indian coal they have in use. It becomes a question of price.

3. Coal is wanted for railway and steam purposes at Madras, for the navigation of the Godáviri and at Cocanada, and will no doubt be also consumed on the canal.

4. It has been ascertained that coal exists on the Godáviri river on the British side, and some coal raised from the dry bed of the river has given "good results" in the Godáviri steamers. The quality of the coal, as tested by boring with small bores, is necessarily uncertain. Some is spoken of as fair, some as inferior; but it is close to the river, and the ground apparently not costly to sink in. If, as estimated by Mr. Vanstavern (who was especially employed upon the coal investigation), the coal seams can be reached by a shaft for an amount of under Rs. 2,000, it would be a matter to be tried at once without doubt; but I would put it higher, and taking the estimate above given, I would make allowance for pumping, ventilating and levelling, say that the trial should be considered as not to be effectually made under a possible Rs. 5,000; say at No. 16 bore, where the coal is within 150 feet from surface and about 18 feet thick, and the shaft only 1 mile from river, but above flood lines.

5. Coal in such a situation ought to be sufficient and economical for all purposes of steam engines on the river and delta and also at Cocanada, as its price must be low from the freight being entirely water and down-stream, so that an extra quantity might be used. How much further it could be carried can only be really known by actual test.

6. The opening of coal at this spot would doubtless stimulate the opening on the Nizam's side.

7. In ordinary times I should not hesitate to recommend the expenditure necessary to reach and test the coal seams, and even in the present times it seems to me desirable to do so. If the coal sufficed only for Godáviri use, the cost would not be wasted.

8. The opening of any coal operation would tend to develop and thus to pacify the country around.

9. The question to be decided then is—

Shall Government endeavour, at a cost which may reach Rs. 5,000, to open the coal already ascertained to exist?

10. If that be agreed then the Chief Engineer should suggest the arrangements, and the co-operation of Mr. Vanstavern should be secured, for his local knowledge and long experience of the district.

11. The working season is from now to June.

5th January 1880.

(Signed) BUCKINGHAM AND CHANDOS.

N.B.—The original maps, sections and memoranda should be returned to Mr. Vanstavern, as they are only lent. I could not trace the copies in Government possession—possibly lost.

ORDER THEREON, No. 698 W., dated 18th March 1880.

THE Revenue Department will arrange to place at the disposal of the Public Works Department the sum of Rs. 5,000 from the accumulated Cattle Trespass Fund for certain experiments on coal-boring operations in the Godáviri district.

2. This amount will be recouped when necessary for the farm purposes later on.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

No. 859.

MEMORANDUM.

HIS GRACE the Governor in Council having decided to make an early commencement with sinking a shaft for working a coal seam, whose existence has been proved at a point midway between Bhadrachalam and Rékapalle on the left bank of the Godáviri, the undersigned is desired to inquire whether His Excellency the Commander-in-Chief thinks that a party consisting of, say, two European Non-Commissioned Officers and a Havildar and Naigue with fourteen Sappers, who are acquainted with mining could conveniently be spared from the Companies of the "Queen's Own" Sappers and Miners which are now attached to the force under the command of Colonel Buck.

2. Their employment in sinking the shaft required might possibly extend to six months.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

15th March 1880.

To the Secretary to Government, Military Department.

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 20th March 1880, No. 213.

WITH reference to your docket memorandum, No. 1,771, dated 16th March 1880,

• Herewith returned.

I have the honor to inform you that the Officer Commanding, Sappers and Miners at Dowlaishweram, has been directed to detach two British Non-Commissioned Officers with a Havildar and Naigue and fourteen Sappers for the purpose of sinking a shaft in the Godáviri district.

2. It is of great importance that these men should not be exposed in tents during the hot season, and His Excellency trusts that Government will see the necessity of having thatched huts for the natives, and suitable erections for the shelter of the British Non-Commissioned Officers employed.

No. 1,964.

TRANSFERRED to the Public Works Department, with reference to its memorandum, No. 859, dated 15th March 1880.

(By Order.)

(Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
Acting Secretary to Govt., Mily. Dept.

No. 972.

MEMORANDUM.

THE Chief Engineer has the honor to forward, for the information of the Superintendent of Works, Godáviri, a copy of a Minute by His Grace the Governor regarding coal-boring explorations on the British side of the Godáviri river, with copies of the correspondence that has passed on the subject.

2. On receipt of an intimation from Mr. Vanstavern that he has no objection to the free use of the plans, &c., borings can be commenced. As it is understood that the working season will only last for about two months longer, every exertion should be made.

3. Meanwhile, in accordance with the wishes of His Excellency the Commander-in-Chief, proper shelter for the British Non-Commissioned Officers employed and thatched huts for the natives should at once be provided.

4. Mr. Walch's attention is invited to Lieutenant Baddeley's letter of the 15th March, in case the requisite machinery, &c., cannot be got from the Dowlaishweram shops.

(Signed) R. H. SANKEY, Col., R.E.,
Chief Engineer, P.W.D.

31st March 1880.

To the Superintendent of Works, Godáviri.

Proceedings of the Madras Government, Public Works Department, dated 14th April 1880, No. 960 W.

Read the following paper :—

From Colonel A. R. CLEPHANE, Officiating Adjutant-General, to the Secretary to Government, Military Department, dated Fort St. George, 2nd April 1880, No. 250.

In continuation of Adjutant-General's letter, No. 213, dated 20th March 1880,

1 Havildar.
1 Naigue.
14 Privates.

I have the honor, by order, to state that the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram reports that the party, as

per margin, is in readiness to proceed under the orders of the Public Works Department.

