96

Extracts

1796

Calcutta 17 May

No

— D. Blacks Analysis
of the Iceland waters —

Experiments

1. Equal quantity of Lime W.
no sediment.
2. Mild Vol: alk: no effect
3. Paper stained blue with
the purple Violet dissolved
the water and dried, changed
a little towards green
4. Cambric stained to a blueish
purple with infusion of Litmus
assumed a more perfect blue
colour, when dried —
5 And of Sugar no change —

6. Sol: Cor: Sub: no change

7. Sol: of Cal: Saturni / [illegible] solution made the water very muddy and white, but a small quantity of distilled Vinegar redissolved nearly the whole of the precipitate and rendered the water almost perfectly clear again.

8. Sol: of Barytes in Muriatic acid made the water become muddy and deposited a sediment which was not redissolved by adding fresh Nitrous acid

9. Sol: of Silver produced a strong muddiness and considerable precipitation which was not redissolved by adding fresh Sol: and

Observation

The 1st Exp: shews the presence of the Muriatic acid, and the $\frac{3}{4}$ of the Sol: acid. But by the 3 4 and 7th it appears that there was more than enough of alkali to saturate both acids

The 5th Exp: shews that it was not Cal: earth but Alkali salt and the 6th that it was not the Sol: but one of the fixed alkalis

The first experiment shewed that the ~~the~~ ~~muriatic~~ alkali was not combined with air, or but in very small proportion

— To investigate the earthy matter and determining quality

Evaporation

10.000 grains by weight to dryness —

Dry Extract of Reykum W. 8.25 Gr

of Geyser — 10. —

The Evaporation was performed in glass vessels 3 inches wide and 7½ deep which received heat from the steam of boiling water not directly ~~by~~ but through the intervention of white iron cases which fitted the glasses and in which they hung — advantages of this apparatus — fixed matter collected on a small surface glasses so moderately heated that they bear water to be added during

the evaporation without breaking — no part of the fixed matter rendered [illegible] — easily weighed —

— At the end of the Evapn. an odour similar to that of impure alkaline leys — assumed the form of transparent jelly of the thickness nearly of half a crown this jelly afterwards white small fragments not connected with each other. A small quantity attached to the glass — off with difficulty —

These phenomena resemble those in evaporating water in which siliceous earth is dissolved especially by an alkaline salt

The Extracts attracted moisture from the air

The Extracts contained a quantity of uncombined alkaline salt which became evident when a small quantity was wetted and applied to paper stained with the juice of violets or radishes, the colour in both cases changed to a green.

Passed the extracts with distilled water thro' a filter, evapor.d small Chrystals of common salt, with Chrystals of an oblong and flatted form, effloresced — was found to be fossil Alkali.

The undissolved matter on the filter appeared to be totally or principally siliceous earth. It was white and exceeding spungy and light. A small quantity wrought into a paste with water, laid on a piece of Charcoal and dried, it was then subjected to the blow pipe, but could not be melted. Another quantity of the same was triturated dry with an equal portion of aerated and ex[s]iccated fossil alkali, put into a small platina spoon, strong heat of the B.w pipe to the bottom of the spoon, a transparent colourless Glass which afterwards by being digested with a small q.y of distilled water was completely dissolved and formed a liquor — Liquor Silicum

— Quantity of uncombined Alkali ascertained by Vit.ic acid of the Sp. G. of 1790 to 1000 Fahr.t. Heat being 60 diluted with 100 times its weight of distilled water

linen rags or Cambric in infusion [solution]
of Litmus well calculated for ascertaining
both the uncombined Acid & Alkali
but the former more certainly than
the latter, turns red sooner than green

The residuum on the filter al-
so contained a small quantity of
argillaceous earth which would not
yield to the blow pipe, nor with al-
kali - no glass formed -

- To determine the quantity
and nature of the earthy matter
7 Sediment collected by boiling

1st Expt some into a platina spoon
1 and made it red hot - Phenomena:
1st became black, then underwent a
slight inflammation, afterwards white

without changing its external form
being only a little contracted in size &
diminished in weight

