

connections must be so chosen that the elongation e is proportional to the force F acting at any instant.

As has already been pointed out, all spring governors may be made very powerful because the spring may be made to offer great resistance without being unduly large or heavy, and hence the angular velocity of these governors may be great. High angular velocity ω means large power because the height of the C curve on which the power depends is $C = \frac{\omega^2}{g} r a^2$ which evidently increases as the square of ω , so that doubling the speed makes the power roughly four times as great.

Certain firms are now undertaking the manufacture of complete governors for specified duty, and the student is recommended to get catalogues from these makers and study the forms adopted by them. The advantage of any form may readily be determined by the methods given.

THE SHAFT GOVERNOR

In modern practice it has been found desirable in many cases to connect the governor directly to the main shaft of the machine, such as the crank shaft of an engine or else to the main lay shaft, as the cam shaft in a gas engine. In general in such a case the revolving weights are pivoted to a wheel keyed on the shaft, the weights thus always revolving in one plane instead of in planes of varying position as in the governors already described. Such governors are commonly called shaft governors and possess numerous points of excellence, so that it will be an advantage to study them with some care.

The shaft governor is used most commonly on steam engines and also finds considerable favor with builders of large gas engines. In the case of the steam engine the revolving weights are usually connected directly to the eccentric which operates the slide valve, the eccentric eye not being fixed to the shaft, but its position controlled by the governor. In most cases the governor alters the eccentricity as well as the angular advance of the eccentric, thus changing all the events of the stroke for a given change in load.

A little thought will show that such governors should be made very powerful because the weights must be able of themselves to hold the eccentric in position against the force necessary to move the slide valve and although the latter always is of special construction in this type of engine yet this force is not inconsiderable; to make such a governor powerful the centrifugal force must be large or the revolving weights must be heavy and we must have high rotative speeds or especially adapted high-speed engines. It is not the purpose here to enter into a discussion of the steam distribution as affected by such governors.

Consider the conditions existing on a disk A , Fig. 38, which is revolving about a fixed centre O at n revs. per min., and we shall neglect the effect of gravity because in most governors it is balanced, although in this case no arrangement is shown for this purpose.