Archives I—10,006—16-8 77.

(1) Number of pages 321.

(2) Date of repair 17.11.86.

(3) Initials of the Referencer leng

TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

Public works DEPARTMENT

G.O. No. B.P. No.	2686 W.	Press. Mis.
Dated	24-10-1879.	197 .

S.G.M.

Not to be folded or roughly handled

2686/1

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

24th October 1879, No. 2,686 W.

General.
Account.

Read the following paper :—

No. 48. Memorandum No. 588 of 16th September 1879, from the Superintending Engineer, Fourth Circle, forwarding letter No. 431 of 6th idem, from the Executive Engineer, Nilgiri Division.

No. 49. ORDER THEREON, 24th October 1879, No. 2,686 W.

HIS GRACE the Governor in Council approves of 500 lbs. of dynamite being purchased from Mr. John Harris, Mining Instructor of Nobel's Explosive Company, and directs that a careful series of experiments at once under that gentleman's guidance be undertaken by the Executive Engineer, Nilgiri Division, with a view to elucidate both the best method of employing this material and its economical value as compared with gunpowder in all the ordinary operations of the department, *e.g.*, removing rock with good and bad faces in the construction of ghaut roads, breaking up and removal of boulders from road surfaces or elsewhere, "getting" rock for the manufacture of road metal, &c.

2. With this view Rupees 1,000 are herewith appropriated from the Provincial Reserve at the disposal of Government under Tools and Plant, and the Superintending Engineer will be requested to submit at early convenience the general proposals, with estimate by the Executive Engineer, for utilizing in the manner proposed the grant now made.

(True Extract.)

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

To the Superintending Engineer, Fourth Circle.
" Examiner of Railway Accounts.

Exd. S. T. Austin.
Spare Copies

GENERAL.
ACCOUNT.

Govt. of [1879] Madras.

PUBLIC WORKS.

To

The SUPERINTENDING ENGINEER,
FOURTH CIRCLE.
&c., &c.

Dated October 24th

Issued

Read... Encl.

G. O., 24th October 1879, No. 2,686 W.

OCTOBER.

Nos. 48-49.

Dynamite.—Appropriates Rupees 1,000 for the purchase of 500 lbs. of — for undertaking a careful series of experiments with a view to elucidate the best method of employing this material and its economical value as compared with gunpowder.