2 To a small mass of Sediment laid on
a bit of Glass was added a drop of aqua
fortis - neither effervesced with it, nor dissolved
it, only changed the colour to a paler
red

3 Another small portion which
had been gently calcined, was well
mixed with the aerated fossil alkali
in equal quantities, and exposed to a
strong heat in the platina spoon.
The Alkali was quickly melted and
became caustic, but the earth would not be brought
into fusion, at least not perceptible

4 A little mass continued in melted
borax on Charcoal undissolved and
without any appearance of effervescing.

This earth must therefore be ~~of the~~ Argillaceous ~~siliceous~~ ~~kind~~. Had it been the siliceous it would have been melted with the alkali into a transparent glass — which happened exactly with different specimens of the pure siliceous earth subjected to the same heat; and had it been any of the alkaline earths the borax would have dissolved it quickly and with effervescence

Quantity from each of the waters 10,000 Grains by wt.

Reykum = $\frac{1}{20}$ part of a grain

Geyser $\frac{38}{100}$ of a grain

The earth was first brought to an obscure red heat

The greater part of the earthy matter ~~in~~ had not yet made its appearance that is the siliceous earth. It still remained in a state of perfect dissolution

in the neutralized and boiled mixtures above described none part of which had actually passed thro' ~~the~~ filtering paper The results of other experiments shewed that the whole of these neutralized mixtures might have been filtered without danger of separating any part of the siliceous earth by that operation

The quantity of silicious earth obtained by Evaporation was in 10.000 gr

Reykum 3.73

Geyser 5.40

The water was evaporated to dryness with a gentle heat in two china cups, carefully washing every drop of the from the glasses into the cups with distilled water and then taking out the dry extracts out of the cups they were put separately into filtering paper and passed distilled water through them repeatedly until all the saline matter

was washed away. The papers being then carefully dried, the earth in them was found exceedingly spongy fine and tender — some of this with half its Wt. of alkali was melted into a pearl ash in the platina spoon

— Experiments to ascertain the Neutral Salts —

Preliminary experiments gave reason to believe these salts to be common & Glauber Salts.

1st Set — Some common salt had been ignited by a second Chrystallization — in Solid Dry and Large Chrystals — Of this was taken 10 Grains by Wt. which were dissolved in about half a pound of distilled water. A solution of silver containing a little superfluous acid, the silver was precipitated in the form of Lunar Cornea

with more was added than what the ten grains ~~would~~ of common Salt would precipitate. The Lunar Cornea after complete subsidence and decantation of the Saline water from it was carefully collected on a small filter and well washed with distilled water and thoroughly dried and weighed. It was learned that 100 Grains of common Salt are sufficient to give 235 of Lunar Cornea — By similar experiments the quantity of common Salt was found to be in 10,000 Grains of

Rye Grass = 2.90
Grass = 2.46

It may be suspected that that Glauber Salts contained in the Land waters might by means of its Vol. acid contribute to the precipitation of a part of the silver, but experiments will prove that

a small quantity of vit: acid or any vit: salt dissolved in a large quantity of water does not precipitate silver; — and to prevent any more of the silver being precipitated by the alkali of the water there was added of purified aqua fortis more than enough to saturate the alkali, before I added the solution of silver —

Another set of Experiments on the same plan was made with Glaubers salt and the sol.n of Barytes in marine acid instead of common salt and the solution of silver. — 70 parts of pure exsiccated Glaubers salt, will precipitate 17 parts of Barytes vitriolica. This fact ascertained of Barytes was added to the solution of Barytes ~~so~~ as long as any the heated water precipitate continued muddiness or precipitate continued the precipitate was washed. dried and weighed. quantity in 10,000 grains

Ryk.m 1.28 Exsicc: Geyser 1.46 —

— Result

In an English Gallon of 231 cubic inches or 58,406 Grains of Rykum water there is

	gr
Caustic fossil alkali	3.
Argillaceous Earth - -	0.29
Siliceous Earth - - - -	21.83
Common Salt - - - -	16.96
Glaubers Salt Exsiccated - -	7.53

