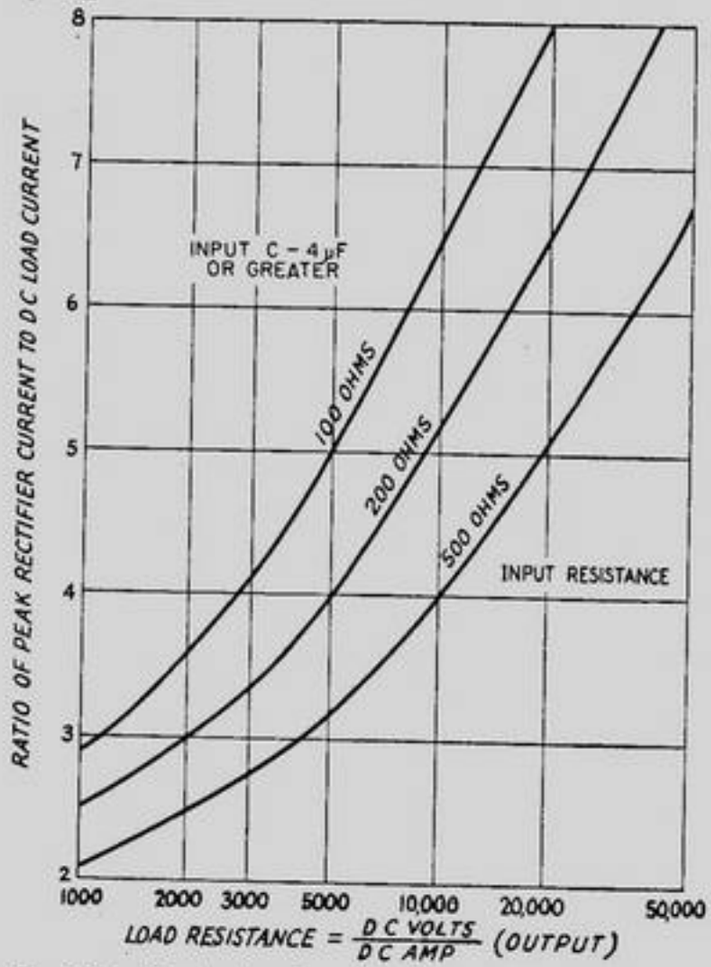

Fig. 12-7—Graph showing the relationship between the d.c. load current and the rectifier peak plate current with capacitive input for various values of load and input resistance.

one-half secondary and R_{sec} is the resistance of half of the secondary winding.

CAPACITIVE-INPUT FILTERS

Capacitive-input filter systems are shown in Fig. 12-5. Disregarding voltage drops in the chokes, all have the same characteristics except in respect to ripple. Better ripple reduction will be obtained when LC sections are added, as shown in Figs. 12-5B and C.

Output Voltage

To determine the approximate d.c. voltage output when a capacitive-input filter is used, reference should be made to the graph of Fig. 12-6.

Example:

Transformer r.m.s. voltage—350
Peak a.c. voltage = $1.4 \times 350 = 495$
Load resistance—2000 ohms
Series resistance—200 ohms
$200 \div 2000 = 0.1$
Input capacitor $C = 20$ μf.
R (thousands) $\times C = 2 \times 20 = 40$
From curve 0.1 and $RC = 40$, d.c. voltage $= 495 \times 0.75 = 370$

Regulation

If a bleeder resistance of 20,000 ohms is used in the example above, when the load is removed and R becomes 20,000, the d.c. voltage will rise to 470. For best regulation with a capacitor-input filter, the bleeder resistor should be as low as possible, or the series resistance should be low and the filter capacitance high, without exceeding the transformer or rectifier ratings.

Maximum Rectifier Current

The maximum current that can be drawn from a supply with a capacitive-input filter without exceeding the peak-current rating of the rectifier may be estimated from the graph of Fig. 12-7. Using values from the preceding example, the ratio of peak rectifier current to d.c. load current for 2000 ohms, as shown in Fig. 12-7 is 3. Therefore, the maximum load current that can be drawn without exceeding the rectifier rating is ⅓ the peak rating of the rectifier. For a load current of 185 ma., as above, the rectifier peak current rating should be at least $3 \times 185 = 555$ ma.

With bleeder current only, Fig. 12-7 shows that the ratio will increase to 7½. But since the bleeder draws 23.5 ma. d.c., the rectifier peak current will be only 176 ma.

Ripple Filtering

The approximate ripple percentage after the simple capacitive filter of Fig. 12-5A may be determined from Fig. 12-8. With a load resistance of 2000 ohms, for instance, the ripple will be approximately 10% with an 8-μf. capacitor or 20% with a 4-μf. capacitor. For other capacitances, the ripple will be in inverse proportion to the capacitance, e.g., 5% with 16 μf., 40% with 2 μf., and so forth.

The ripple can be reduced further by the addition of LC sections as shown in Figs. 12-5B and C. Fig. 12-9 shows the factor by which the ripple from any preceding section is reduced depending on the product of the capacitance and inductance added. For instance, if a section composed of a choke of 5 h. and a capacitor of 4 μf. were to be added to the simple capacitor of Fig. 12-5A, the product is $4 \times 5 = 20$. Fig. 12-9 shows that the original ripple (10% as above with 8 μf. for example) will be reduced by a factor of about 0.09. Therefore the ripple percentage after the new section will be approximately $0.09 \times 10 = 0.9\%$. If another section is added to the filter, its reduc-

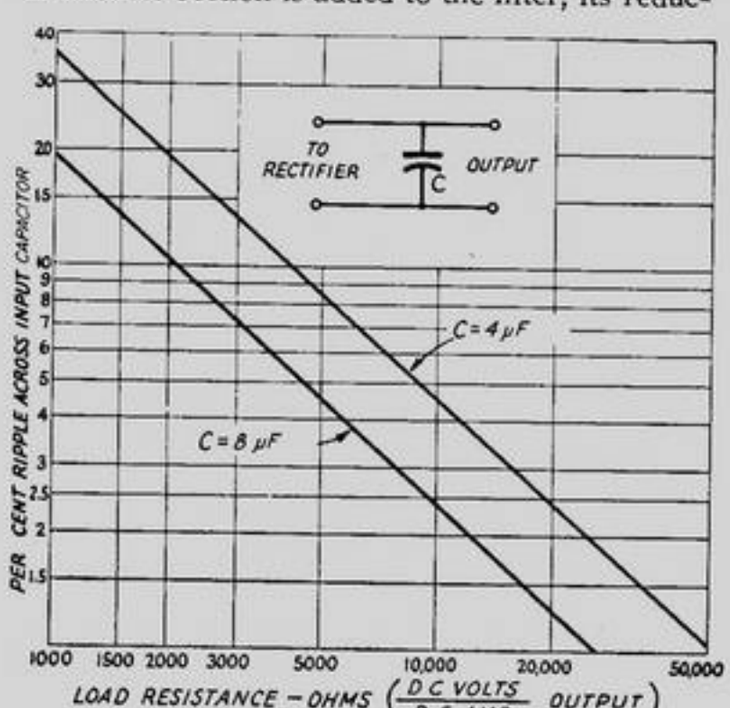

Fig. 12-8—Showing approximate 120-cycle percentage ripple across filter input capacitor for various loads.