TABLE II.—*Power Consumption of Circular Cylinder.*

Airspeed = 0.		Airspeed = 15 m/s.	
R.P.M.	Watts.	R.P.M.	Watts.
290	6·0	1,020	14·5
580	10·0	1,115	15·5
885	11·5	1,240	17·3
1,190	19·0	—	—
1,400	24·0	1,500	23·8
1,775	27·0	1,700	26·0
2,260	40·1	1,900	28·4
2,810	51·8	2,080	31·8
3,140	68·0	2,220	28·6
3,475	89·2	2,300	30·2
—	—	2,420	31·9
—	—	2,500	33·6
—	—	2,600	34·8
—	—	2,700	37·2
—	—	3,000	44·8

The first test on the compound strut, in which the gap between cylinder and fairing was $\frac{1}{8}$ in., showed this combination to be inferior to the circular cylinder when considered as an airfoil. A large scale effect was also found, coefficients for a fixed ratio of peripheral speed to air speed varying with the air speed. Tests with a $\frac{3}{8}$-in. gap were made next, but such a large increase of drag was found that no further combinations were tried.

After the completion of the force measurements, apparatus was installed to allow the introduction of smoke filaments into the air stream just in front of the cylinder, and a series of photographs were taken at various combinations of rotative and air speeds.

Reduction of Data—Presentation of Results

The air forces acting on the cylinder were assumed to be symmetrical about a horizontal plane through the tunnel axis, *i.e.*, the resultant air force was assumed to act in this plane. The dimensions of the set-up were such that a factor 1·965 had to be applied to the measured forces to give true forces acting on the cylinder. Coefficients were derived on a basis of projected area of the cylinder as follows :—

$$C_D = \frac{D}{qS}$$

$$C_{CW} = \frac{CWF}{qS}$$

$$r = \frac{V^1}{V},$$

wherein q is the dynamic pressure, S the projected area of the cylinder, D the drag force, CWF the cross wind, or " lift " force, V^1 the peripheral speed and V the air speed.

The data from tests on the circular cylinder are given in Tables I and II. Fig. 4 is a vector diagram which shows the variations of resultant as well as component forces throughout the range explored, Fig. 5 indicates the variation of cross-wind force with the ratio of peripheral to translational speed, and Fig. 6 shows the power necessary for rotation at zero and 15 m./s. (49·2 ft./sec.) air speed. Corresponding data on the cross cylinder are given in Tables III and IV [not published—ED.]; Figs. 7, 8 and 9 are the vector diagram, plot of cross-wind force against speed ratio, and power consumption against revolutions per minute respectively. The data taken on the compound strut with $\frac{1}{8}$ in. gap are given in Tables V and VI [not published]; Figs. 10, 11 and 12 are plotted therefrom. Results from the second strut combination are given in Table VII [not published] and plotted in Figs. 13 and 14.

Discussion

As no mathematical or physical analysis of the results has been attempted, as yet, this discussion will, necessarily,

