

Correspondence between Erasmus Darwin and Josiah Wedgwood

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From E. Darwin

to
 Joseph Wedgwood Esq^r

Mar 22. 86

Dear Sir,

Appleby Leicestershire

I have not been at home since about an hour after you left Lichfield having been a Wanderer or a sojourner ever since in this part of the County - have therefore not yet fabricated another lamp but only thought over it,

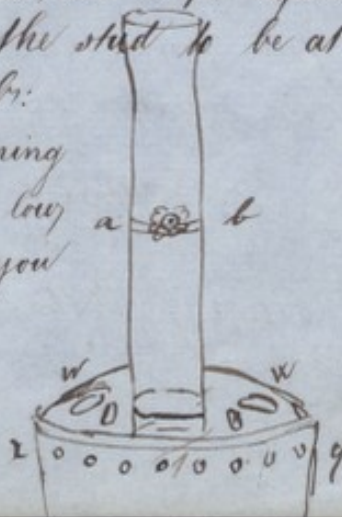
1. I think in the specification it should be said the wick is made to rise or sink by a rocket and pinion as in Fig 1 or by a stud sliding in a nick as in Fig 2 or the like since the essential circumstance is the wick being placed within the circumference of the flame not in the manner of elevating or sinking it,

2. The easiest way of putting on the external tube, so as to have no wick in it will be to make it, in two pieces, one to fit upon the other and the stud to be at the joining a. b.:

3. This joining may be as low a b or as high as you please



Fig. 2



The air-hole may be round the rim or on the top of the can at x x

The animal gut should be first blown up with air and dry'd - 2. cut into proper pieces 3. the ends of each piece made wet with warm water and attached to the two ends. and the wires put round 3 and then dry'd before the oil is put into it.

I am interrupted and the post is about going Adieu, I fear'd the snow would much incommode you, when I found so much more than I expected myself.

From yours
Mar 22. - 84. E. Darwin

From J. Wedgwood
to
E. Darwin.

Dear Sir March 29

I have been waiting some days for the advice on the other side and now it is arriv'd at bedtime & the post leaves us early to morrow morning so that I have barely time to thank you for your favor from Appleby - to say that I shall observe and profit by the contents - that I am preparing Models &c &c &c - & to wish you and your family a very good night, thanking you very kindly for your late hospitality

Adieu

Yours most sincerely
J. W.

with a copy of Letter from Mr. Byerley
March 28.

From E. Darwin

to
J. Wedgwood

3.

Dear Sir

Apr 4 - 86

I was set off from Drayton to have passed Sunday night last with you at Eturia, but Fate drag'd me another way - or the D — l as the Manicheean's would exprefs it.

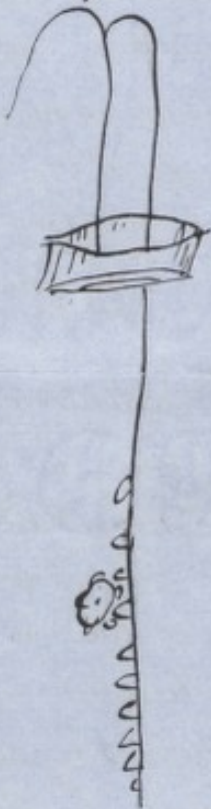
I should advise you to permit the ague to continue, as it may introduce a new habit, & thence nature (or the above mentioned D — l, as you like) may forget her bad habit. If the ague does not weaken her very much I should give her no medicine at all, (not even a vomit) except she wants some natural evacuation, as a stool daily. If it should continue a month I should then advise to put an issue into the thigh of the affected side; and then unless the child should become very weak, or have a tendency to jaundice, or a hard tumour on one side of its bowels. I should still leave the ague to continue.

In respect to the lamp, if the pressure be made on the oil by weights, as you propose, the column of oil in the top of the lamp becomes shortened as it wastes both by its own diminution, and by the diminished height of the counter column of oil at the base I study'd (I believe all the possible means, both with & water, & springs, & air, as in the fountain

of Hiero (I think it is called) I tried the last with great diligence many years ago before I understood the theory of the cone. I believe no means will succeed but those with the bag and lead weight,

As lead is about 12 or 13 times heavier than oil an inch of lead will raise a column 12 or 13 inches.