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50 c

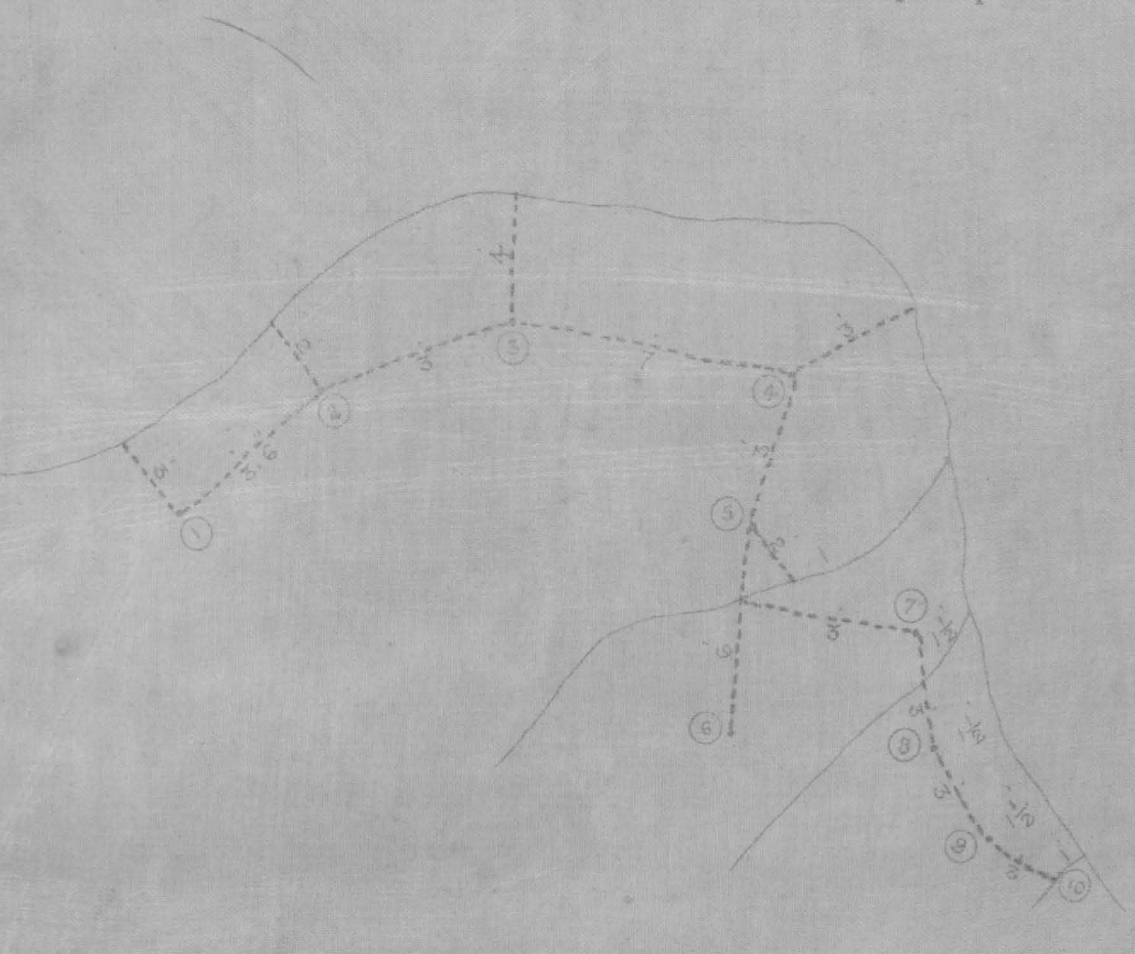
2686/2

APPENDIX to Proceedings of the Madras Government, Public Works Department, dated 24th October 1879, No. 2,686 W.

From Major J. L. L. MORANT, R.E., Executive Engineer, Nilgiri Division, to the Superintending Engineer, Fourth Circle, dated Ootacamund, 6th September 1879, No. 431.

A Mr. John Harris, Mining Engineer, Dynamite and Mining Instructor to Nobel's Explosives Company of Glasgow, recently visited Ootacamund and, with my assistance, exhibited some experiments with dynamite, which I beg with your permission here to record.

2. A large projecting rock near the pavilion was first attacked. Its shape in plan was roughly as below:—



The following gives the depth of the holes and the charges of dynamite:—

	Depth. FT.	Depth. IN.	Weight of charge of Dynamite. OZS.
No. 1	2	6	1½
„ 2	1	0	1½
„ 3	3	9	10
„ 4	2	9	4
„ 5	1	6	3½
„ 6	1	0	1½
„ 7	9	0	2
„ 8	1	6	3½
„ 9	0	9	1½
„ 10	1	6	1½

No. 3 hole was first fired, it tore off three large pieces of rock and shattered and cracked the main body behind the hole a good deal. Six ounces of dynamite were then placed in one of the large cracks caused by the above explosion, and effected the further breaking up of the rock.

Nos. 1 and 2 were then fired simultaneously; the effect was satisfactory, and a stone 19 cubic feet in size was thrown out by the charge in No. 1.

No. 4 was then exploded and did considerable execution, blowing out the rock and earth behind the hole, and cracking the face in many directions. This hole was situated on the highest point of the rock.

Nos. 5, 6, 7, 8, 9, and 10 were then exploded together and went off nearly simultaneously, tearing down the whole of that part of the face which was in three tiers.

A charge of 11 ounces of dynamite was then simply laid on the centre of an irregular shaped rock 3½ × 2 × 2 feet, there being no bored hole to take the charge. The charge was covered with clay and the detonator and fuze fixed. The explosion split the rock in two, and cracked the pieces so much as to enable the whole to be easily broken up for road metal with a sledge hammer.

Two rock boulders, each about 18 inches in diameter, were similarly broken up and smashed to pieces by an ounce and half an ounce of dynamite, respectively, placed in two bored holes 6 inches deep.

3. A bar of wrought iron, 4½ × 4 inches in section and 18 inches long, had had a hole 1 inch in diameter bored through its centre: in this hole 4 ounces of dynamite were placed. It tore the iron completely in two.

