$V = \frac{1}{2}v$, *i. e., the wheel works to the best advantage when the velocity of its periphery is one-half that of the stream.*

SCH.—If the velocity of the periphery of this wheel is too great, water is thrown out of the buckets before reaching the bottom of the fall. In practice, the circumferential velocity of water wheels of this kind is from $4\frac{1}{2}$ to 10 feet per second, about 6 feet being the usual velocity of good iron wheels not of very small size. The velocity of the water therefore is limited to about 12 feet per second, and the part of the fall operating by impulse is therefore about $2\frac{1}{4}$ feet. The rest of the fall operates by gravitation, but a certain fraction is wasted by spilling from the buckets, and emptying them before reaching the bottom of the fall. The great diameter of wheel required for very high falls is inconvenient, but there are examples of wheels 60 feet in diameter and more.

The efficiency of these wheels under favorable circumstances is 0.75, and is generally about 0.65.

155. Work of Breast Wheels.—When the variation of the head-water level exceeds 2 feet, a breast wheel is better than an overshot. In breast wheels the buckets are replaced by vanes which move in a channel of masonry partially surrounding the wheel. The water falls over the top of a sliding sluice in the upper part of the channel. The channel is thus filled with water, the weight of which rests on the vanes and furnishes the motive force on the wheel. There is a certain amount of leakage between the vanes and the sides of the channel, but this loss is not so great as that by spilling from the buckets of the overshot wheel.

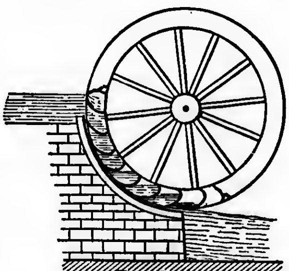

Fig. 83