I have thought of no improvement since I wrote but what I believe was mentioned, that the socket better should be turned the contrary way, which will bring the button into the centre of the pillar



I have not made another fearing to give my workman two distinct ideas, but if you wish me to make one I will immediately set about it - I fear you found the screw troublesome when you left Derby.

Shall we hope to see you all in your passage to London? adieu

E. Darwin

Mrs D. desires with me to be remembered to Mr. and Miss W.





From Dr. Erasmus Darwin F.R.S.
to
Jos. Wedgwood Esq.



4.


Dear Sir,

Derby April 7- 86.

I was streighten'd for time when I wrote last, prevented me from saying more about the Lamp.

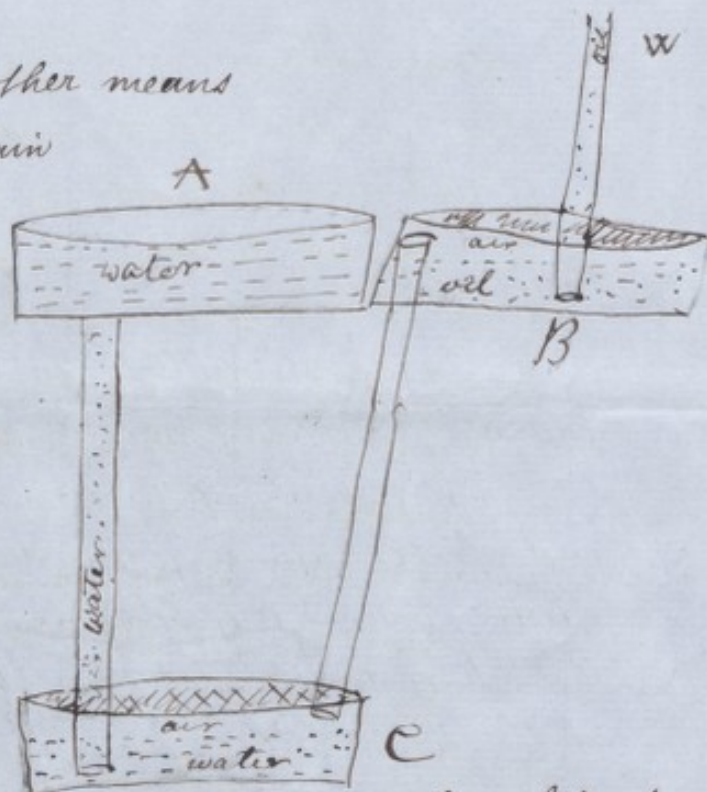
1. In respect to filling it, the place where the end of the funnel is inserted must be made larger a little (which will not incommode the wick) so that the end of the funnel may stick easily in this part of the wick-holder (the wick being then taken out) then a section of the pipe of the funnel would be  to fit the part of the wick holder which is dotted 

2. Another way would be to leave a place on purpose to fill it without taking out the wick at  with a  in which the funnel common form'd pipe might stick upright & then taking hold of the candlestick part would distend the bladder & help the descent of the oil.

3. The pipe of the funnel should have a cock in it, which would be neither difficult to understand nor expensive to make oil becomes visible in  then when the the wick holder runs is spill'd over

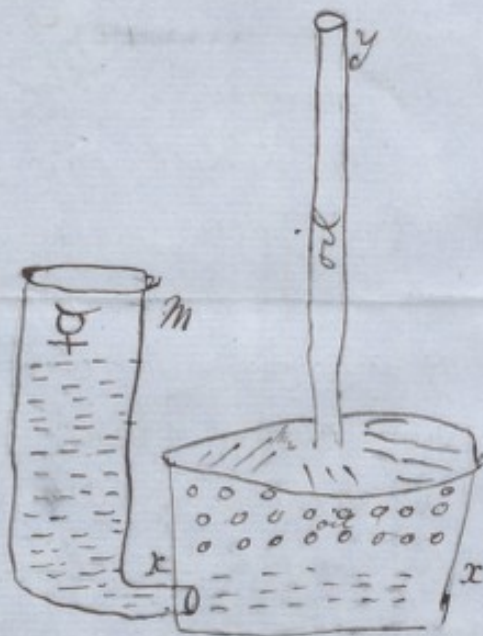
Now for all other means

1. Héero's fountain



the Vessel B was placed over the vessel A in the model I made. But this labours under such variety of evils that it cannot succeed. 1. because as the oil at W wastes the surface of the water both sinks at A & rises in C & hence the error is doubled
2. the variations of heat & cold much affect it.