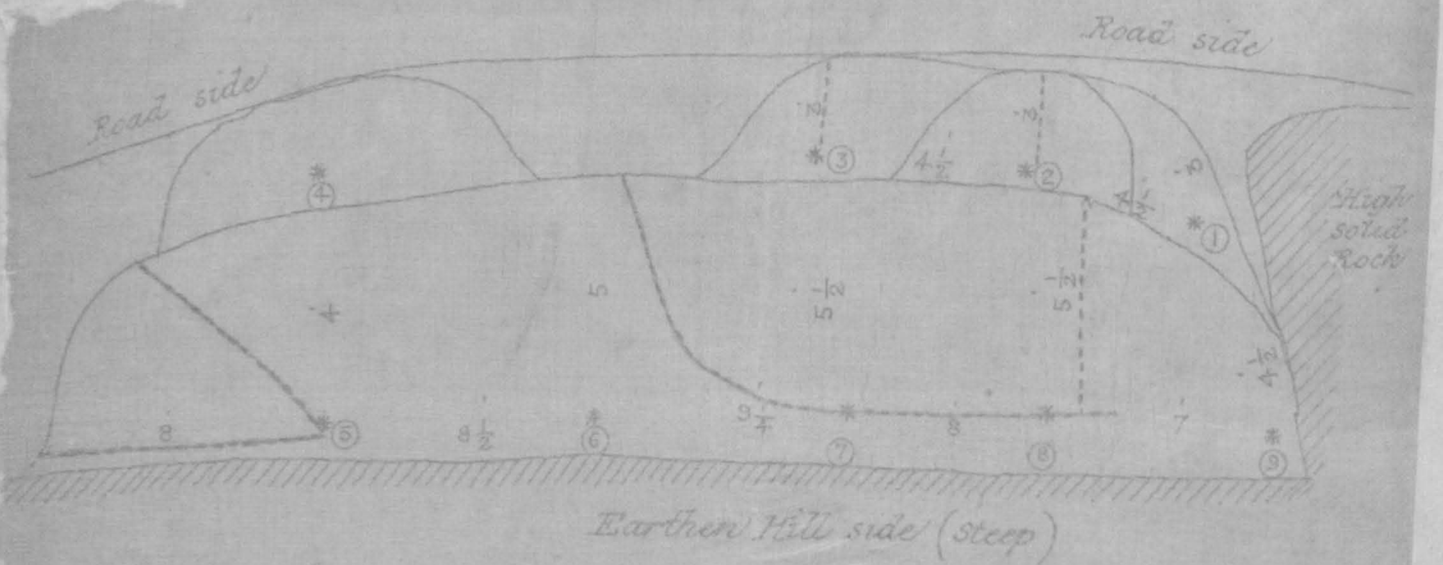
A hollow cast iron road-roller, 2 feet 10½ inches in diameter, and weighing 473 lbs., was smashed into thirty pieces (each small enough to be easily lifted by two men) by a charge of 8 ounces of dynamite exploded on its upper circumference. A cast iron truck-wheel, weighing 3 cwt. 7 lbs., 2¾ feet in diameter, was broken into fifteen pieces (all light enough to be easily raised by one man) by a discharge of 7 ounces of dynamite in the centre axle-hole. A wrought iron plate half an inch thick and 1 foot square was smashed into six pieces, and driven down 1 foot into the solid ground, by a charge of 2 ounces of dynamite exploded on its upper surface.

4. The stump of an Australian blue gum tree, 1 foot above and 3 feet below the ground, and 2 feet 6 inches in diameter, was torn asunder by a discharge of 18 ounces of dynamite placed in a hole underneath it. One half of the tree was blown out and smashed to pieces, and the other half broken up sufficiently to be removed without any difficulty. An exactly similar stump was torn up out of the ground and shattered to bits by the explosion of 1 lb. of dynamite placed in a 1-inch vertical hole bored 3 feet down its centre.

A felled stump 18 inches in diameter and 9 feet long had 2 ounces of dynamite exploded in a hole 14 inches deep in its centre. The stump was torn completely into two pieces and greatly shattered.

5. Mr. Harris was good enough to remain at Coonoor for two days to experiment on a large solid piece of rock on the side of one of the roads.

