ward, shows as much as 56 inches annual average. To the north, the eastern and middle States average from 37 to 40 inches; Michigan and Wisconsin, 32: and Iowa and Kansas, 31. In Kansas, however, the rainfall rapidly falls off going west, coming down to 20 inches or less, and further west, again, we come to the borders of the great desert, where there never is enough to make crops of grain. In Ontario the average rainfall is about 45 inches. In the east, as a general rule, the summer is scarcely ever too dry. in the far west it is scarcely ever too wet. A wet season, drowning out crops in the east, brings to Kansas and Nebraska just enough rain to make heavy crops. *Per contra*, when the season is just dry enough to make good crops in the east, it is apt to be too dry altogether for the west; and in such a year we hear of short crops, comparatively, in the great grain-growing region. This was certainly the case last year, and the "smart" operators who engineered the recent wheat and corn corners in Chicago appear to have had early and reliable information of the fact. Ere the month of June had passed they were pretty well posted as to the actual condition of the western grain crops, and on this information, as a sure basis, they entered upon the campaign for higher prices. With some of them the game of speculation was not wholly so wild as it appeared to be, because they had beforehand secured reliable information as to the crops As has been mentioned by some of our own correspondents recently in these columns, American capitalists are this year making greater efforts than ever before to obtain sure and early information with regard to the coming harvest—east, west, north and south.

A point of some consequence is that, when the season is one favoring the west at the expense of the east, the aggregate grain crop is immensely larger than when, with conditions reversed, the season is good for the east and bad for the west. And the reason why is evident enough. The boundless west being the region whence grain comes to market by millions of bushels, a poor grain season there and a good one, respectively, mean greater scarcity in one case and greater abundance in the other, than the same circumstances in the east would mean. A poor wheat season in Maine and Quebec has but little effect on supply and prices, but a poor wheat season in Iowa and Minnesota would mean a great deal. Beyond all question, the dry season of 1881 in the west, affecting as it did the great grain exporting States, has been a principal cause of the recent scarcity of beef cattle and the high prices of grain and meat.

What, then, is the present prospect? We shall not attempt to trespass upon Mr. Vennor's domain, and to prophesy what the season is to be. But we are able to point out clearly enough certain contingencies, with the results that must surely follow should either be realized. If the present summer is to turn out cool and wet on the whole, there will be a heavy yield of grass but poor crops of grain to the eastward, approaching the Atlantic seaboard, But this will be exactly the right season for the west, and the grain crops there will be beyond the common. Ontario, being in middle longitude, will very probably have a rather wet season, but still not so wet as farther east Illinois and Iowa will be in their glory, and Manitoba and the Canadian North-west will have one of the best seasons ever known there. In the North-west a season too dry is sometimes to be feared, but too wet a season hardly ever comes at all. Of course, should the season turn out dry instead of wet all these probabilities would be reversed. But present indications are very visibly in favor of large grain crops in the west, and a consequent enormous aggregate supply, covering many times over all possible deficiencies in the east.

REGULARITY OF MOTION FOR MILL SHAFTING.

SECOND ARTICLE.

True regularity in the motion of shafting consists not merely in its making a certain number of revolutions in a given interval of time, but in its velocity maintaining a certain definite relation to time, whether the interval be great or small.

A shaft may make one hundred revolutions per minute, and give the same number though repeatedly counted, and yet, if the time be reduced to quarter minutes, it will be found to vary considerably, in one quarter minute making twenty-six revolutions, and in the next twenty-four, and so on. Again, while the number of revolutions may be comparatively regular, the actual velocity of the periphery, or rim of a pulley on the shaft, will be found to vary very much during one revolution. It is this irregularity during each revolution, causing a jerkiness in the motion, which is so much complained of and leads to so much trouble, rather than a slight variation in the total number of revolutions made in an hour or a day. A little consideration will show that shafting driven by water power ought to be almost entirely free from this inequality of motion.

The source of the power and of the motion is the action of gravity, which is a constant quantity; there is no cut off and no expansion, but during each entire revolution of the water-wheel the same force is being constantly applied in the same direction, and hence, so long as the resistance remains the same, the motion produced will be exactly uniform in velocity No such perfectly constant and uniform action can be produced in a steam engine acting upon a single crank. By carefully comparing the action of a water-wheel during *one* revolution and a steam engine during *one* revolution, the superiority of water power for regularity will become apparent, and also the advantage of combining two or more steam engines on the one shaft, with the cranks set so as to divide the circle.

In the case of a water-wheel, the number of revolutions per minute may vary, either from the load in the mill changing more quickly than the governor is able to change the flow of water, or the total head may fall or rise, and so change the actual number of revolutions, yet be the velocity fast or slow, it ought to be uniform. If it is not, the cause should be looked for and remedied. Shafting out of line, pulleys improperly keyed or unbalanced, or wheels imperfectly geared, will probably be found to be the disturbing elements.

If the centre of gravity of the shafting and its load of pulleys be not revolving in a true circle, uniform motion cannot be obtained, and a small amount of inequality in balancing the weights may be so magnified by the velocity as to be a very serious matter for the motive power of the mill.

Power will be absorbed, but instead of being applied to a useful purpose, will become the means of injuring and perhaps destroying the shafting. Too much attention can hardly be given to keeping all the shafting and pulleys in perfect running