2. With ζ & oil here the column of ζ as it sinks at M, rises α & x hence the error is doubled & the oil subsides in the tube y 16 times as much as the ζ perpendicular height of this double error.

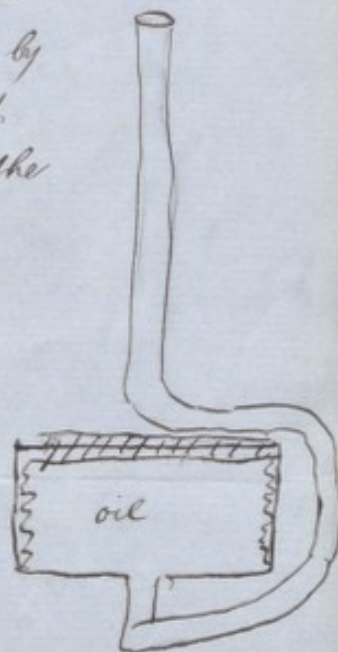
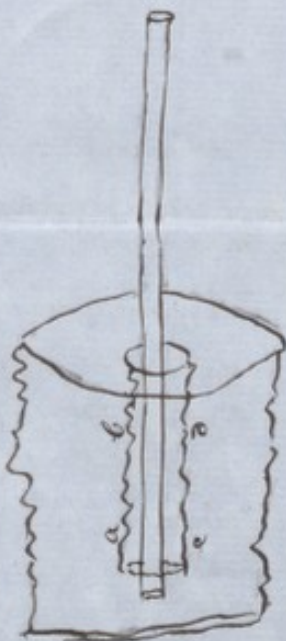


- 3 Your scheme is I think less objectionable, than the above as the error is not doubled; if Oil alone is used, thus when the oil in the reservoir sinks an inch, the oil in the wick sinks only an inch. This however is a great defect & the machinery less simple. But the Patent I think should be so expressed as to include this too. which is on the same principle viz, the oil raised by a weight from a reservoir beneath the wick.

If you wish me to construct one here let me know & I will set about it.

I hope the shadow of the Gent has left.

If a fixed pillar is quite necessary which I doubt it may be done by putting the pillar through the centre of the reservoir, by putting it into a chicken's gut, at a. b. c. d. but I much prefer the other.



Your fair Secretary made no explanation of her elegant copper plate design

Adieu best Com^{ts} E. Darwin

P.S. I think the best way of filling the lamp is by directing (by a printed direction) the person to sink the wick as low as it will go into the wick-holder by means of the Batten; & then the top of that part of the wick-holder, being made rather larger, will contain the neck of the funnel which should be a cock as above.

Mr. French is endeavouring to forward a navigation to bring coals to this Town, & said he understands you have a plan, or design or survey formerly made by Mr. Brindley or others - if you have such a thing, perhaps you would favour him with a sight of it.

Mr. Darwin joins in Compl. & hopes of seeing you in your road to Town.

From D: Erasmus Darwin F. R. S
to Josiah Wedgwood Esq^r.
Apr. 12. 86

Dear Sir,

Mr. Nicholson is an ingenious & accurate man, the transparency of the flame I had attended to and accounted for the great light from snuffing a candle on that idea I had thought of making a pyramidal lamp for some optical experiments perhaps his concentric lamp might be of use, for common purposes it would not be so agreeable as a pyramidal lamp, but neither of them so useful as the present ones - 1^o. as their intricacy & brilliancy would not be less convenient than two on the common Argand's plan.