The plan of the rock was this :—



The lower four holes were first fired; their depths and charges were as follow :—

	Depth. FT.	Depth. IN.	Charge. OZS.	
No. 1	3		2¼	fired simultaneously.
„ 2	2	4	2	
„ 3	4	6	4½	missed fire.
„ 4	1	2	2	

In No. 3 hole the fuze was damaged and did not burn down to the charge. The hole having been simply filled with water in lieu of tamping, the fuze was removed with the greatest ease, and a fresh fuze and detonator inserted, when the charge was exploded satisfactorily. The results were very good, but had these holes been a foot or so deeper the back holes 7, 8, and 9 would subsequently have caused more damage than they did.

The back holes were then exploded; they were of the following depths, and had the following charges :—

	Depth. FT.	Depth. IN.	Charge of Dynamite. OZS.
No. 5	6	2	11
„ 6	6	2	23
„ 7	6		20
„ 8	6	5	11
„ 9	5	4	26

The effect of No. 5 was somewhat reduced by the lower lump of rock in front not having been properly removed by No. 4; it however tore off large lumps and cracked all the rock in the direction of the red line.

No. 7 was next exploded in the belief that it would, if first discharged, help No. 6. This discharge had a very excellent effect; it blew out all the rock in front as shown in red, and cracked the rock all along just in front of No. 8.

No. 6 was then exploded and blew out the whole side between Nos. 5 and 7. No. 9 was then fired as No. 8 had been interfered with by the discharge of No. 7. This charge cracked, moved, and smashed up the rock in numerous directions; but did not blow very much out.

No. 6 was then discharged and had a similar effect. The rocks blown out were thrown over the road side, and those cracked and moved were cleared out, and the whole place cleared by the evening. The cost of all this was as follows :—

	RS.	A.	P.		RS.	A.	P.
6½ lbs. of dynamite at	1	8	0	per lb.	9	12	0
15 yards of fuze at	0	1	0	per yard	0	15	0
10 detonators	0	1	9	each	1	1	6
14 yards of boring	0	14	0	per yard	12	4	0
50 coolies at	0	5	0	each	15	10	0
				Total ..	39	10	6

The quantity of rock removed was about 40 cubic yards. The cost with dynamite is thus about 1 rupee per cubic yard. Our rate with gunpowder varies from 1½ to 2¼ rupees per cubic yard.

6. The use of dynamite would thus appear to offer the following advantages :—

(a) it cheapens the work;
(b) its use avoids the necessity of tamping, the hole being merely filled with water; in the case of a miss fire this is a very important point;
(c) it smashes up the rock into smaller pieces than with gunpowder, thus enabling the rock to be more easily removed and more readily broken up for road metal;
(d) rock suddenly required to be very quickly removed from a blocked road can be very easily broken up with dynamite, without any bored hole being necessary.

7. The report now submitted does not pretend to be in any way an exhaustive one. But, if you will have the goodness to move the Chief Engineer to sanction the purchase of one-third or half a ton of dynamite with fuze and detonators, &c., Mr. Harris is willing to bring it up here together with an electric battery, and to explain to all our Superintendents how to use it. I could then prepare and submit an exhaustive a report as possible upon it. The limited funds placed at my disposal cannot this year bear this charge, but if sanctioned, the dynamite can be kept in stock and be used as required on sanctioned works. In this way sanction is merely required to increasing my stock by from Rs. 1,000 to 2,000.

8. I may add that the rock operated on was in both cases the hardest description of hornblendic gneiss.

Executive Engineer's Office
Ootacamund 6th September
1879.

