One of the most important things to take into consideration is the commercial conditions surrounding the timber selected. A wood block pavement, or in fact any pavement, must be constructed as cheaply as possible commensurate with the quality required. This means that careful consideration must be given to the commercial conditions surrounding the timber.

There is perhaps no better illustration of the danger involved in this connection than was evidenced in the city of Chicago in 1912. Every ordinance called for Southern yellow pine or woods equally good for paving purposes. As all know, the yellow pine market early in 1912 joined the aviation craze, and Lincoln Beachy lost every laurel he ever won. The sky was the limit, and, as a result, wood block pavements broke all records for high prices to the consumer and small profits to the manufacturer. Our company was more fortunate because of the supply of tamarack timber, which was not affected by the airship mania, and we sold every foot we had, and could have sold four times as much more had we laid in a larger supply earlier in the year.

While these pavements were soaring and being damned by every property owner who had to go up and plank down his hard-earned cash to pay his assessment, we were vainly struggling with the city to permit us to deliver hard maple, which could be purchased at a considerable lower price than yellow pine, or even tamarack. But the policy of the city was against letting down the bars, and the taxpayer paid the bill.

It is not the intention of the writer of this paper to plead for any particular wood. The writer has no favorites, and is so situated that he can furnish any wood that has yet been used as advantageously as any competitor. I am a pretty good Democrat, at least to the extent of crying free trade. I believe in an open specification. Put the Northern and Southern woods into competition and then give the taxpayers the benefit of that competition. Do not put yourself at the mercy of the Southern floods or Northern thaws. Play both ends against the middle with a stringing bet near the centre, and you will have as near a system that will beat the game as it is possible to find. Any of the four woods mentioned in this paper is good enough for a street pavement. Therefore, get the one that is most available, and that is the one that will be the cheapest.

ADZING AND BORING TIES AND THE COST OF INSTALLING PLANTS OF THIS KIND.

By James A. Lounsbury.

Railway track construction in this country has never, for any long period, been adequate to the demands made upon it. Traffic, wheel loads and speeds have continually outrun all efforts to keep the sub-structure equal to the requirements. Track improvement programs providing for a liberal margin in carrying capacity have been overtaken and passed by the growth of traffic almost before the work was completed, and therefore little relative gain has been made. This has been due to some extent to the fact that such improvements have been made under pressure, and time has not permitted the close investigation and study of the means and methods necessary to produce the highest ultimate economy, but the necessity of doing the best possible with the amount of money available for the work has probably been the chief limiting factor.

The era of extensive railroad building is practically past and future progress will be along the line of intensive development, in which the quality will be higher as the quantity grows less. The continually narrowing margin between income and operating expense is forcing railroad officials to consider details of economy which heretofore have not appealed so strongly to them.

Probably the most important step that has been taken in this direction is the rapidly growing practice of chemically treating ties in order to secure the longest serviceable life for the smallest tie investment. But the chemical treatment cannot show its maximum efficiency with the prevailing methods of handling the ties when putting them in track. The folly of paying twenty to thirty-five cents per tie for chemical treatment and then to so mutilate them by hand adzing and spike driving as to greatly reduce the beneficial effect of the treatment is too obvious to require argument.

Machine Adzing.—Of the 150,000,000 ties used annually in this country, approximately 74 per cent. are hewn and 26 per cent. sawed. Hewed ties are never straight and the face side is never a plane surface. Sawed ties are straight when first made, but go "into wind" during seasoning. This is particularly true of many varieties of hard wood. The consequence is that the rails when laid have an insignificant bearing on the tie, throwing the weight of the supported load on a very restricted area of the rail base and introducing, very serious stress factors into the rail problem. Hand adzing is resorted to commonly to correct the defects in the tie surface, but this is at best only a partial remedy, and its effect on the impregnated part of the tie is destructive. The advantage of having a full and perfect bearing for the rails over the whole width of the face of every tie is evident. It reduces rail cutting, decreases the danger of half moon breaks in rail bases, reduces disturbances of the ballast and gives added firmness and stability to the track. Where plates are used it is a practical necessity to give them a full bearing on the ties, as the increased surface makes it more difficult for them to properly seat themselves under traffic. If their bearing on the tie is not parallel with the bottom of the rail they increase the danger of rail breakage, as they form an anvil upon which the impact of rapidly moving loads is received. If the point of support is along one edge of the rail base only the danger to the rail is apparent.

Boring for Spikes.—Many tests made by the United States Bureau of Forestry, by several universities and independently by a number of the railroads have demonstrated conclusively that common square spikes have increased holding power when driven into previously bored holes. These test reports are too voluminous to be reproduced here, but your attention is directed to tests made in August, 1909, at Purdue University, under the auspices of the Bureau of Forestry, by Mr. J. A. Newlin, Engineer of Timber Tests. Also to very exhaustive tests made under the direction of Mr. R. I. Webber at the University of Illinois in 1906. Conclusive tests have been made by the A., T. & S. F. Railroad, but I do not know that they have been made public. These records agree as to the main facts, but the difference in the conditions surrounding the several tests makes exact comparison difficult. It is sufficient to note that the differences are in degree only. They indicate that in the oaks, beech, gum, long leaf and short leaf pine and Douglas fir the increase in resistance to vertical pull varies from 5 per cent. to 15 per cent. in favor of the spikes in bored holes, where the holes are ⅛ inch to 3/16 inch smaller than the spikes.

It is unfortunate that there are almost no reliable data showing the comparative resistance to lateral pressure of spikes driven directly and those driven into previously bored holes. This is of even more importance than the resistance to vertical pull, as upon it depends the maintenance of gauge and the prevention of rail spreading under high speed trains. It is probable that the resistance to flange pressure is increased in much greater proportion than the resistance to vertical pull, because the spike in a bored hole has a backing