2. There are no European Non-Commissioned Officers with the Detachment.

No. 2,117.

TRANSFERRED to the Public Works Department, in continuation of No. 1,964, dated 25th March 1880.

FORT ST. GEORGE, (Signed) H. N. D. PRENDERGAST, Colonel, R.E.,
3rd April 1880. Acting Secretary to Govt., Mily. Dept.

ORDER THEREON, No. 960 W., dated 14th April 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 21st April 1880, No. 996-A W.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 6th April 1880, No. 84.

I HAVE the honor to acknowledge the receipt of your memorandum No. 972, dated 31st ultimo.

One Indent in triplicate.

2. As you will have seen from my letter No. 701, dated 31st March 1880, and its enclosure, I have no officer or upper

subordinate whom I can send for the coal operations, and the Officer Commanding the Detachment of the "Queen's Own" Sappers and Miners here has no European Non-Commissioned Officer.

3. In paragraph 10 of the Minute by His Grace the Governor it is said that "the co-operation of Mr. Vanstavern should be secured," and it seems to me that it would be advisable, as he lives not far from where the operations are to be carried on and has had some experience in such work, to employ him on a salary to superintend the work, but I have no authority to open negotiations officially with him on the subject, or to make him any offer.

4. The steamers cannot now go up the river further than Koide (52 miles), and only boats of very small draft can get from there to where the operations are proposed, some 35 miles further.

5. There are no pumps here at all suited for deep shaft sinking, and I enclose an indent for such a pump and machinery to drive it, which, if approved, please send on to the Government workshops, Madras. If the pump be sent it should be accompanied by a Maistry who understands its working.

6. I think if you will consider all the circumstances of the case you will see that there is no probability of the work being done in the "two months" mentioned in paragraph 2 of your memorandum under notice.

From Lieutenant W. L. C. BADDELEY, R.E., General Superintendent of Public Works Workshops and Stores, Madras, to the Secretary to Government, Public Works Department, dated 15th March 1880.

We have two deep well pumps in store which would be suitable for working a shaft 80 feet in depth.

2. The five-inch lift pump which we made for the Ooregum Company is a good pattern for deep shafts, and we could make up these very soon if required.

3. One of the Workshop Maistries would be available to look after the pumping machinery, but there is no one here who understands anything about mining.

4. If Dowlaishweram cannot provide the engines, we can spare a 4 horse-power portable or any number of Gwynne's or Nasmyth's 4 and 6 horse-power engines and boilers combined. These also could be made fairly portable by fitting them on a stand with wheels.

5. We have no machinery for working or lifting coal, but probably there would be no difficulty in making up any ordinary appliances.

ORDER THEREON, No. 996-A W., dated 21st April 1880.

THE Superintendent of Works, Presidency, will at once direct the General Superintendent, Public Works Workshops, to despatch one of the deep well pumps mentioned by him as suitable for a shaft 80 feet deep to the Superintendent of Works, Godáviri, along with one of the Workshop Maistries for looking after this and such other machinery as it may be found necessary to send for unwatering the coal shaft.

That officer should also be directed to place himself without delay in correspondence with the Superintendent of Works, Godáviri, relative to any steam pumping or other machinery that may be deemed necessary for sinking the shaft below 80 feet.

2. The Superintendent of Works, Godáviri Division, is authorised to make arrangements with Mr. Vanstavern for directing the operations, preferably fixing a definite sum on the shaft being sunk to the bottom of the seam indicated by the borings, and reporting the terms as soon as possible for the information of Government.

3. The original borings having been executed during the monsoon, His Grace in Council has no reason to suppose that the work need now be subjected to any delay.

on account of the season, and as he attaches the greatest importance to the sinking of the shaft, no efforts should be spared to effect that object at the earliest date.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 27th April 1880, No. 1,035 W.

Proceedings of the Madras Government, Military Department, dated 14th April 1880, No. 2,404.

Read the following papers:—

Proceedings of the Madras Government, Public Works Department, dated 7th April 1880, No. 893 W.

Read letter from the Superintendent of Works, Godáviri, dated 30th March 1880, No. 701.

I HAVE the honor to enclose copy of a letter received this day from the Officer Commanding Detachment "Queen's Own" Sappers and Miners at Dowlaishweram, and to request instructions.

2. I would point out that the district is shorthanded, that just at this season there is a great amount of work in connection with the anicut and head works, canals, &c., which has to be compressed into a very short time; and I trust, therefore, that no one will have to be taken away from such work to carry out the "hutting," &c., referred to by Major Hamilton, and which it appears to me the men might carry out themselves.

3. I do not know where the Kottapalle referred to is.

From the Officer Commanding Detachment "Queen's Own" Sappers and Miners, to the Superintendent of Works, Godáviri, dated 29th March 1880, No. 209.

WITH reference to letter, No. 822, dated 20th March, from the Adjutant-General (copy annexed for your information), I have the honor to report that the party, consisting of one Havildar, one Naigue and fourteen Privates, is in readiness to proceed up the river under your orders. There are no European Non-Commissioned Officers with this detachment.

2. I presume that you will supply all necessary tools.

3. The party will have to be hutted by the Public Works Department.

From the Officiating Adjutant-General, to the Officer Commanding "Queen's Own" Sappers and Miners, Dowlaishweram, dated 20th March 1880, No. 822.