No. 431 3886/4 AP 1

From,

The Executive Engineer,
Nilgiri Division

To,

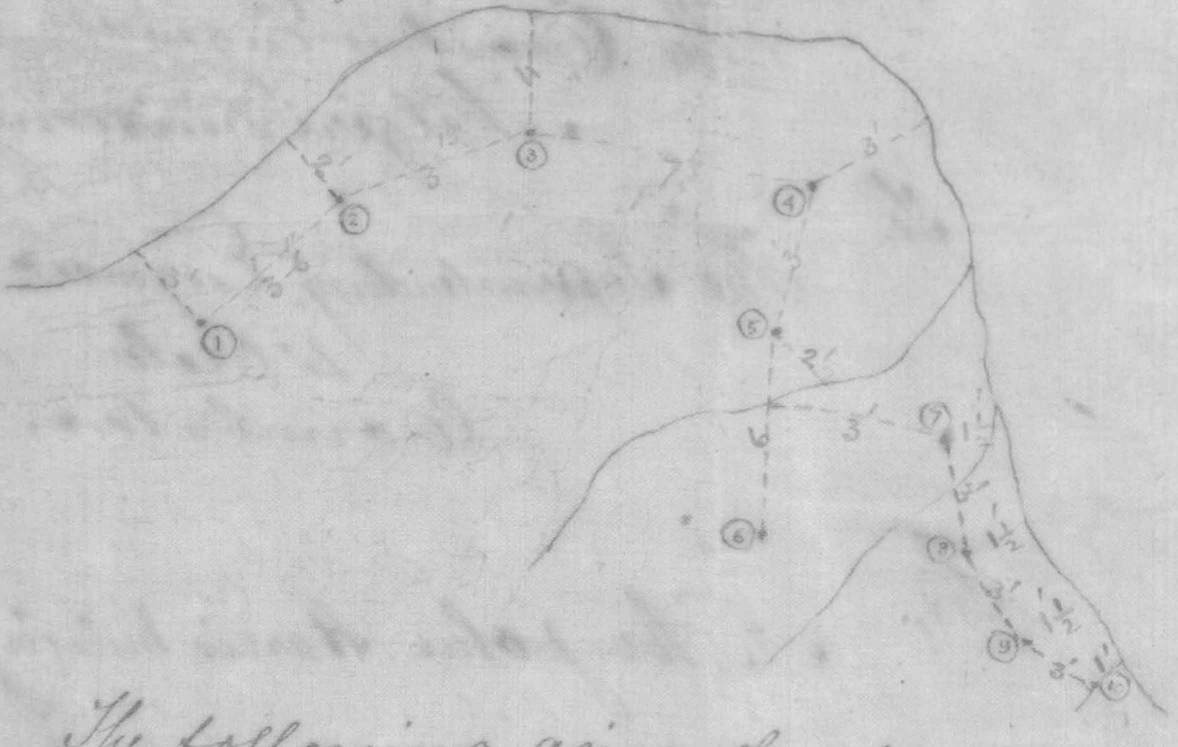
The Superintending Engineer
4th Circle
Coimbatore.

Sir,

A Mr. John Harris, mining Engineer, Dynamite and Mining Instructor to Nobel's Explosives Company of Glasgow recently visited Ootacamund and with my assistance exhibited some experiments with Dynamite which I beg with your permission here to record.

2. A large projecting

rock near the Pavilion was first attacked. Its shape in plan was roughly as below



The following gives the depth of the holes and the Charges of Dynamite.

	Depth	weight of Charge of Dynamite
No. 1	2' 6"	1½ ounces
" 2	1'	1½ "
" 3	3' 9"	10 "
" 4	2' 9"	4 "
" 5	1' 6"	3½ "
" 6	1'	1½ "
" 7	9"	2 "
" 8	1' 6"	3½ "
" 9	9"	1½ "
" 10	1' 6"	1½ "

No. 3 holes was first fired, it tore off three large pieces of rock and shattered and cracked the main body behind the hole a good deal. 6 ounces of dynamite were then placed in one of the large cracks caused by the above explosion and effected the further breaking up of the rock.

No. 1 and 2 were then fired simultaneously; the effect was satisfactory, and a stone 19 cubic feet in size was thrown out by the charge in No. 1

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Nos 5, 6, 7, 8, 9 and 10 were then exploaded together and went off nearly simultaneously tearing down the whole of that part of the face, which was in three tiers

A Charge of 4 ounces of Dynamite was then simply laid on the centre of an irregular shaped rock 3½ × 2 × 2 feet, there being no bored hole to take the charge. The charge was covered with clay and the detonator and fuze fixed. The explosion split the rock in two, and cracked the pieces so much as to enable

the

the whole to be easily broken up for road metal with a sledge hammer.