I have thought of Springs, & made some attempts & hope they will succeed well but if the reservoir be only 2^o inches diameter it must be 8 or 10 inches high, or 12 to have the spring act with accuracy - But as great exactness in the height of the column of oil is not wanted (I believe) I can make springs for broader reservoirs, as suppose 4 or 6 inches diameter, which will not take up more than 3 inches of space at the bottom of the reservoir & then the whole reservoir need not be more than 6 or 8 inches deep.

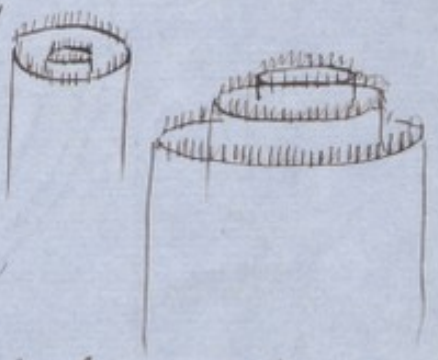


I will immediately execute one on each of these plans and send you them, as they will be much preferable to weights though not quite so accurate

The conical bag has an inconvenience viz, which ever end you place upwards, or next to the wick the narrow end will be compressed first and thence the resistance to its compression will constantly increase instead of decreasing - this however I have invented a method to counteract, but I believe, so little accuracy is necessary that I can do it by Springs alone

The consumption of oil is less than I expected - I don't think increasing the thickness or conicality of the wick will succeed, as we saw by the thick wick I show'd you here.

The pyramidal lamp would be more pleasing to the eye than the concentric one of M. Nicholm, & is not at all on the same principle as the light of the interior one does not pass through the flame of the exterior one



As he has published it in the Magazine, you have certainly a right to make use of it. As he has given it to the public

The defect of the Origens lamp of M. French is the holes admitting the air, exterior to the flame, being too near the flame; & hence it has not

so strong a current, because the heated chimney is so much shorter. But if no smoke is formed I think the lamp preferable, because the consumption is less, as well as the quantity of light, & I should prefer two lamps less luminous, if equally clear; to one of double the luminosity, for common use. But perhaps the contrary may be more agreeable for ornamental illumination for which the pyramidal flame would be more agreeable than the concentric, tho' the latter will have a more brilliant eye.

M^{rs} Darwin begs her compl^t to Miss Wedgewood, & hopes much to see her at Derby at her return, & will then answer her agreeable letter by word of mouth

adieu

from your sincere & affect^d friend
C Darwin

M^r French said the cup & saucer you gave Miss Violetta is the most beautiful thing he ever saw in the world. He admires the figures, & the absence of glaze &c. &c.

From J^r C. Darwin F. R. S.

6.

Jos^h Wedgewood Esq^r
Stroud.

Dear Sir.

Derby May 9. 84

M^{rs} Darwin & myself sincerely condole with you on your late loss; which I hope

nevertheless M^r. Wedgwood & Miss Wedgwood bear
as well as such a degree of attachment will admit of.

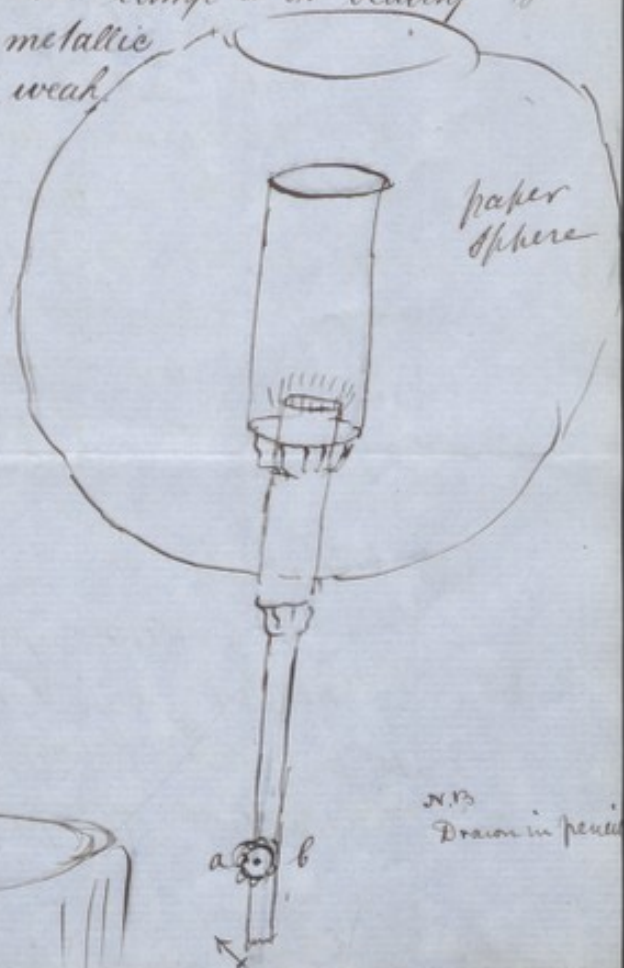
The spring lamp I believe will answer well, I have
one now burning by me, as a candle, not having
added the circular wick. The body is $2\frac{1}{2}$ inches
diameter & $10\frac{1}{2}$ high containing the spring & the
oil, from thence rises a thin candle 15 inches high
the whole being $2\frac{1}{2}$ inches high, — grand to behold!

