Selecting a fan beyond this point results in higher capacity, high outlet velocity, lower efficiency and a tendency to create noise.

Characteristics

The *paddle wheel type fan* practically is obsolete for ventilation. Its use largely is confined to such applications as conveyors for material, or for gases containing foreign material, fumes and vapors. The open construction and the few large flat blades of these wheels render them resistant to corrosion and prevent material from collecting on the blades. Fig. 2 shows that over the entire useful range the static pressure and total pressure decreases as the capacity increases. The power curve is prac-

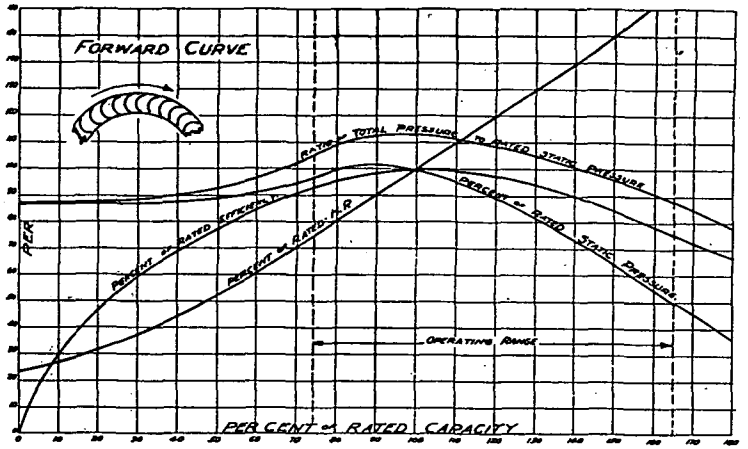


FIG. 3. CHARACTERISTICS OF FORWARD CURVE MULTIBLADE FANS

tically a straight diagonal line increasing from no-delivery to full open delivery. A larger size fan is required for a given capacity in comparison with multiblade fans.

The *forward curved multiblade fan* is the type most commonly used in heating and ventilating work, as it has a low peripheral speed, a large capacity and is quiet in operation. The point of maximum efficiency for this fan occurs near the point of maximum static pressure. The static pressure drops consistently from the point of maximum efficiency to full open operation. Fig. 3 shows that this type of fan will have a high and low delivery for a given static pressure at constant speed. The power curve rises continually from low to peak capacity, but if reasonable care is exercised in figuring resistance there is no danger of overloading the motor.

The *partial backward curve multiblade type of fan* lends itself particularly to direct drive through a considerable range of sizes, as this fan must be driven approximately 75 per cent faster than the forward curve multiblade fan for the same results. Fig. 4 shows a continually dropping contour as the quantity of air delivered increases. The power curve gradually increases showing a tendency to flatten at maximum delivery,

reducing the probability of motor overloads if the actual resistance is less than calculated. As with the paddle wheel fan the air delivery at a given speed is more constant with varying resistance than with the forward curved multiblade type. Multiblade fans with radial blades have performance characteristics resembling the partial backward curve multiblade fan, the outstanding difference being in the speed, as the radial type operates at approximately 80 per cent of the speed of the partial backward curve type for equal results.

FULL BACKWARD CURVE MULTIBLADE FANS

The outstanding characteristics of the *full backward curve multiblade type fan* are the steep pressure curves, the non-overloading power curve,

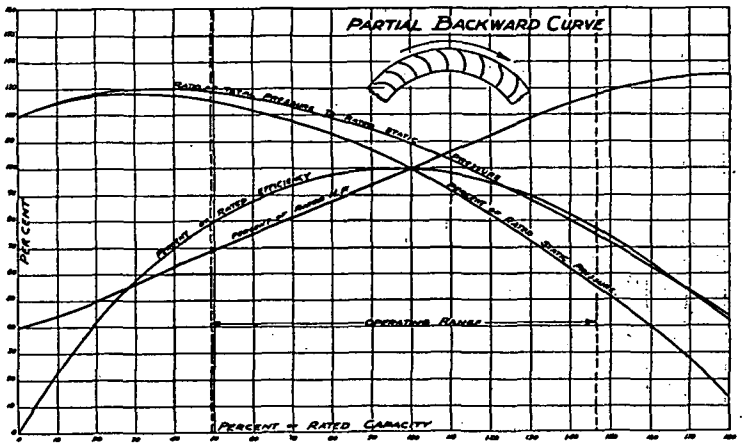


FIG. 4. CHARACTERISTICS OF PARTIAL BACKWARD CURVE MULTIBLADE FANS

and the high speed. This fan operates at a peripheral speed of approximately 250 per cent of the forward curve multiblade type for like results. The pressure curves begin to drop at very low capacity and continue to fall rapidly to full outlet opening. This makes the fan adaptable to parallel operation for such application as stoker installations. The steep pressure curves tend to produce constant capacity under changing pressures. Where wide fluctuations occur, the use of this type of fan is desirable to prevent overloading of motors. The maximum power requirement occurs at about the maximum efficiency. Consequently a motor selected to carry the load at this point will be of sufficient capacity to drive the fan over its full range of capacities at a given speed. The high speed of this type makes it adaptable for direct connected electric motor drives. The high speed necessitates heavier construction, and more operating attention and service is required than for the other type multiblade fans. The dimensional bulk for a given duty is 150 to 200 per cent that of a forward curve multiblade type fan.