At the request of Government in the Public Works Department the Commander-in-Chief has sanctioned the services of a party of two European Non-Commissioned Officers, a Havildar, Naigue and fourteen Sappers, who are acquainted with mining, from the companies attached to the force under Colonel Buck, for employment in sinking a shaft for working a coal seam between Bhadrachalam and Kottapalle on the left bank of the Godáviri, and you are requested to detach the above party for this purpose.

UNDER the circumstances explained in Mr. Walch's letter, the detachment will provide hutting accommodation for themselves, the usual allowances being granted by the Military Department.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secretary to Govt., P.W.D.

To the Military Department.

ORDER,—Communicated to His Excellency the Commander-in-Chief.

2. Under O.G. (Military), No. 356, dated 30th January 1872, all special charges, including cost of hutting, incurred on account of Sappers employed on purely civil works, form a debit against the Public Works Department.

(True Extract.)

(Signed) H. N. D. PRENDERGAST, Col., R.E.,
Ag. Secretary to Government, Mily. Dept.

ORDER THEREON, No. 1,035 W., dated 27th April 1880.
COMMUNICATED to the Examiner of Public Works Accounts.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Military Department, dated 16th June 1880, No. 3,763.

Read the following papers :—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri District, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 27th May 1880, No. 547.

I HAVE the honor to inform you that immediately on receipt of G.O., No. 996-AW., dated 21st April 1880, I put myself in communication with Mr. Vanstavern, and enclose copy of my last letter* to him to which I have received the enclosed reply, in which I am sorry to say he declines to undertake the superintendence of the coal shaft sinking for the reason which he states in a private letter.

That reason being that he thinks it probable that private affairs may render it necessary for him to leave the country before it would be possible to complete the shaft.

2. I am now at a loss to know how to carry out the wishes of Government as regards the speedy sinking of the shaft. An extra Overseer having come (see my No. 519, of 24th May 1880) I could send him, but he knows nothing of the kind of work, and it is doubtful if the working under him of the Sappers, whom it is proposed to send, would be smooth, and I would recommend that a Non-Commissioned Officer of the Sappers and Miners should be sent for the work.

3. Mr. Vanstavern states that, though borings could be got down during the rains and when the river was high, the difficulties and expense of sinking a shaft would, he is sure from a knowledge of the place, be much greater than in the dry season, as water would be met with at a much higher level and in much greater quantities.

No. 126.

REFERRED to the Military Department, with request that it may be ascertained if the services of any Non-Commissioned Officer of Sappers (European) acquainted with mining or shaft sinking can be placed at the disposal of this department for directing the operations as suggested by Mr. Walch. If such a Non-Commissioned Officer can be found, it is requested that he may be directed to proceed at once to the spot.

(Signed) R. H. SANKEY, Colonel, R.E.,
5th June 1880. Secretary to Government, P.W.D.

From the Adjutant-General, No. 173, dated 14th June 1880.

In returning Military Department memorandum No. 3,561, of the 7th current, I have the honor, by order, to inform you that the services of Corporal Nicks of the

"Queen's Own" Sappers and Miners are available for the Godáviri coal shaft. He is stated to be zealous and by trade a "Fitter."

ORDER,—Ordered that the Adjutant-General's letter be communicated to the Public Works Department.

2. His Excellency the Commander-in-Chief is requested to cause Corporal Nicks to be detailed at once for the duty.

(True Extract.)

(Signed) J. MICHAEL, Col.,
Secy. to Govt., Mily. Dept.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 28th July 1880, No. 1,164.

WITH reference to our inspection of the proposed site for coal shaft on 22nd instant, I have the honor to forward tracing from plan of survey which I then ordered to be made.

2. I append the orders now issued to the Corporal in charge of the party with reference to this survey.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to Corporal F. NICKS, Golagudiem, dated 28th July 1880, No. 1,163.

WITH reference to the accompanying plan a report ought to have been sent stating whether there are any indications that point E., said to have been shown by villagers as site of bore-hole No. 16, is really the site.

2. If there be not any trustworthy indications that it really is so, the shaft is to be sunk at point A., or should that be in a local depression where trouble will be given by surface drainage, at some convenient point between it and D.

NOTE.

WITH reference to the annexed letter No. 1,164, of the 28th July 1880, from the Superintendent of Works, Godáviri, on the subject of the coal sinkings, I beg to offer the following brief remarks, having lately had the opportunity of inspecting the site of the operations in company with Mr. Martindale and Mr. Walch.

2. Leaving Dowlaishweram on morning of the 21st ultimo, Mr. Walch and I taking the new steam launch, *Arthur Cotton*, were enabled to pass very nearly through the Godáviri gorge before anchoring for the night, although the current was strong, 5.3 feet in depth, passing over the crest of the anicut.

3. Next morning picking up Mr. Martindale at Woodagudiem, we arrived at the site of the coal operations about noon, and spent some five or six hours in inspecting the locality and chiefly in endeavouring to find out the precise position of bore-hole No. 16, at which point, owing to the promising results of the previous borings, it had been decided to sink the shaft.

4. We found Corporal Nicks with his fourteen Sappers encamped at Golagudiem (*Golagaram* of the Indian Atlas), the party were well and sufficiently provided with shelter till the new shed 80 feet x 18 feet now sanctioned (and for which corrugated iron sheets have been brought down from the spare stores at Dumagudiem) has been run up, as it will be immediately.

5. In addition to an ample supply of tools of all kinds there was ready a pump which will, I hope, answer all purposes till a depth of 80 feet has been reached, when

one driven by steam now preparing at the Madras workshops will be sent up for unwatering the shaft at greater depths.