Geyser

Caustic fossil alkali - -	5.56
Argillaceous earth - - -	2.80
Siliceous earth - - -	31.58
Common Salt - - -	14.42
Glaubers Salt exsicc:	8.57

An attempt to account for the Barometer being always lowest at Calcutta about noon ——— C. P. —

This phenomenon is owing to the sea and land breezes —

The air lying over the land being rarefied by the action of the sun during the day ascends in the higher regions the place it occupied is supplied by a current of air from the sea

During the night the rarified air becomes condensed and consequently must descend the consequence must be a current of air from the shore towards the sea

In the forenoon while the sun is rising, the Barometer is observed the mercury must therefore descend. In the latter, while the sun is descending my

the Syphons must cease, and the
mercury consequently rise —

At the greatest cold happens at
dawn, the barometer should be highest
then

In England the air is a hot day
in summer rather up an easterly char-
acter, in the night it moves Southward
into the room —

But Calcutta does not experience
a sea breeze sensible with regard to the
direction of the wind, there may not-
withstanding be both an ascending
and descending current current Ex-
pressed to effect the Barometer —

The wind at Calcutta commences
always most forcibly during the night
then in the day —

But independent on the sea &
land breezes, if it be admitted that
in all warm climates that there
is an upward current during the day
and downward current during the night
then phenomena of the Barometer ne-
cessarily follows —

From Mr Watt's Remarks
upon a Compound Screw

Let one screw play within another
so that while the largest turns
round and rises in the frame, the
innermost may rise but not turn
round — Let the rise of the thread
of the under (large) screw be a and
of the other a-b

Suppose now the two screws
to be turned one round, the
point of this screw will be raised thro
the space a above its former situa-
tion with regard to the frame in
which it moves. But if the se-
cond or the smaller screw thro
a space equal to one of its threads
= a-b therefore this last screw must
have advanced thro a space equal to

the difference of the two that is
thro' b Ex: Gr. Let the screw AB.
largest have 10 threads in an inch
and a thread of $BE = \frac{9}{100}$ of an inch —
hence $a = \frac{1}{100}$ and $a-b = \frac{9}{100}$ therefore
$b = \frac{1}{100}$ that is at every turn of the
button F the point of the upper
screw will advance $\frac{1}{100}$ part of an inch

Suppose the rise of a thread
in the larger screw to be given &
also the space thro' which the point
F is to advance at every turn of the
screw, to find what n°. of threads of the
larger screw divided into a number of
parts greater by one will give a
thread of the lesser screw

Let n = num. required

Then $\frac{an}{n+1} = a-b$

$an = an - bn + a - b$.

$bn = a - b$

$n = \frac{a-b}{b}$

Then is the form Eq —

$a = \frac{1}{10}$ $b = \frac{1}{100}$ then $n = \frac{\frac{1}{10} - \frac{1}{100}}{\frac{1}{10}} = 9$

that is if nine of the longer Threads be divided into ten equal Parts one of those will be equal to a Thread of the lesser sort —

By the above Formula the following Table was constructed in which the figures in the left hand column are the value of b, and those at top the value of a, and those in the middle of the Table the value of n. When the value of n involves a fraction, we get rid of it by multiplying both n and $n+1$ by the Denominator of that fraction Thus if $a = 30$ and $b = 500$ $n = 15\frac{2}{3}$ and $n+1$ $16\frac{2}{3}$, the Numbers 47 and 50 are in the same proportion, therefore if 47 Threads of the longer sort be

divided into 50 Parts one of them will be the size of a Thread in the lesser sort —

