the wheel. The water will therefore drop off the floats deprived of nearly all its kinetic energy. Nearly the whole of the work of the stream must therefore have been expended in driving the float; and the water will have been received without shock, and discharged without velocity.

Let $v$ and $V$ be the velocities of the stream and float respectively; then the initial velocity of the stream relative to the float is $v - V$, and the water will continue to run up the curved float until it comes to relative rest; it will then descend along the float, acquiring in its descent, under the influence of gravity, the same relative velocity which it had at the beginning of its ascent, but in a contrary direction. Therefore the absolute velocity of the water leaving the float is $V - (v - V) = 2V - v$.

Now the useful work $U$ done on the wheel must equal the work stored in the water at first, diminished by the work stored in the water on leaving the wheel; hence

$$U = \frac{W}{2g}v^2 - \frac{W}{2g}(2V - v)^2$$

$$= \frac{2W}{g}(v - V)V. \qquad (1)$$

Comparing this expression with (1) of Art. 156, we see that the work performed by the Poncelet wheel is double that of the common undershot wheel.

SCH.—This wheel works to the best advantage when the speed of the periphery is one-half that of the stream (Art. 154, Cor.). This conclusion also follows from the form of the floats, as above described; since if all the work is taken out of the water when it leaves the floats, its velocity must then be zero, and therefore $2V - v = 0$, or $V = \frac{1}{2}v$.*

The efficiency of a Poncelet wheel has been found in ex-

* The inventor, Poncelet, states that, in practice, the velocity of the water, in order to produce its maximum effect, ought to be about $2\frac{1}{4}$ times that of the wheel, and that the efficiency of the wheel is about 0.7 (Tate's Mech. Phil., p. 313).