deflector is lifted out of the jet until, finally, the deflector and spear come to rest with the deflector just clearing the jet.

If the load be thrown on, the deflector is raised, the bell crank lever 20 is withdrawn from the valve and the pressure on the front of the plunger 14 forces the spear backwards, increasing the area of the nozzle.

A slow movement of the spear, combined with a rapid movement of the deflector, is ensured by connecting rod 35 to lever 33 through a spring 34. The rapid movement of the deflector compresses the spring which keeps valve 16 against its seat. As the spear rod moves to the right it is followed by valve 16, but the rate of travel of this valve is regulated by the resistance of the dashpot 24. A non-return valve in the piston of this dash-pot allows the oil to pass readily from its upper to its lower side, and then permits the lever 20, and with it the valve, to be withdrawn rapidly when the load is suddenly increased. This is followed by a comparatively rapid opening of the nozzle.

The direct connection of the governor to the deflector gives extremely rapid and close speed regulation on a sudden reduction of load.

Art. 150.—Theory of the Impulse Turbine.

Let u represent the peripheral velocity of the wheel.
v represent the absolute velocity of the water.
w represent the tangential component of velocity of the water.
f represent the radial component of velocity of the water.
v_r represent the relative velocity of water and vane.
suffix 2 represent the conditions at entrance to the wheel.
suffix 3 represent the conditions at discharge from wheel.

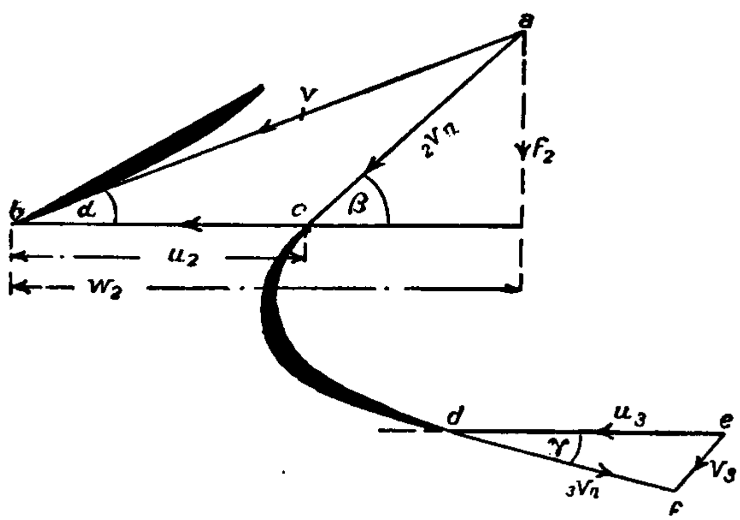

Fig. 210.—Velocity Diagram for Axial Flow Impulse Turbine.

Then for entry to take place without shock the velocities at entrance are represented by the triangle of velocities, $a\ b\ c$, (Fig. 210), and the state of affairs at exit is indicated by triangle $d\ e\ f$. From these it appears that :—