June 1909

My dear Lord Rayleigh —

I am taking the liberty of sending you in a roll some photographic records of sound waves, which ~~I hope will~~ may be of interest ~~to you~~. I have long wished to make a detailed study of the physics of tone quality. ~~I have finally~~ constructed a ~~sound~~ recorder ~~for this purpose with which the records sent were made~~. Only an abstract ~~the~~ description of the instrument has not yet been published, and so I may briefly explain it. A glass diaphragm 1/10 mm thick is held firmly by its edges, so as to receive the air waves. A fibre is cemented to the center of the diaphragm and passes around a small steel staff pivoted in jewelled bearings; the fiber is kept taut by a delicate spring. Motions of the diaphragm thus give rotation to the staff; ~~the effective radius of the staff is 0.3 mm, and~~ A minute mirror is attached to the staff and reflects light from an arc to a moving film. At a distance of 16¼ inches the spot of light moves 2000 times as far as does the diaphragm, showing the staff to have an effective radius of about 0.3 mm. The staff and mirror weigh 2.8 mg, and this mass is so ~~inertia is a minimum~~ distributed as to reduce the inertia as much as possible. The film is moved by clockwork at rates varying from 5 to 50 ft per sec as required. There is no appreciable lost motion, and no lag or distortion so far as I have been able to discover. There is nothing novel in the apparatus unless it be its simplicity and delicacy, which make for ~~great~~ efficiency.

The following plates are sent in the roll:

(a) Two small prints. These were made early in the work, merely to test the instrument and not for exhibition. One shows that the record of simple sound (Koenig fork 256) is a close