6. Twenty horizontal circular frames of angle iron, sufficient if spaced at 5 feet apart to reach to a depth of 100 feet, were also on the ground. If stiff soil or rock be met with, these may be spaced at greater intervals or omitted altogether and answer for 150 feet in depth, but in any case Mr. Walch can readily send up all that is needed in this respect from Dowlaisweram.

7. Mr. Martindale, who takes a kindly interest in the work, will see that the party have ample and good supplies, and if, as I hope, the men only keep their health, the work should progress favorably, though it is at the same time to be feared that, particularly at this season, water may be met with close to the surface, and difficulties on this account may delay operations.

8. Corporal Nicks had explored nearly all the area of previous operations, but had failed to discover the precise location of bore hole No. 16. Most of the sites of the other bore holes as pointed out by the villagers had been marked by a rough block of red sand stone, but in this particular case no indication could be found and it was thus fortunate that we were able to visit the place at this time.

9. From there not being a single definite point or bearing given on the survey whereby to recognise the old holes, and from these having been mere punctures and easily obliterated, it was necessary to fix the point in question by as many approximations as we could. The result is shown by the tracing now sent up by Mr. Walch. Our approximations led us to decide on the point A., and it would now appear from subsequent information received from the villagers (probably those of Totapilly, who we were informed had been engaged on this particular portion of the old work) that the point E. at no great distance from A. is the true point.

10. I feel assured that in no case will the point selected here be much out, though, of course, it would have been very much more satisfactory to find the exact locality.

Mr. Walch's present decision as conveyed to Corporal Nicks may therefore, I think, be safely accepted.

11. The whole country about is rather undulating, clayey, with bushy jungle here and there, and well raised above the river, but showing from the moisture which lodges in the lower portions, that at this season much water may have to be encountered in sinking the shaft.

12. It would, of course, be premature to say much about the results of these operations, but if Mr. Vanstavern (whom I met at Woodagudiem, but who owing to illness was unable to accompany me to the coal field) is to be credited, the coal is likely to turn out very shaley. The best specimen, he informed me, only yielded 30 per cent. of carbon, and the worst 9 per cent.

13. As regards the proper designation of this coal field, there is some doubt. Totapilly, by which it appears to have been first known, though shown on the atlas, is a very insignificant village and at a distance from our present workings. Tiperpenti (Tipurapentaneed of the tracing) is not shown on the atlas, and is also both insignificant and at some distance. If the field is to be called after any of the neighbouring villages, Golagudiem, where the camp is and which is both shown on the atlas and is on the river bank, would be the most appropriate designation.

14. But to the best of my judgment it would be preferable to call it the Bhadrachalam field, as it is sufficiently near to this, which is certainly the best known and most important place in the neighbourhood.

15. If the Government approve, therefore, I would in all future correspondence designate this the Bhadrachalam coal field.

16. The Superintendent of Works has orders to send up fortnightly progress reports of the work done.

9th August 1880,

(Signed) R. H. SANKEY, Colonel, R.E.,
Chief Engineer, P.W.D.

No. 318.

MEMORANDUM.

THE accompanying note is forwarded to the Superintendent of Works, Godavari, for information.

2. The decision conveyed in his letter No. 1,164, of the 28th July 1880, with reference to the point at which the shaft is to be sunk is accepted.

3. Fortnightly progress reports should be continued in order that His Grace the Governor may be kept advised of the results.

4. This field will in future be designated the Bhadrachalam field in all official documents.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

14th August 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaisweram, 18th August 1880, No. 1,336.

In continuation of my letter No. 1,164, of the 28th July 1880, I have the honor to forward, herewith, an extract from letter No. 4, of the 5th August 1880, received from Corporal Nicks stating that he is fully convinced that bore hole No. 16 was at the point E. shown on the survey plan, of which copy was sent with my No. 1,164.

Extract of a letter from Corporal F. NICKS, R.E., in charge of Coal Shaft Sinking, to G. T. WALCH, Esq., Superintendent of Works, Godavari, dated 5th August 1880, No. 4.

WITH reference to your docket No. 1,163, dated 28th July 1880, regarding point E as shown by villagers, I am fully convinced it is the actual site of bore hole No. 16. In the first place I was taken to the spot E by two villagers who stated they were employed at the boring. I examined the surface soil and found indications that boring had been done there. I found two different soils, viz., light colored clay and sand stone in layers, the same as would come from an auger after boring.

2. On the 3rd instant I made inquiries at the village of Tipurapentaneed and found a man who was employed from the commencement to the finishing of the borings under Mr. Vanstavern; he also took me to the exact spot marked E as shown on plan and showed me the above soil as mentioned, and states that was what came up with the auger; he also pointed to a tree where they cooked their meals, which is only 10 yards from the spot. I intend to sink the shaft at the place pointed. I have already commenced getting stores on the spot to commence work.

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 23rd August 1880, No. 1,434.

Report No. 1 on progress of work at Bhadrachalam coal fields to 14th August 1880.

THE sheds having been erected and necessary machinery moved up to site for shaft, actual sinking was commenced on 12th August, and up to 14th depth gone down to was 4 feet 6 inches.

No. 393, dated 3rd September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 3rd September 1880, No. 1,587.

Report No. 2 on progress of work at Bhadrachalam coal fields from 15th to 28th August 1880.

