CORRESPONDENCE

re Rocket Propulsion

P.O. Box 159, Shanghai.

August 17th, 1930.

Dear Sir,—A great deal has been published recently as to the hopes of achieving propulsion by rockets both in the air and even beyond it. As one who has been associated in a small way with the developments of aviation since 1907 I am much interested in this alleged prospect of a great advance, but venture to sound a note of caution.

It is comparatively easy to show that *rocket propulsion can only be efficient at velocities comparable with those of ejection of the gases.* The latter in order adequately to utilise the energy of the combustible must be of the order of 2,000 metres/second.

The kinetic energy given up by the liberated explosive is $(v^2 + c^2)/2$ per unit mass, where v is the absolute velocity of the rocket and c is the velocity of ejection. The power exerted is vc per unit mass so that the limit of efficiency is

$$2vc/(v^2 + c^2).$$

This is unity if $v = c$, but is only 0.04 if $v = 0.02 c$ (40 metres per second or 144 kilometres per hour) and only 0.385 if $v = 5.0 c$ (10 kilometres per second).

Hence at both normal aeroplane speeds and also at " interplanetary " speeds the action of a rocket will be inefficient owing to the kinetic energy remaining in the ejected gases.

Yours faithfully,

HERBERT CHATLEY.