

Letter from Alexander Graham Bell to Mabel Hubbard Bell, December 26, 1891, with transcript

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One new ewe reported from the mountain — and one old returned. Series of experiments with plaster casts — seems to show that brushing plaster on the ozok. surface — spoils the plaster surface. The plaster should be disturbed as little as possible during process of setting. Stirring the plaster gets rid of air-holes — with cylinders that do not contain a record — and leaves a beautiful shining surface on interior of mould. When plaster is brushed on to ozokerite cylinder (without any record on it) — plaster surface does not shine — and seems to be covered with a friable layer of plaster — indeed seems to be a layer of plaster powder — very fine — which can be wiped off with finger. Similar — floury layer observed when records are on cylinder. Stirring — under such circumstances — does not prevent air-holes.

Trouble I think is — that waxy surface of ozokerite record repels the moist plaster — so that air remains in the grooves of the record causing air holes in the plaster. Oil wets surface of ozok. and expels air — but it repels the wet plaster — and probably would not suit. Thought — try a liquid that wets both plaster and ozok. — as an intermediary. Have found that alcohol is such a liquid. Then mix your plaster — and when all O.K. dip your ozokerite record for a moment in alcohol and then plunge it while wet into the liquid plaster. Cylinder should be closed at bottom. Expect that this will prevent formation of air holes — not tried yet.

Been dreaming of flying machines. Feel sure that no apparatus can be safe which has not the power of lifting itself in 2 the air — or of being lowered without horizontal velocity. Both Langley and Maxim depend upon horizontal velocity for support. Hence difficult to see

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(1st) how they are to start and (2nd) once up — how they are going to come safely down. Their only safety is in continuous horizontal flight.

Tried a steel propeller upon vertical shaft Sept. 4th, 1891. See note book P. 68. It not only raised itself on axis — but also lifted a weight. Considering blocks as portion of disk — diameter of disk a-b only 12 inches. When I tried a similar propeller of wood four feet from (a) to (b) — would not ascend — because of friction on square axis — and found it required an enormous power to rotate it. When I come to imagine a similar arrangement many times larger — realize that power required to turn axis — so enormous as to render plan impracticable.

Think I see way out. Imagine a wheel as large as a room — and you will realize that if you took hold of axis and tried to turn it you could not do it — power required to turn it enormous. But a child could turn it — if he applied his hand to the circumference. It is all a matter of leverage. The larger the diameter of the wheel — the more easy it is to move it — by applying power to the circumference.

Apply this to wing piece (a-b) — Apply your power to the ends (a) and (b) and it should be easily turned.

An experiment has suggested itself to me of such a simple and yet important character — that I have set Mr. Ellis to work to construct apparatus. Make brass-pipe a,d,c,e,b — bent as shown. Axis at c — wire a,b — wings of cotton or silk (f,g). At (c) a vertical pipe leading to a boiler (h) — below which are lighted wicks — fed by kerosene oil or by alcohol. Water or alcohol in boiler (h) when heated — vapour or steam expelled from nozzles (a) (b) should cause rotation of whole apparatus — boiler and all.

Query — will the whole thing go up — carrying boiler and fuel? If so experiment most important.

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Arrangement is a steam-engine — with no other parts than boiler and fuel holder — and we save the weight of pistons — propellers and etc.,

Arrangement is now half completed and will be ready for trial on Monday I hope. Distance from a to b — 30½ inches. Wing-piece and vertical pipe (without boiler and etc.,) weigh 107 grammes.

Noted Dec. 26th, 1891 at Beinn Bhreagh, C. B. A.G.B.

Dear Mabel:

Please don't talk about above idea. Think there is a very great deal in it — but of course many experience would be necessary 4 before anything should be said. Think I can tell by results of this apparatus whether or not it is worth while pursuing matter. With much love to you and Elsie and Daisy.

Your loving husband, Alec. Mrs. A. Graham Bell, %Macquay Hooker and Co., Florence, Italy.