SHAFT sunk from 4 feet 6 inches to 15 feet; soil passed through chiefly "blue and yellow clay" with kunkur; sand stone just reached; some trouble given by water after heavy storms. Party apparently not working quite satisfactorily. Will be visited soon.

No. 450, dated 17th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 16th September 1880, No. 1,721.

Report No. 3 on progress of work at Bhadrachalam coal fields from 28th August to 15th September 1880.

SHAFT sunk from 15 to 34 feet; soil passed through chiefly yellow sand stone compact *in situ*, but breaking up easily when dug out. Pump arrangements fixed.

No. 490, dated 30th September 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 22nd September 1880, No. 1,722.

I HAVE the honor to inform you that I have on 15th, 20th and 21st instant inspected the work at the Bhadrachalam coal fields, and I find that, though going on slowly, it is being well done.

2. The shaft has now been sunk to a depth of 39 feet and water has just been reached.

3. The first 5 feet passed through was ordinary alluvial and vegetable soil; then came for 10 feet yellow clay, about the lower 5 feet of which was mixed with kunkur; then for 14 feet 6 inches yellow sand stone compact and hard *in situ*, but disintegrating when removed to the surface; and below this to the 39 feet depth a light blue clay chiefly "pipe clay" with at 38 feet a stratum of a few inches of sand stone.

4. Through this last thin stratum of sand stone water has commenced to come in slowly. At 4 P.M. on 20th I saw the bottom of the shaft practically cleared of water, and at 6 A.M. (21st) 1 foot 8 inches in depth had accumulated.

5. The Abyssinian pump sent from Madras has been fixed and works well, clearing such water as is now coming in with perfect ease.

6. The party is well housed and has kept in fair health. Corporal Nicks and some of the men have had rheumatism, one or two have had slight fever, and the Nague who went up with the party has been sent back to Dowlaishweram with bad ulcers on his feet, and he has been replaced by another man.

7. There have been no accidents, and I am quite satisfied with the care taken by Corporal Nicks, who is in immediate charge of the operations. I cannot say I am quite satisfied with the rate at which the work has been carried on, but native Sappers, it appears to me, do not generally work rapidly.

No. 506, dated 5th October 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 5th October 1880, No. 1,843.

Report No. 4 on progress of work at Bhadrachalam coal fields from 15th to 30th September 1880.

SHAFT sunk from 34 to 44 feet; soil passed through, sand stone, with layers of light blue clay, chiefly pipe clay; water coming in quickly. Pump, "Abyssinian," has now to be worked night and day.

2. The Corporal in charge reports that his detachment is working unsatisfactorily, and that "if the sepoys are required to work in the shaft or at the winch they report themselves sick."

3. It seems likely that these men are behaving as they are with the object of being sent back to their Company, which they think may soon be sent to Bangalore; it would, I think, be well to let them know for certain that they will not be sent away from the work till it is finished, and that if they are sick they will have to go into hospital at Rajahmundry and when discharged return to the work. Eight coolies are now employed to assist the detachment.

No. 2,331.

THE Chief Engineer concurs with the Superintendent of Works that it will be advisable to let the Sappers distinctly understand that they will not, by malingering, be enabled to desert the work which they have been sent up to carry out.

2. When sick they may be sent to the hospital at Rajahmundry as proposed.

(By Order.)

(Signed) J. PENNYCUICK, Major, R.E.,
Deputy Chief Engineer, P.W.D.

18th October 1880.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Yernagudem, 20th October 1880, No. 2,006.

Report No. 5 on progress of work at Bhadrachalam coal fields from 1st to 15th October 1880.

SHAFT sunk from 44 to 50 feet; soil passed through, sand stone, said to be hard, with thin layers of clay.

2. Slow progress due to large quantities of water to be dealt with, and the Corporal reports that the Abyssinian pump can no longer keep the water down, and no further sinking can go on till the steam pump is at work. This is expected daily.

No. 2,422, dated 2nd November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 18th November 1880, No. 2,641 W.

Proceedings of the Madras Government, Military Department, dated 13th November 1880, No. 7,102.

Telegram from the Superintendent of Works, Godáviri, to the Public Works Department, Madras, dated 26th October 1880.

"Another Non-Commissioned Officer to help Corporal Nicks, often ill, and Dresser for coal party much wanted."

TRANSFERRED to the Military Department, with a request that it may be stated whether any Non-Commissioned Officer can be sent from the "Queen's Own" Sappers and Miners for the purpose.

OOTACAMUND,
29th October 1880.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

From the Adjutant-General, dated 10th November 1880, No. 499.

WITH reference to a telegram from the Superintendent of Works, Rajahmundry, dated 26th October 1880, transferred to the Military Department under Public Works Department No. 601 of 26th ultimo, and referred to His Excellency the Commander-in-Chief under Government endorsement memorandum No. 6,887 of 30th idem, herewith returned as requested, I have the honor, by order, to state that there is no objection to the services of Corporal B. Fuller, R.E., being placed at the disposal of Government in the Public Works Department for employment at Rajahmundry.

ORDER.—The Adjutant-General's letter communicated to the Public Works Department.

(True Extract.)

(Signed) J. MICHAEL, Colonel,
Secretary to Government, Mil. Dept.

ORDER THEREON, No. 2,641 W., dated 18th November 1880.

COMMUNICATED to the Superintendent of Works, Godáviri.

2. It is requested that the services of Corporal Fuller may be made available as early as possible.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 30th November 1880, No. 2,674.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 4th November 1880, No. 2,254.

Report No. 6 on progress of work at Bhadrachalam coal fields from 16th to 31st October 1880.