	10	20	30	40	50	60	70	80	90	100	500	1000	10,000
2	4	9	14	19	24	29							
5	1	3	5	7	9	11	13	15	17	19			
10				3	4	5	6	7	8	9	49		
20						2	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4	24	49	
30						1	$1\frac{1}{3}$	$1\frac{2}{3}$	2	$2\frac{1}{3}$	$15\frac{2}{1}$	$32\frac{1}{3}$	
40								1	$1\frac{1}{4}$	$1\frac{1}{2}$	$11\frac{1}{2}$	24	249
50										1	9	19	199

The cases where the compound sort will be most exact with an Arm a very slow motion or very great Power is wanted —

From Russels history of
Aleppo

— None but Moslems are permitted to enter the Mosques at Aleppo. And there is only one where Jews and Christians are permitted to enter the court yard — This court yard is left as a thoroughfare, even during the hours of prayer. — Not so strict at Constan: and other cities —

— The word Bazar is persian and Turkish — nearly of the same form all over Asia — China —

—Locks of the Bazar gate of wood—Key about a span long and an inch thick with ~~this~~ are driven four five or more ~~iron~~ short nails which fit the interval of as many in the bolt and move the bolt backwards and forwards—The gates are covered with plates of iron
—Private houses have Egyptian locks—
—Gates in the principal streets also watchmen—difficult for offenders to escape—Their precautions and its being unnecessary not to appear in the street without a lantern render housebreaking and street brawls very rare at Aleppo

—The Divan is the Basha's audience room
The corner seats of the Divan are reputed the most honourable
—Divan placed on the entrance into the house
—Roofs where there are no domes are flat and plastered with a composition of mortar tar ashes and sand—Europ. Inhabitants by their terraces communicate with one another and with the Bazar, a great advantage during the plague
—To leap over a neighbour's wall is thought as ignominious as breaking open his house—few intrigues

— more dust than smoke
— Fuel wood and Charcoal
— Bagnios the greatest Nuisance
fuel employed to heat them
consists of the dung of animals
filth of stables, parings of
fruit and other offals collected
by people in the street —
+ on the subject of ancient fuel
consult Marmi Vol 1st pag. 254
and Belon translation of Theodore
— Glass Stove — these better of
quality —
— Tannery — Catgut manufact.
— Aqueduct said to be coeval
with the city — repaired by the
Empress Helena mother of Const.
who also built the church now
converted into the principal

Mosque —
— Aqueduct sometimes on the
surface — some places under —
ground —
— Close to the city extensive
quarries — granite stone at first
soft but hardens in the air
Marble from different parts
red from Damascus —
= Lime on account of fuel a
dear article — plenty of lime
stone — Plaster of paris —
employed in finishing the
principal room, and likewise
by way of cement for the small
earthen pipes of the fountains
= The fountains or basins not
lined with marble are plastered

with a composition of quick lime pounded chalk stone cotton and oil this plaster is durable and effectu-ally prevents the oozing of the water—

Clay bed— Fullers earth mixed with dried rose leaves and made into balls much used for cleaning the hair in the Bagnios. Breeding women and sickly girls by election consume a considerable quantity of this earth

— Metals not found at present near Aleppo nor probably in any part of Syria— Lead Tin and iron chiefly from England and Holland + Mines of Lead and Copper in Armenia

— Two sorts imported from Armenia

one sells dearer than the other because it is said to boil w. sooner

— Salt Lake 10 miles from Al: Shallow from 1 to 2 a Am makes thick upper parts separated from the under dried and winnowed then separated— best sort very fine— excellent quality

— At 11 miles— Sounds village

a cavity in the Earth the sides of which contain coral, madrepores and other marine productions— no appearance of Vol: action

Extract from the report of the Committee for improving the manufacture of Gunpowder at Bombay —

Defects of the present Gunpowder works —

1 Bad construction of the furnaces for heating Salt petre — no chimnies — grating too far from the bottom of the boilers — Pans constructed — 300 Gallons of wood = 10 or 1200 in the old —

2. The water in which Salt petre has been Crystalized, is thrown away on fresh Petre, this means the impurities of the Saltpetre are added to the second &c. so that the Salt petre is generally less pure at the end, than at the beginning of the process —

