are furnished for adjusting the brushes in position, these hand wheels being so located that the brushes may be adjusted from either side of the generator.

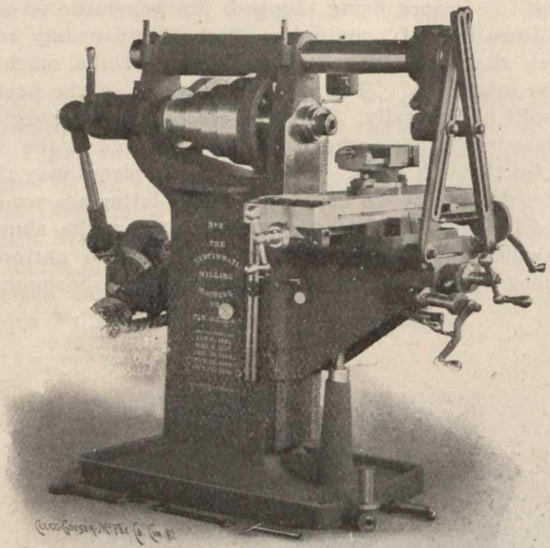
MACHINE SHOP NOTES FROM THE STATES.

BY CHAS. S. GINGRICH, M.E.

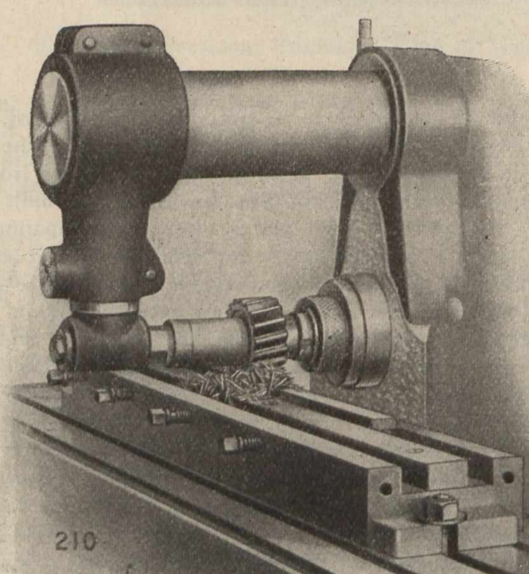
XII.

High Speed Milling.

We are used to listening to tales of what is being accomplished with the new high-speed steels, that we are no longer surprised at results that several years ago would have seemed utterly impossible. Indeed, many of us who are not actually engaged in producing these results, accept the reports without fully realizing what it all actually means in the machine shop. Take a case in point:



In your January issue one of your advertisers gave an illustration of some rapid milling work, together with data on same. The writer had an opportunity to see this work being done several days ago, and when he saw the chips being plowed away ahead of the cutter, realized for the first time what a tremendous advance has been made in this direction. The illustration is reproduced herewith, and shows a No. 3 Plain Cincinnati Geared-Feed Miller fitted with a high speed steel cutter, taking a roughing cut across grey iron bars, which run from ¾-in. to 3½-in. in width. The regular rate for doing the work is from 27 to 30-in. per minute table feed. A picture of the machine itself is also reproduced herewith. This machine is kept busy day after day at this terrific speed, and has been doing it for over a year without any apparent injury to the machine or any signs of distress. When the writer saw it at work, it was milling bars 3-in. wide and 26-in. long, and feeding 30-in. per minute. The cutter had been doing continuous work for three days without being sharpened. This cutter is run at about 80 ft. surface speed, and then is loaded up with all the feed that the machine can carry.



One of the remarkable things about it all is the fact that this fast feed does not cause the cutter to heat nearly so much as when taking the extremely slow feeds that were in vogue a few years ago, in fact, a cutter never gets so hot that it cannot be comfortably handled.

Now, that such results as these have become every-day practice, it is little wonder that the miller is replacing small planers and shapers in up-to-date machine shops.

ESSENTIAL ELEMENTS IN THE DESIGN OF DAMS.

JOHN S. FIELDING, C.E., TORONTO.

(Continued from last issue.)

Unequal Loads Affecting Top of Dam.

Earlier writers upon this subject held that a dam was a beam supported against the banks at its ends and uniformly loaded. Recent authorities deny this, and assert that each vertical foot of the dam is a unit which must take care of itself, and is independent of any other part. This latter contention is also incorrect, for, as dams are usually constructed, each vertical foot of wall is intimately joined to the abutting sections, and is affected by the action of its neighbors. If we assume that one vertical foot of a dam is under pressure, and all the other sections are unloaded, this particular piece of loaded wall would have a tendency to move forward a certain amount at the top, diminishing to zero at the bottom, providing it were free to move at all. The amount of this movement would depend upon the compressibility of the bottom, the height of the structure, and the nature of the workmanship. This will be uniform for each vertical foot of the dam only when all of these conditions are exactly similar, and if the maximum movement at the top of the dam were plotted as a straight line, the section of the dam at each unit of length would have to be varied to meet the controlling factors mentioned above. As this latter condition would be an impossibility, the line of movement at the top of the dam would really be represented by an irregular line, or a curve. A uniform movement, such as would be represented by a straight line, could not take place without one part having an undue tendency to move forward, being assisted by parts not so affected, and this would give a case of unequal loading.

It is well known in structural design, that unequal loading can be taken care of only by the employment of some form of member adapted to the taking up of diagonal stresses, acting in conjunction with components which are at right angles to the line of pressure—in other words, in the dam there would be a push and a pull in the upper and lower fibres of the wall, and also a diagonal stress, all in a horizontal plane, and for as many horizontal planes as it is convenient to take in the vertical height of the wall. The top of the wall would be most in need of this triangular construction, and the bottom would require the least. The logical conclusion from this theory would be, that the wall would have to be wider at the top; but the requirements against overturning also demand that it be wide at the bottom, and it would seem that there is need for considerable width at all parts of the dam.

It is true that if the bottom be rock, the compressibility of the bottom may be very small. If the material used in the dam were granite, the compressibility of this material would also be small, and in a greater or less degree, the effect of varying workmanship may be slight; but the height of the wall is at all times a distinct and powerful factor in determining the resistance to destructive effort. In the case of a foundation inferior to rock, there