SHAFT sunk from 50 feet to 55½ feet; sand stone passed through to 55 feet, then a layer of clay. Below this it has been impossible to go with the Abyssinian pump and the steam* pump must be awaited.

* Arrived at Dowlaishweram, 2nd Nov. 1880.
Despatched by steamer to Golagudiem, 4th November 1880.

Firewood is being collected for the engine.

The Corporal in charge of the party has been suffering from dysentery and fever, and it appears that without his personal presence on the work it does not go on properly; another Non-Commissioned Officer is therefore very necessary, especially as pumping will have to be kept up at night. The unhealthiness of the place at this time of the year and the possibility of accidents make it also highly advisable that a Dresser should be attached to the party. Telegram of 26th October asking for another Non-Commissioned Officer and a Dresser was therefore sent.

Telegram from the Secretary to Government, Public Works Department, Madras, to the Superintendent of Works, Godáviri, Rajahmundry, dated 16th November 1880.

"Does further experience show that a Dresser for the coal party is still essential."

Telegram from Superintendent of Works, Godáviri, Rajahmundry, to the Secretary to Government, Public Works Department, Madras, dated 17th November 1880.

"HEALTH of coal party better, since rain stopped. May do without Dresser."

ORDER THEREON, No. 2,674 W., dated 30th November 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd December 1880, No. 2,708.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 18th November 1880, No. 2,401.

Report No. 7 on progress of work at Bhadrachalam coal fields from 1st to 13th November 1880.

THE steam pump arrived at Golagudiem on 6th, and since then the party have been fully occupied in taking it, and the engine to work it, to the shaft and setting it up; the Corporal in charge reports that "the work is proceeding in a satisfactory manner."

2. Lieutenant Gale, R.E., visited the party on the 6th and 7th, and the Corporal in charge reports that since that visit and the change of Havildars which was then made the detachment has been working better than it had been working for some time previously.

3. The health of the party is better than it was, and it is thought that now it may get on without a Dresser, though of course it would be safer to have one on the spot, and another Non-Commissioned Officer to assist Corporal Nicks is very necessary as mentioned in the last report.

ORDER THEREON, No. 2,780, dated 3rd December 1880.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd December 1880, No. 2,934 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 2nd December 1880, No. 2,554.

Report No. 8 on the progress of work at the Bhadrachalam Coal-field.—13th to 30th November 1880.

THE party have been engaged in keeping water down in the shaft with the Abyssinian pump and setting up the steam-pump and its engine.

No further sinking has been possible in the period under notice.

2. The Corporal in charge again reports, "there is a great deal of sickness among the detachment. Fever is very prevalent."

ORDER THEREON, No. 2,934 W., dated 22nd December 1880.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 10th January 1881, No. 38 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Wuddigudem, 16th December 1880, No. 2,751.

Report No. 9 on the progress of work at the Bhadrachalam Coal-field.—1st to 15th December 1880.

THE steam-pump was set to work on the 8th. There were then "18 feet of water in the shaft," and "it took 2 hours 35 minutes to pump dry;" owing, however, to extra framing, &c., being found necessary, actual work of excavation was not recommenced till 13th.

2. On the 15th the undersigned inspected the work. The shaft was down 56 feet, it was in good order and the pump going dead slow was keeping it clear of water.

A layer of clay (chiefly pipe-clay) had just been reached through which water was coming in freely.

The water has for some time past been sensibly affected by variations in the level of the river, which is now low, though not so low as it will be. It is impossible to say whether the one pump will be able to deal with the water which will be met with in the next 100 feet, and it will probably be advisable to have another ready; it could be driven by the same engine and driving machinery.

3. The huts were being moved up to near the shaft.
4. Ninety cubic yards of firewood for the engine have been cut.
5. The health of the party is not good, there are generally one-third or so of the sepoy down with fever, but it does not appear to be of a virulent type.
6. Corporal Fuller, R.E., has now (on 15th) joined the work.
7. No steamer will be able after this to get to Gollagudem, and probably not even to Wuddigudem till next June or July.

ORDER THEREON, No. 38 W., dated 10th January 1881.

THE Government consider that the additional pumping power referred to in paragraph 3 of the foregoing letter should be provided. The Superintendent of Works, Godáviri, will arrange accordingly.

2. The work being unhealthy should be pushed on as rapidly as possible.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 14th January 1881, No. 96 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 7th January 1881, No. 2,927.

Report No. 10 on the progress of works at the Bhadrachalam Coal-field.—16th to 31st December 1880.

- (1.) Shaft deepened by 8 feet to 64 feet.
- (2.) Soil passed through "different kinds of clay."
- (3.) Removal of huts to site of shaft finished.

ORDER THEREON, No. 96 W., dated 14th January 1881.

Recorded.

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Government, P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 25th January 1881, No. 195 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 10th January 1881, No. 2,966.

I HAVE the honor to send herewith a letter from Corporal Nicks, R.E., in charge of the coal operations near Bhadrachalam, reporting the inrush of a large volume of water into the shaft.

2. Till this occurred all seemed to be going on well, though slowly.

3. I have told Corporal Nicks to again rig up the Abyssinian pump and see if with it he cannot get the water down low enough to get at the steam-pump box and again set it going, and then if the two will keep the water down sufficiently low it is possible that by putting in specially prepared cylinders we may be able to get through the treacherous stratum which has led to the present mishap; but if water with our present appliances cannot be kept so low, another pump more powerful than the present one, with machinery and engine to drive it, must be sent up.