3. Water to Salt that the natives will not drink it is used in the manufacture, both for Crystallizing the Saltpetre, and added to the composition with the mills — The only object of the saltpetre manufacture in which Salt seems to have been, the separating Vegetable and other matter perceivable by the eye, without attending to the different Salts with which it is adulterated —

To remedy the rain water must be collected during the rainy season — Quantity for one year would not exceed 600 butts of 100 Gall. each —

\+ Mr. Farquhar's mode of refining Salt petre — is to add to it 1 1/2 times its weight of water when ~~then~~ this solution is well clarified, and sufficiently evaporated, he lets it Chrystallize of those Chrystals he takes 1/2 only for use the uppermost which are the purest. The remaining Chrystals are re-fined again

Observation — Salt petre is at least 50 pr. Cent dearer

at Bombay than at Bengal. Wood is also dear — This would occasion a considerable additional expense here — & Salt Pr. is volatile in the heat of boiling water —

\+ French mode of refining Salt-petre by two washings with cold water the first 40 per Cent the 2d 25 pr. Cent adopted by the Committee as the best. —

50 Bombay maunds = 1400 lbs of finely powdered Salt Pet into a wooden tank, 40 pr. Cent of cold water poured on them and well stirred, let stand 24 hours — water drawn off by a cock — Salt petre is then

-peat into small baskets sus-
-pended above the Tank, and the
water forced out as much as pos-
-sible by mixing the salt with the
hands. It is then returned to the
Tank and 25 P Cent more of
water is added, after standing
another day this is drained off
as before. It is now found that
72 P Cent of Salt Petre is got
back, of a very considerable degree
of purity ~~is got~~ the remainder
being dissolved in the two
waters, or is mixed with some
impurities that fall to the bottom
of the Tank. This purified Salt
petre has a brownish colour
from containing a little veget.
and mineral matters ammonia

together probably be less than
1 p P Cent. These can do little
injury to the Gun powder —
The Sea Salt is reduced to less than
1 P Cent. and the Still more
hurtfull salts with earthy bases
are completely taken away
care should be taken to
pick out as much Dust as
possible from the Crude
Salt P. before it is powdered
and to remove as much
of it during the washing
as may be

There remains in the
water of the two washings
about 23 P Cent of Salts
which consists of Nitre, sea salt,
and salts with earthy bases

in different proportions according to the nature of the Crude Salt &c. 5 P Cent more is found of Salt Petre combined with impurities, and which should be removed again before it is used —

Of the 23 P Cent of Salts contained in the water the Salt Petre = 16 parts — Now in the understood of the Salt Petre in which the committee made experiments

The process of getting in this way 72 P Cent is very easy, and not expensive, but in order to remove the remaining $\frac{16+5}{21}$ = parts of Nitre the usual process of boiling and Crystallization must be gone thro which requires a good deal of Wood, and are very tedious & expensive —

The two washings should evidently be kept separate from each other. For the 1st contains nearly the whole of the Salts with earthy Salts and the greater part of the Sea Salt. The 2 ~~contains~~ on the contrary being one they alledged in the exact way affords Crystals that may be mixed with the common Salt Petre of the market

So large a proportion of Salt Petre as the two washings contain certainly should not be thrown away. — Quere whether

+ The effect of these washings depends on this principle that water tho' saturated with Nitre does not the less dissolve common salt or salts with earthy bases. Let it be supposed for example, a quantity of Salt petre contains 12 P. Cent of sea Salt and that it is washed with 40 P Cent of water, it will be found that 2/3 of this salt will be got back again from the first washing even in the great way, that is to say, the sea salt in the mass is now reduced to 1/3 of its original quantity or 4 P Cent. If the Salt petre be washed a second time with 25 P Cent of water, it will be found that a greater quantity of salt will be got from this 2d washing than was added to it, or that out of 4 parts 3 and nearly one half are removed, that is to say the Salt petre remaining contains less than one per Cent of sea salt. It is evident that in this example a great deal more water is used than what is necessary for dissolving 12 p. Cent of sea Salt but it ought to be observed that an additional quantity of water is necessary from the dry Salt & retaining a considerable portion of it

— From this principle is derived a method of assaying the saltpetre by

and other of different kinds of Salt petre — Wash the Salt petre with a Saturated solution of pure Nitre — The loss of weight is the foreign salts, with which the Salt petre was adulterated —

The Committee have purified Salt P. to one P cent of foreign Salts — are of opinion that a greater loss will ~~salt~~ be experienced by Chrysn. than by washing

— Danger for plenty matter.