2 Rock boulders each about 18 inches in diameter were similarly broken up and smashed to pieces by an ounce, and ½ an ounce of Dynamite, respectively, placed in two bored holes 6 inches deep.

3. A Bar of wrought iron 4½ × 4 inches in section and 18 inches long had had a hole 1" in diameter bored through its centre: in this hole 4 ounces of Dynamite were placed. It tore the iron completely in two.

A hollow cast iron road

roller 2' 10½ in diameter and weighing 473 lbs was smashed into 30 pieces (each small enough to be easily lifted by 2 men) by a charge of 8 ounces of Dynamite exploded on its upper Circumference. A cast iron Truck wheel weighing 3 cwt, 7 lbs, 2¾ feet in diameter, was broken into 15 pieces (all light enough to be easily raised by one man) by a discharge of 7 ounces of dynamite in the Centre axle-hole. A wrought iron plate ½ inch thick and 1 foot square was smashed into 6 pieces, and driven down one foot into the soled ground, by a charge of

2 oz

2 oz of Dynamite exploded on its upper surface

2686/7

4. The Stump of an Australian Blue gum tree one foot above and 3ft below the ground, and 2'6" in diameter, was torn asunder by a discharge of 18 oz of dynamite placed in a hole underneath it. One half of the tree was blown out and smashed to pieces, and the other half broken up sufficiently to be removed without any difficulty. An exactly similar stump was torn up out of the ground and Shattered to bits by the explosion of 1 lbs of dynamite placed in a one inch vertical hole bored three feet down its centre.

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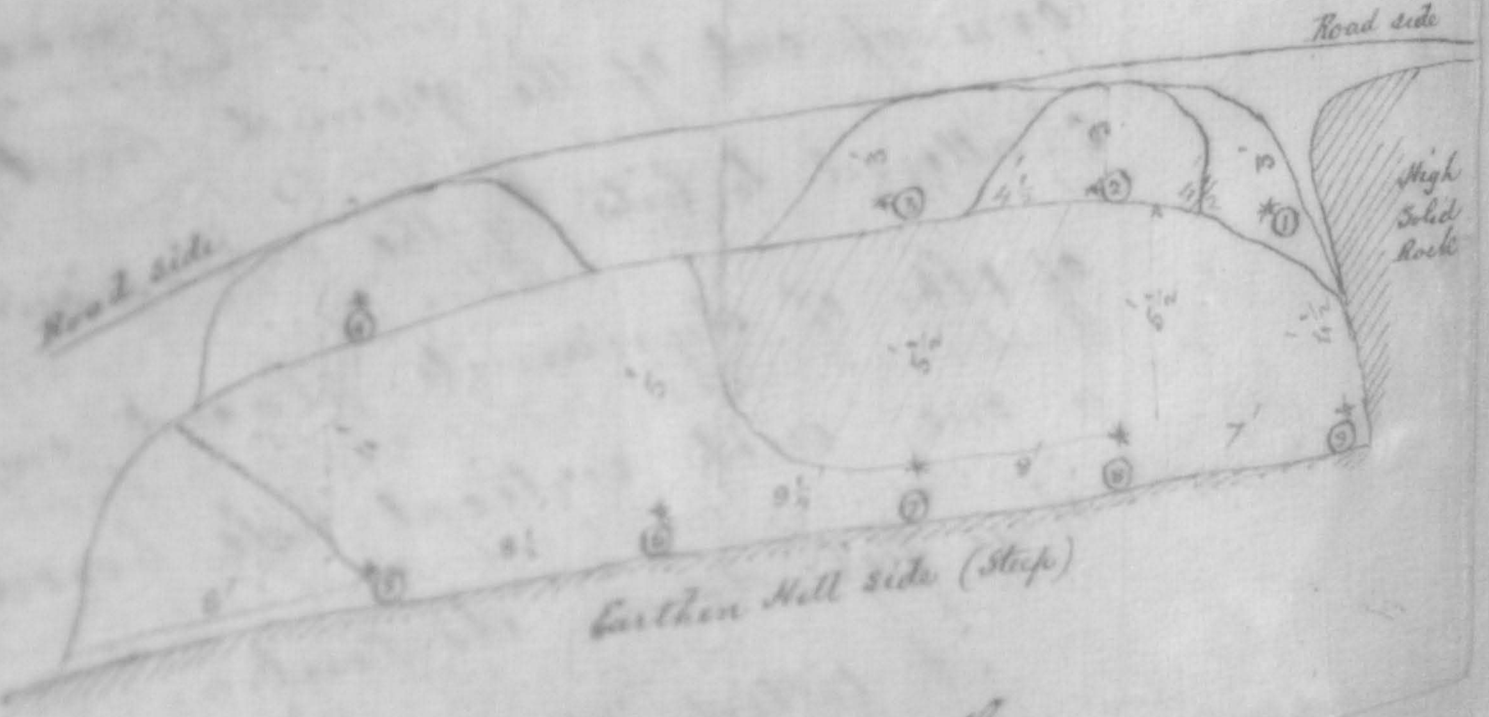