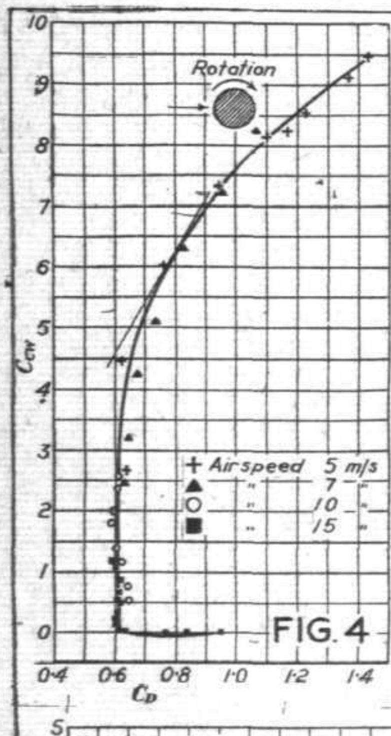

FIG. 4

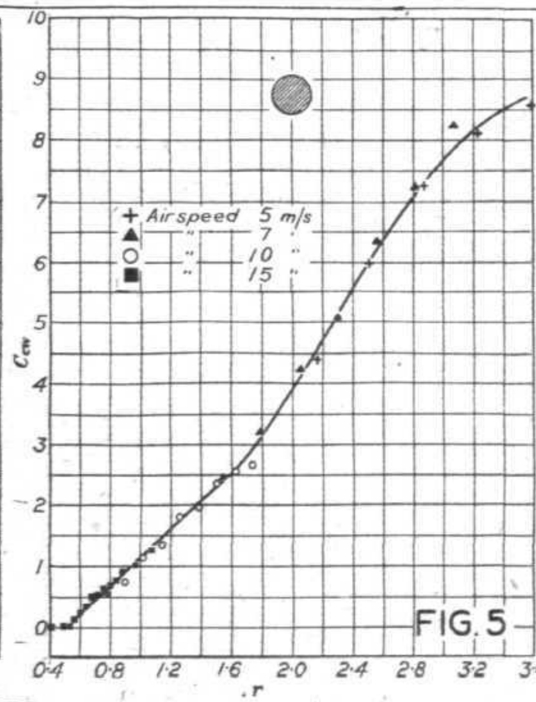

FIG. 5

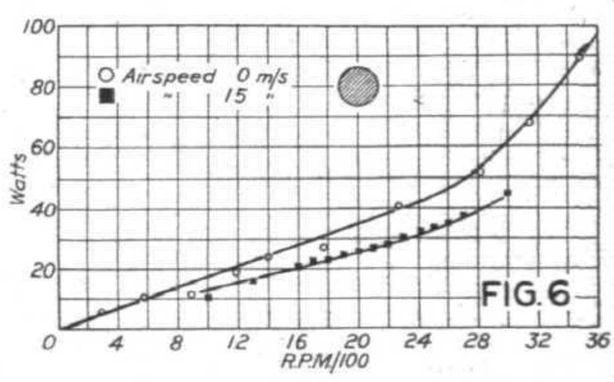

FIG. 6

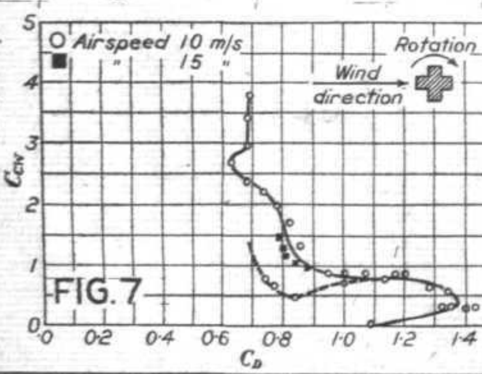

FIG. 7

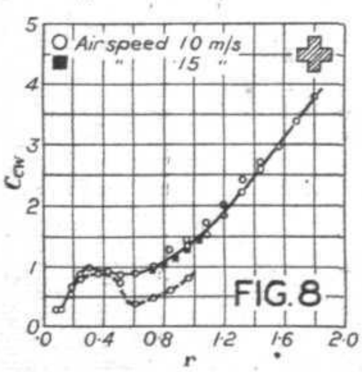

FIG. 8

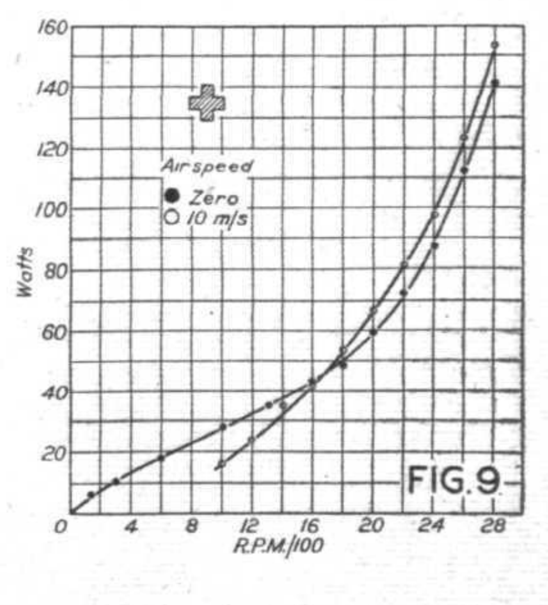

FIG. 9

TESTS OF ROTATING CYLINDERS : Fig. 4 is the vector diagram in which the lift and drag coefficients have double the value of the corresponding British " absolute " units. The maximum L/D occurs where the tangent touches the curve and reaches the value of 7·8. Fig. 5 shows lift coefficient on basis of *r*, which is ratio of rotational to translational speed. In Fig. 6 the curves show the power required to rotate the cylinder in still air and in a wind speed of 15 metres per second. It will be noted that less power is required to rotate the cylinder in moving than in still air. Figs. 7, 8 and 9 give corresponding curves for the cross-cylinder. It will be noted that these are somewhat erratic.