need not be drawn except on cutters with very fine delicate teeth or on extremely large cutters, to take the hardening strain out. When you draw the temper, then draw to a straw color.

Wm. Abbott, 13 St. John street, Montreal, has been appointed Canadian agent for the makers of this steel.

WOODWARD FRICTION WATER WHEEL GOVERNOR.

The power to operate this governor is supplied from the main shaft of the water wheel installation and is delivered to the shaft of the governor by the large pulley seen in the rear of the cut. On this shaft is mounted a compressed paper friction which is almost indestructible and the wear is inappreciable. Supported by sleeves on this main shaft are two pans, which, when pressed against the friction, move the gates of the turbines in either direction by means of suitable gear connection to an intermediate shaft seen in the front of the cut, this intermediate shaft being connected in turn to the turbine gate shaft. The speeder balls of the governor are separately driven from the main shaft of the installation. There is also a cam continuously revolved by means of the belt shown in the cut and a spiral gear, which can be plainly seen in the foreground. This cam will be noticed just below the spiral

upon an oblique shaft. This disk, can be clear., seen in the cut. This oblique shaft is geared to the intermediate shaft so that it revolves only when there is a movement of the gates. It is further provided with a square thread as is also the compensating wheel. The object of this device is to avoid racing of the governor, and the principle is as follows: When the speed is normal the compensating wheel seeks the center of the disk which is supported upon it because this disk is constantly revolving with the cam. When a movement of the gates occurs the compensating shaft is revolved and the wheel will travel along its shaft in such a direction that it will separate the cam from the tappet when the gate has been moved to that point which will give the correct speed, after the momentum of the machinery has been overcome. During this interval the disk will return the compensating wheel to the central position. This device can be designed to properly compensate for any condition as the time element can be varied, not only by varying the pitch of the screw, but also by varying the speed of the oblique shaft with a change of gears. This compensating mechanism is the same as has proved so satisfactory in the vertical model and absolutely prevents racing. This governor is the largest and most powerful one manufactured. The friction wheel, twenty-four inches in diameter and twelve inches wide, is made with sufficient surface to transmit, if



gear. As the speed changes the rod of the speeder raises and lowers, carrying with it the tappets arms and tappets. These tappets can be seen one above and one below the cam mentioned above. As soon as a change of speed occurs, either one or the other of the tappets, as the condition demands, is engaged by the cam and forced out from its center. This motion is then conveyed through suitable crank shafts to the main shaft on which is mounted the friction, and as this shaft is forced back and forth the friction is brought to bear on either the opening or closing pan. When the speed is normal this cam revolves between the upper and lower tappets without engaging either. The cam mechanism is capable of very close adjustment, enabling the governor to act on so small a change of speed that for the ordinary conditions of ighting service, no perceptible variation of speed will be allowed. At the same time the governor will not act upon the gate when the speed and load are steady, and consequently there is much less wear on the gate mechanism than with a sovernor that keeps the gate in continuous motion, although so slight as not to affect the speed. Just below the cam and fastened to the same shaft is a concave disk. Below this disk will be seen the compensating wheel which travels loosely necessary, 5,000 foot pounds per second to the turbine gates. All the gears of this governor are cut from the solid and are wide face and coarse pitch. The shafts are of ample size and are well supported in large bearings. The friction shaft, which is the only shaft that runs continuously, has ring oil bearings and from them there is a continuous supply of oil carried to the hubs of the pans which are loose on the shafts. These pans are so constructed that it is impossible for oil which may work out of the bearing to get onto the friction surface. All the parts are made to be interchangeable. Special tools have been made to accomplish this, and should any part give out from wear or accident, a perfectly fitting part can be provided without delay. For operating generators in parallel, there is an equalizing device that will give perfect distribution of load when the proper adjustments have been made. This model has been in successful operation for over a year and as it follows the same principle of design as the vertical type, it can be said that it was never in an experimental stage. The Ottawa & Hull Power & Mfg. Co., of Hull, Que., have had one of these governors in use for some time on their temporary plant, and are now installing two of them on their large station, which when complete will have an output of 10,000 h.p.