The

The lower 4 holes were first fired; their depths and charges were as follows.

2686/8

		Charge	
No 1	3' deep	2¼ oz	fired simultaneously
2	2' 4"	2 "	
3	4' 6"	4½ "	missed fire
4	1' 2"	2 "	

In No. 3 hole the fuze was damaged and did not burn down to the charge. The hole having been simply filled with water in lieu of tamping the fuze was removed with the greatest ease, and a fresh fuze and detonator inserted, when the charge was exploded satisfactorily. The results were very good, but had these holes been a foot or so deeper the back holes 7, 8 and 9 would subsequently have caused more damage than they did.

2 The back holes were then exploded; they were of the following depths and had the following charges.

		Charge of Dynamite
No. 5	6' 9" deep	11 ozs
" 6	6' 2" "	23 "
" 7	6' "	20 "
" 8	6' 5" "	11 "
" 9	5' 4" "	26 "

The effect of No. 5 was somewhat reduced by the lower lump of rock in front not having been properly removed by No. 4; it however tore off large lumps and cracked all the rock in the direction of the red line.

No. 7 was next exploded in the belief that it would, if first discharged, help No. 6. This discharge had a very excellent effect; it blew out all the rock in front as shewn in red and

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2686/9

the rock all along just in front of No 8.

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	R. A. P		Rs A P
6½ lbs of dynamite at	1- 8- "	per lbs	9- 12- "
15 yards of fuze at	" 1- "	per yard	" 15- "
10 detonators	" 1- 9	each	1- 1- 6
14 yards of Boring	" 14- "	per yd	12- 4- "
50 Coolies at	" 5- "	each	15- 10- "
			39- 10- 6

The quantity of rock removed was about 40 cubic yards. The Cost with Dynamite is thus about 1 Rupee per cubic yard. Our rate with gun powder varies from 1½ to 2½ Rupees per cubic yard.

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(b) its use avoids the necessity of tamping, the hole being merely filled with water: in the case of a misfire this is a very important point.

(c) it smashes up the rock into smaller pieces than with gunpowder thus enabling the rock to be more easily removed and more readily broken up for road metal.

(d) rock suddenly required to be very quickly removed from a blocked road can be very easily

2686/10

easily broken up with dynamite without any bored hole being necessary.

7. The report now submitted does not pretend to be in any way an exhaustive one. But, if you will have the goodness to move the Chief Engineer to sanction the purchase of ⅓ or ½ a ton of dynamite with fuze and detonators &c., Mr. Harris is willing to bring it up here together with an electric battery, and to explain to all our Superintendants how to use it. I could then prepare and submit an exhaustive a report as possible upon it. The limited funds placed at my disposal cannot this year bear this charge, but if sanctioned, the dynamite can be kept in Stock and be used as required on sanctioned works.

Sir

In this way sanction is merely required to increasing my stock by from Rs 1000 to 2000.

8. I may add that the Rock Operated on was in both cases the hardest description of hornblendic gneiss.

I have &c &c

(Signed) J L L. Morant Major R.E.
Executive Engineer.

No 588

Submitted to the Chief Engineer I.W.D with reference to Memo: No 2755 dated 15 August 1879 the undersigned has no experience of Dynamite and has no opinion to offer. But he is of opinion that unless the Executive Engineer has a work on hand requiring

requiring

8

2686/11

requiring a large quantity of blasting, 1000 lbs are more than necessary to keep in stock.