4. Such machinery and engine however could not be got to the place before the next season of freshes in the river, say next July, and should it be found quite impossible to deal with the water with the present appliances I would request instructions as to what in the interval is to be done with the Sapper coal party.

From Corporal F. NICKS, R.E., to the Superintendent of Works, Godáviri, Dowlaisheram, dated Gollagudem, 5th January 1881, No. 118.

On Tuesday evening we were deep enough for 9th ring, and on Wednesday morning myself and Corporal Fuller started putting in same, as the soil was very treacherous it not being safe to trust sepoys; we had a slip of earth from the north side of shaft at about 11 A.M. We started then to plank that portion, as we had put in on (4) four plining (*sic*) planks and placed ring, we worked on and had placed four planks in the north quarter; we then noticed the water gradually rise, and the pump would not keep it down. I then sent Corporal Fuller up to ascertain if the engine was under proper steam, he informed me as he was coming down in bucket that steam gauge indicated 25 lb. ☐ As I was in the act of guiding the bucket down the water burst in from the south-west side, bringing with it a large quantity of "clay," about one-quarter yard, which knocked me down. Corporal Fuller said to me we had better take all tools up with us, but before he could get out of the bucket the water rose to my waist. I then said, never mind the tools we must get above the water in case the rings in upper work give way, as I had put my arm in where water was rushing from and found a large hole about 6 inches by 2 feet, so the clay could not be more than 1 foot 6 inches thick in front of the hole we had previously left, a berm of 6 inches in other work and considering this work was very dangerous we left a berm of 1 foot 3 inches.

We then cleared out of shaft as soon as possible with the water rising at the rate of 1 foot per minute, leaving all tools at bottom as we could not get at them for the water. I also kept engine at work till 10-25 P.M. making 25 strokes per minute, but the water still kept rising.

Rise of water	4-10 P.M.	No water more than ordinary.	5th January 1881.
Burst in at	4-15 P.M.		
7 feet	4-25 "		
21 feet 3 inches	5-50 "		
26 feet 8 inches	7-50 "		

Whilst taking measurement at 10 P.M. the pump gone out depth of water at the above time 29 feet 4 inches. I then gave orders to engine driver to draw fire, I then emptied boiler as I had been under steam near 400 hours.

At present we cannot get pump clear as working box is under water, the only remedy will be to get another set of top gear pipes and pump rods; if it is the Godáviri which is broke in upon us, which I think it is, it will be useless. 11-30 P.M.

I took measurements at 11-35 and found 33 feet 4 inches and at 7 A.M., the 6th, and found 38 feet 8 inches.

Please give me further instruction in answer to this.

ORDER THEREON, No. 195 W., 25th January 1881.

THE Superintendent of Works, Godáviri, has already been authorised* to arrange * G.O., No. 38 W., dated 10th January 1881. for the provision of additional pumping power.

2. The Government await a further report before passing orders on the subject of paragraph 4 of the letter above read.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Yanam, 19th January 1881, No. 3,073.

IN continuation of my No. 2,966, dated 10th instant, I have the honor to state that Corporal Nicks reports that in spite of all efforts it has been found impossible to raise the pump to get at the upper box and working barrel, and that at noon on the 6th the water had attained the "height of 40 feet" since which it has not varied.

2. It is evident, therefore, that another and more powerful pump must be provided if the work is to be persevered with.

Telegram to the Superintendent of Works, Godáviri, Rajahmundry, dated 27th January 1881, No. 193.

MORE powerful pump for coal workings sanctioned. Arrange for one at once.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 3rd February 1881, No. 308 W.

Read the following paper:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated 28th January 1881, No. 3,185.

Report No. 11 on the progress of work at the Bhadrachalam Coal-fields.—1st to 15th January 1881.

WORK progressed steadily till 5th, when the shaft was down 69 feet, water in large quantities then came in and overpowered the pump (see letters Nos. 2,966, 10th January 1881, and 3,073, 19th January 1881, to the Chief Engineer), and on the 15th there were 40 feet 4 inches depth of water in the shaft.

2. The Abyssinian pump which had been taken away and put on the barge was again taken to the shaft, and its placing commenced with the hope (a faint one) that with it the water can be so lowered that it may prove possible to get at the steam-pump boxes and set it going again. (See paragraph 3 of letter No. 2,966, 10th January 1881, to Chief Engineer.)

ORDER THEREON, No. 308 W., dated 3rd February 1881.

Recorded.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 22nd February 1881, No. 493 W.

Read the following papers:—

From G. T. WALCH, Esq., Superintendent of Works, Godáviri, to the Chief Engineer, Public Works Department, dated Dowlaisheram, 31st January 1881, No. 3,225.

WITH reference to your telegram of 27th I have the honor to report that I have no means of here arranging for a more powerful pump for the coal shaft, and can only suggest that one may be supplied from the workshops at Madras or obtained from England.

2. Having had no experience in the work for which the pump is required, and having no one here who has had such experience, I cannot state with any certainty what is the nature and power of the pump required, and it seems therefore that it is best for me to explain the conditions of the case and from them possibly some Mining Engineer or manufacturer of mining machinery will be able to decide what is wanted. The conditions are these—

3. (a)—The shaft is 6 feet 3 inches diameter.
- (b)—It is sunk at about 1 mile from the edge of the Godáviri.
- (c)—The substrata already passed through (to 69 feet depth) have been almost entirely yellow sandstone, alternating with bands of yellowish and greyish clay, chiefly pipe-clay, and the boring shows that the general character of the strata to be yet passed through will be similar, but with fewer bands of clay, down to about 120 feet, when shale and coal will be met with.