— answer — In making 100 Bls no accident whatever happened.

— By the solution of Silver in Nit: acid it appears that all the Gun Powder from Europe, the fine

battle powder excepted, contains common Salt —

— Nitre has no water of Chrystallization — nor does it attract any moisture from the Atmosphere. But a little Sea Salt by attracting moisture soon injures Gun-powder — This might be got quit of altogether by two Washings and one Chrysn. The Nitre of the powder for small arms should be well refined otherwise the cartridge when it is exposed to the air under a large surface becomes wet and unfit for service —

+ Little fault found at the Mills with the other two ingredients

+ In the Bombay powder mills 12 Pistons each 25 lib fall 17 times in a minute on 80 lib of composition for 4 days which allowing one hour for change of cattle is about 7 hours a day, or the composition receive 28000 strokes. — In Mr Forget's mill, comp. is kept in the mills for 17 hours, receives 16 strokes a minute, in all 16000 which he observes is little more than 1/5 of what has been supposed necessary in Europe —

— The Committee have kept a quantity for 6 days instead of 4 but no advantage from it

— Preference of the beating ~~mills~~ to the cylinder mills.

— It shows that the powder of two large a grain — does not inflame all at once —

— When large grained powder is made 1/3 reduced to dust; which small 1/2 — This dust was on trial found not altered in the proportion of ingredients, for the beating mills it made good powder

— Mode of proving Gun P. defective

G. P. which contains a large proportion of sea salt when dry will stand the common proof — but exposed to the air &c —

— Besides the ordinary proof an Analysis should be made of a quantity taken from a certain number of barrels and mixed together — whether the ingredients are in proper proportions and lastly whether the Salt petre be of due degree of purity ——

— Proof is that of the Powder a Brass mortar at the elevation of 45° into the Chamber of which 3 oz of G. P. is put, a brass ball = 60 lb — Dist: for proof = 525 feet

— Contains 75 per Cent of Salt petre — other Ingredient vary

— Former was about 71 ——

+ The powder should always be exposed to the air for one night on an open paper before it is used, for no conclusion can be drawn from powder well dried in the sun and then kept for a few days from the air —

Expenses for 240 bar!
each cont: 100 lb ——

Total expen. Salt pe	2,573.1
— Ditto Sulphur -	509.
—— Charcoal - -	173.
— Feeding Cattle - -	1055
Monthly interest on the pur. and [illegible] of bat: of Buff:	75
Servants wages - -	745
Petty expenses	1621
	5,372.2

W.

that is 22. 1.60 ℔ Bar.

— This rather below than above the rate

+ The works at present can make only 240 Barrels ℔ month

+ Salt petre loses 20 ℔ Cent in refining tho' the real quan.ty of foreign salts should not exceed 10 ℔ Cent. yet great quant. of fuel to recover the S. P. from the 20 ℔ Cent cont.d in the water —

— By the operation of Milling granulating, sifting and drying there is a loss of 12 ℔ Cent — a — the comp.n which should produce 8 Bar. only 7.

— Of crude Sulphr. Tin and Stones = 12 lib in 33 lib. On this there is a loss = 25 ℔ Cent, by refining

— For 240 Ba

Salt P. from 129 ½ bags each = 154 lib ... at = 2375 Rupees

Sulphur 2400 lib a 10 ℔ Cent of other = 544 Rupees

Charcoal 3600 lib a 15 ℔ Cent = 173