Coimbatore
16th September 1879

A Mussell
Supg. Engineer 4th Circle.

c.c. P. 2455 – 15-8-79

P.W.D.
19SEP79
No.

From
The Supg. Engineer,
Fourth Circle.

Dated 16th
Recd } September /79

No. 588

Dynamite:—

Submitting copy of letter No: 431 of 6th September /79 from the Executive Engineer Nilgiri Dn; & stating that as, he has no experience in — he has no opinion to offer.

Recd 26-9. ~~Retd~~ 20.10.79
Circ 20-9-79
2 Octy 18-9

2686/12

×

This draft was reconsidered in the Rev. Dept. – returned on the 20th inst.
Seen by W.
21/10

×

There are papers on hand from G.D. raising the question of allowing import. of Dynamite.
The Hble. [illegible] these. They are in Sub. or Rev. D. ~~Attached~~

Recd - 26-9 ~~Retd~~ 20-9-79
Circ 20-9-79
8-9-79

A

Hon W Hudleston

2080 W

For orders

I submit herewith a very interesting report on some experiments with Dynamite (some of which I myself witnessed) carried out here shortly since by the Asst. Mr Harris

It is a matter of very great importance that we should try and introduce the employment of this material in lieu of gunpowder as likely to save immensely in both time, trouble, and expense.

Although at this moment we have no very heavy blasting road work on hand the use of this material particularly in all hill roads in the mere "getting" rock. In the manufacture of road metal will I am convinced save annually a very large sum of money – The way in which dynamite breaks up hard rock and smashes it in any direction eminently fits it as a material for preparing road metal, and as will be seen even applying it in the ordinary way for removing rock on the sides of Ghaut roads it is made more economical than gunpowder and would prove

6 Octr 18–9

2686/13

itself still more so if applied in the manner best suited to its peculiar action

I have already recommended its employment in lieu of gunpowder to the Army Commission for all military operations and for submarine explosions such as may be carried out at Paumben or other places it would be invaluable

On the whole I think it of the greatest importance if for no other reason than the appreciable saving which would result annually in regard to road metal to have the substance carefully experimented on under a competent officer with Mr Harris present to attend his advice - This is in itself an advantage which should not if possible be missed

~~RHE~~
20/9/79

I have advised Mr Harris to see the Commandant of Sappers. It is of great importance ~~that~~ the Corps should be ~~thoroughly~~ instructed in the carriage and employment of dynamite for all military operations

2686/19

Suggest to the administration that PWD can provide the funds.

No 2686 W d/ 24 Oct/79

Draft order

Read entered

Memo No 588 of 16 Sept 1879 from the Supdg Engr 4th Circle forwarding letter No 431 of 6th idem from the Ex Engineer Nilgiri Division

---

His Grace the Governor in Council approves of 500 lbs of dynamite being purchased from Mr John Harris Mining Instructor of Nobels Explosives Company and directs that a careful series of experiments be at once under that Gentleman's Guidance

be undertaken by
the Executive Engineer
Nilgiri Division with
a view to elucidate
both the best method
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as compared with
Gunpowder in all
the ordinary operations
of the Department
e.g. removing rock
with good and bad
faces in the construction
of Ghaut roads
breaking up and
removal of boulders
from road surfaces
or elsewhere, "getting"
rock for the manufacture
of road metal

to Ooty 18-9

&c.

2886/15

With this view Rs 1000
are hereby appropriated
from the provincial Reserve at the
disposal of Govt under
Tools and Plant —
and the Supt. Engineer will
be requested to submit
at an early convenience the
formal proposals with
Estimate by the Executive
Engineer for utilizing
in the manner proposed
the grant now made

20/9/79

Wd
24.10

To S.E. 4th Circle
Ex. & N.W.

Despd
1-11-79

Pw 6724

Govt. of {1879} Madras.

PUBLIC, WORKS.

To

Dated

Issued

Recd. Encl.

G. O., 24 Octr 1879, No. 2658W

Nos. 48-49

Dynamite ~~Rs 1000~~

~~appropriated~~ Appropriate Rs 1000 for the purchase of 600 lbs of — for ~~the~~ undertaking a careful series of experiments with a view to elucidate the best method of employing the material and to economical value as compared with gunpowder

48-49