like a star amid the dusky air! it has burnt three
I have investigated the law of adapting springs of
all strengths, & will begin tomorrow to make one
with a circular wick & hope to send it in a
week or 10 days.

The bladders I have also I believe found out how
to improve & adapt

The conical bag is not manageable in practice I believe
as the thin stalk of our lamp is its beauty &
when known to be a metallic
stem will not appear weak.

I think of making it
thus & having no
wheel & socket
but a sliding
brass knot.



N.B.
Drawn in pencil

The body parts will be deeper in the spring lamp, as a spring takes up more room, than a weight, but by this the lamp becomes as portable as a candlestick.

sic → M.'s Ideas about lighting rooms are most likely the consequence of his reasoning about the transparency of flame, that is its permeability to light. I don't think they can be any of our ideas. the same time the less he thinks about lamps the less likely he will be to fall upon our ideas. & therefore perhaps it will be better not to hear his ideas at present till you determine about the patent.

My new spring-lamp is easily filled & the whole very simple.

The circular wick may either be applied as we did the other, or on a thin stem as above, the latter I shall first attempt.

Adieu, from, Dear W.

Your affect. friend

& obedt. servt. - E. Darwin.

From Dr. Erasmus Darwin F.R.S.

to
Josh Wedgewood Esq^r

Stroud May 12/86

Dear Sir.

Atom-springs, which are the simplest & cheapest, will take up more room in respect to perpendicular height, than springs of a deuced construction (as perhaps 4 or 5 shillings difference)



I have made several experiments on worm-springs & find they will easily be managed so as to keep the oil accurately at the same height (excepting some accidental difference of friction in their rising & raising the oil) in the following proportion.

The tin-box at bottom will be $6\frac{3}{4}$ inches diameter and about nine inches tall.

The oil will rise eleven inches, so that 3 inches being allowed for the bladder and 6 for its apparatus. The base of the machine will be as above nine inches tall & the shaft nine (2 inches being common to both).

This I think too low as a mould-candle & candlestick stands about 2 ft. high.

I am about to try springs of another form & also other kinds of worm-springs, but wish to have a line from you to know what size of the base, & what height will be most agreeable to your designs, as I shall attempt to come as near that as I can.

In that which I made the oil rises about 16 inches, but then it is ill-calculated (being the first) & in burning six hours the surface of the oil in the shaft sinks 2 inches, which is not sufficiently accurate because the friction of the bladder & spring can not be calculated and therefore whatever inaccuracy the machine will allow of, must be used for counteracting the inequality of friction.

But by what I have done, I see how to

come to perfect accuracy, except friction; but wish to know the height of the base & its diameter; & the height of the shaft. which will best suit your designs.

By the additional expense of complicated springs (perhaps 4 or 5 shillings) I expect to make the base with its bladder & springs to rise but 3 1/2 or 4 inches high: & to be about 4 or 6 inches diameter, & the shaft of what height you require, but I shall be necessitated to make 2 or 3 experiments first on the strength & action of these new-forms of springs.