(d)—Down to 55 feet there was but little water, but at that depth the Abyssinian pump could no longer deal with it, and the steam-pump sent up from the Madras Workshops was put up; whilst doing this (it occupied some days) the water rose 18 feet, this the pump when set to work cleared out in 2 hours 35 minutes.

(e)—This pump, driven by an old 8 horse-power engine, kept the water down easily enough till the shaft had reached a depth of 69 feet, when there was a sudden inrush through

• For the first 7 feet came in at the rate of a stratum of pipe-clay and about 630 gallons a minute. the water rose 29 feet 4 inches in 5½ hours against the pump going 22 strokes a minute. The pump then got choked and

See copy of letter from Corporal Nicks, No. 118, 5th January 1881, herewith. the water rose another 10 feet 8 inches, that is 40 feet

in all (or to 29 below top of shaft) in another 14 hours and at that level it has stood.

(f)—The shaft has to go down to a total depth of about 150 feet.

(g)—The river—the variations in level of which have been noted to affect the water in the shaft—rises in the season of floods (from June to October) from 15 feet to 20 feet or so above its present level, or approximately to from about 10 feet to 15 feet below level of top of shaft.

(h)—As most of the soil to be passed through is sandstone, much sharp sand comes up with the water, and it has been found to rapidly wear away any leather it comes in contact with, such as "buckets," valves, &c.

4. As already stated in my No. 2,966, 10th January 1881, paragraph 4, machinery or apparatus of any kind, weighing more than could be carried by two coolies, could not be got to the shaft till next July, because it could not be taken by water much if at all beyond Koide, some 34 miles below Gollagudem, and between the two places there is no road, only a jungle track, which in places passes over rocky slopes of hills.

P.S.—As all pumps occasionally get out of order and all engines require to be stopped now and then, it will be highly advisable, if not necessary, to have two pumps and two engines, and it is of course of great convenience that the working parts of the pump should be easily raised or got at.

From the same officer, dated 6th February 1881, No. 3,294.

Report No. 12 on the progress of work at the Bhadrachalam Coal-field.—16th to 31st January 1881.

The Abyssinian pump (see paragraph 2 of last report) was fully rigged up by 19th, and pumping then commenced with it; by 24th the water had been reduced 11 feet, or to 29 feet in depth, and then the working part of the steam-pump was got at.

2. The leather "buckets" which had worn out (they are constantly wearing out owing to the action of the gritty sand, see paragraph 3, (g.), No. 3,225, 31st January 1881), were renewed and the pump was started again on 25th; by the evening of 27th it had reduced the water by 8 feet, or to 21 feet, in depth, below which it could not reduce it, and the leathers having again worn out it had to be stopped for a time, when the water immediately rose against the Abyssinian pump to 30 feet 7 inches depth.

3. It is quite evident that with the present pumping power it will be impossible to recommence sinking operations.

4. There can be little doubt that the water in the shaft is in communication through some permeable stratum with the water in the river, and that enormously powerful machinery and a very great expenditure will be necessary to enable the shaft to be sunk to where it will reach the shale and inferior coal which borings and geological researches have established to exist in small quantities in the locality.

ORDER THEREON, No. 493 W., dated 22nd February 1881.

THE Right Honorable the Governor in Council considers that before any further expenditure is incurred the opinion of an expert in mining matters should be obtained. The Chief Engineer has, it is understood, written to Calcutta to inquire whether the services of any qualified person can be secured.

Meanwhile the work should be suspended.

2. Orders have already been issued to the Superintendent of Works, directing the Sappers to return to their Company.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 542 W.

Read the following paper :—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated Dowlaishweram, 11th February 1881, No. 3,370.

FURTHER information has shown me that I was wrong in supposing that when water burst into the coal shaft at Bhadrachalam it came in at the rate of "630 gallons a minute," as stated in the margin, paragraph 3, clause (e) of my No. 3,225, 31st January 1881; it came in at the rate approximately of 200 gallons a minute.

2. I would take this opportunity of asking for early orders on paragraph 4 of my No. 2,966, 10th January 1881.

ORDER THEREON, No. 541 W., dated 23rd February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

Proceedings of the Madras Government, Public Works Department, dated 28th February 1881, No. 541 W.

Read the following paper :—

From G. T. WALCH, Esq., Superintendent of Works, Godavari, to the Chief Engineer, Public Works Department, dated 17th February 1881, No. 3,463.

Report No. 13 on Bhadrachalam Coal-field work.—1st to 15th February 1881.

As stated in last report it is quite impossible to proceed with the work, and it therefore has been at a complete stand-still during the last fifteen days.

ORDER THEREON, No. 542 W., dated 28th February 1881.

Lodged with reference to G.O., No. 493 W., dated 22nd February 1881.

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

I.W.C. No 1161.
From
The Supt of Works
Godavari.

To,
The Chief Engineer
P.W. Department

17th February 1881
Des^d 12/10/80
12.3463

Report No 13 on Bha-
drachalam Coal Field
Work.

1st - 15th February 1881.

As stated in last
report it is quite impossi-
ble to proceed with the
work and it therefore
has been at a complete
stand still during the
last 15 days.

O. S. S. S.

Supt. of Works
Godavari
No. 545
Landed with
S.P. No. 493
Godavari

Compd. Ld. C. S. S.

430 * 431