M^{rs} Darwin joins in all good wishes to you and yours with your affect. friend

Derby & obed. serv^t
May 12. 86 C. Darwin

8 10

From M^r. Erasmus Darwin F. R. S.

to
Jos^h. Wedgwood Esq
July 29. 1789

Dear Sir,

I understand that the Patent lamp is not M^r. Heirs of Swinor Green. He told M^r. Day he knew of no such thing.

- pray inquire about it, and send me either an Account of it, or a lamp, Adieu.

- pray make Derby your road if you can, as nothing gives me so much pleasure, & information I must add, as seeing you. Miss

Susan Freyde is come to our asize ball,
but no Mrs Wedgewood

Truly from your affect. friend

July. 29-84. E. Darwin

From Dr. Erasmus Darwin F. R. S.

11.

to
Josh. Wedgewood Esq^r.
Dear Sir, Sep. 1787

I cannot conveniently come to Mellock tomorrow, but shall be very happy to see yourself & party, or any of you here, but cannot supply with beds at present.

I have made a lamp, which I think worth a patent, it is press'd with weights, as I can not yet succeed with springs, so I do not quite despair of them - this new lamp is I suppose 6 or 7 pounds weight it has not a bladder nor a conical box or bag, but acts quite well - it requires being carried about with care, & to be set down without much jolt, as all other fountain lamps must. It stands up like a handstick, the box at the bottom is 7 inches high, & about 3½ wide, may be made about 5 high & 14 wide conveniently.

I intend to make one more trial with springs, & bladders, neither of which I yet quite despair of. If I do not see you here you shall hear again from me in a week, but Derby is your last road every way, & our new bridges are the eight wonder of the Peak.

The Madona & Bambino are well, comple^t from all

here attend you all, I think of taking the first step towards a patent immediately & will include the springs & bladders also in it, unless in my next trial I shall despair of them.

I burnt my new lamp three hours last night. at the end of which a misfortune happened to it, which will be repaired to day
adieu - your affect. friend
C. Darwin.

If I do not see you I will send you a drawing & description - & you will pray send me either Kerr's lamp, or an account of its performance & principle.

from Dr. Erasmus Darwin F. R. S.

To Josh Wedgewood Esqre

12

Dear Sir,

Derby Sept. 11. 87

I send this lest you should think of making derby in your road - & I am much pleas'd by a letter from Mr. Bent to go immediately to Mr. Newton, his neighbour. How unfortunate it is that we can't meet!

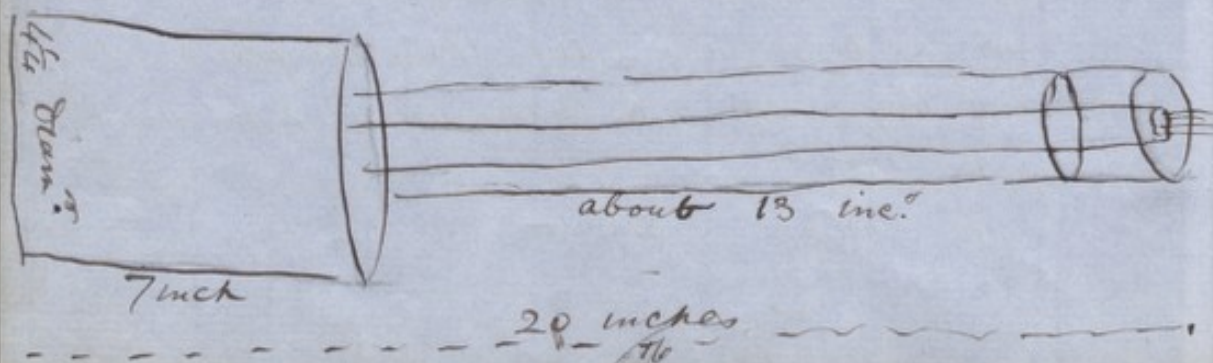
1. My new lamp is easily made fill'd & clean'd - 2. it requires two pounds of mercury. 3. it takes three pounds & $\frac{1}{4}$ of lead. 4. the lamp itself weighs $3\frac{3}{4}$ pounds - 5. the oil I suppose $\frac{1}{2}$ a pound - nine pounds & a half. If springs can be used $3\frac{3}{4}$ pounds will be saved & if bladders 2 pounds more, above half the weight.

You shall hear from me in a week, or as soon as I can make my ultimate trial with springs & bladders.

Pray don't mention the lamp, as I suspect Professor Robinson had heard I was doing something on this subject.

Adieu C. Darwin

Dimensions of the new Lamp



From D. Erasmus Darwin F. R. S.

8
to
Isaiah Hodgwood Esqre. Sep. 17. 86

Dear Sir,

Are you at Matlock? if you are I will come, & see you, but should more wish you would come & pass a few days here! Mr. Darwin is from a weeks visit to Lichfield & joins in our wish of seeing you all if you are all at Matlock, may say, if Mr. & Mrs. Clive be at Matlock & how what day you will come to Derby

Adieu E. Darwin

My other engagements here prevented me from, consuming oil lately, but I think it in a good train.

Sept: 17- 86.

I shall be from here all Monday & half Tuesday.

9
From D. Erasmus Darwin F. R. S.

to
Isaiah Hodgwood Esqre.

Dear Sir,

Dec 12. 1786

I have begun again to attend to the lamp, have got over the difficulties, which checked my progress - am about now to try experiments on the bladders, & expect to succeed - the lamp has perform'd well one hour & I am oblig'd to go from home - the wick is elevated without a wheel, hence it is more simple - the drawing I shall,

subjoin the hope to see you all in your
road to London or in your return

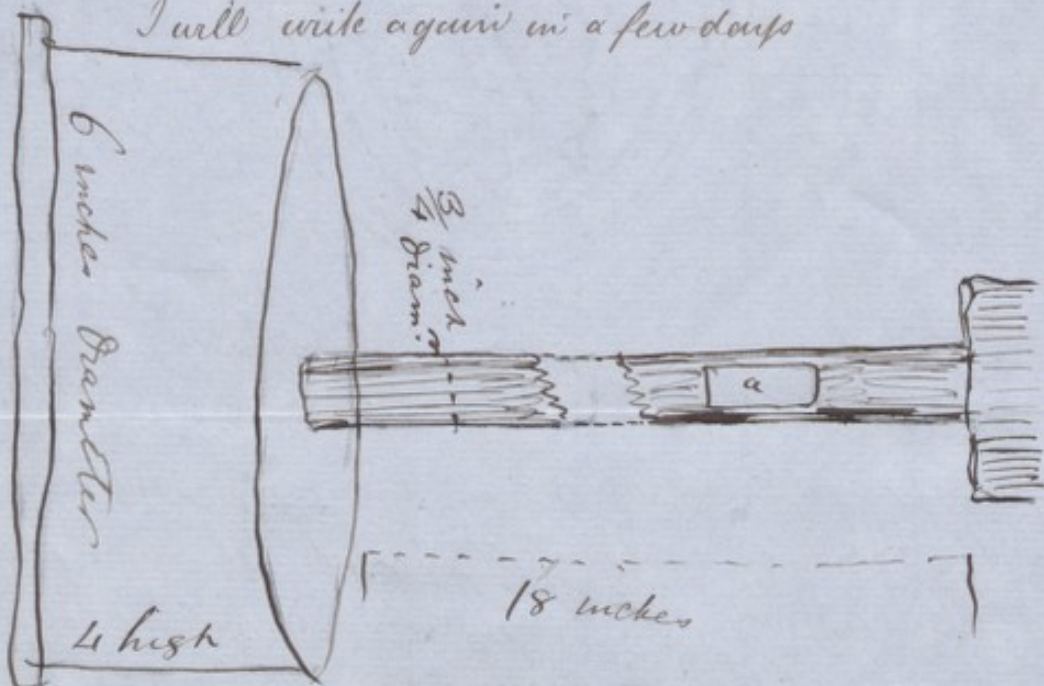
Decr. 12 86

Adieu E. Darwin

having got free from the ratchet wheel there
is nothing to hinder a silver case from being
slid on over the copper pillar, that the oil which
steals over the edges of the lamp may slide
down between them. - the lamp is also easily
fill'd - Send me word what height of the
column, & of the oil box, & what diameter of
the oil box you should like best that I may
try the next in that form.



I will write again in a few days



a the air hole drawn to long & not
so wide as in the original lamp