gunite being shot directly onto the brick and not trowelled. The surface is even and regular, presenting a pleasing stucco appearance.

After the gunite had set a week, the writer could not knock it off with the hardest blows of a heavy carpenter's hammer, the blows leaving hardly a mark when struck flat, and only a slight dent when struck with the sharp edge, the gunite being stronger than ordinary cement mortar on account of the cement receiving its initial set in place and on account of its density due to manner of application.

It will be noticed that there are only about 42 cu. yds. of gunite in the whole work (figuring an average depth of ½ inch and not allowing for filling of holes), whereas about 52 cu. yds. of sand were used. But little sand rebounded as waste—probably not more than three cubic yards on the whole job, including waste in handling. Deducting 3 yards from the 52 yards used, leaves 49 yards of sand making 42 yards of gunite. It is not at all likely that much of the 7 cu. yds. difference was required to fill the holes, so this supports the theory that the gunite is denser than hand mortar, of which 49 yards would have been made with 49 yards of sand and a 1 to 3 mix.

The work was under the supervision of G. A. Mitchell, of Toronto, engineer of bridges and buildings, G.T.R., and R. Armour, masonry engineer, G.T.R., Montreal, and in charge of Ed. Neville as foreman.

NOISELESS BLASTING

Although Maxim has not yet invented a "silencer" for use by those engaged in blasting rock, it is possible to split rocks noiselessly. This can be done in several ways, says "Engineering & Contracting," of Chicago. One method consists in drilling holes about 2½ or 3 ins. in diameter, and filling them with small lumps of freshly slaked lime. The drill hole is filled a foot at a time and water poured in to fill the voids, then another foot of lime and more water, and so on up to within the upper sixth of the hole. The top part of the hole is then filled with tamping, well rammed. In less than a quarter of an hour the rock begins to crack.

The holes must be speedily loaded and workmen must remain away from them, for the tamping is occasionally blown out with a great deal of force.

Building and machinery foundations may be removed in this manner without endangering nearby structures.

INDEX TO VOLUME 32

The index to Volume 32 of *The Canadian Engineer*, January 1st to June 30th, 1917, is being prepared, and will be published as an integral part of one of the August issues.

The increasing demands for steel for the manufacture of munitions place the private consumer in a difficult position, and to obtain his requirements he has to pay high prices, reports the Canadian Bank of Commerce. All steel mills continue to be very active, and the same is true of textile mills. In both cases the demands upon them are beyond their capacity. Stocks in the mill warehouses are low, but in the retail stores they are fairly complete. Labor troubles are common to all industries, and as a result production is not up to capacity. This is particularly the case in the mining industry. The production of all the Canadian coal fields is much less than normal, and some anxiety exists as to the winter supply at points distant from the mines where lack of transportation facilities adds to the difficulties of the situation.

METHODS OF LOCATING CURVES ON SUBDIVISIONS *

By R. Russell Grant, O.L.S.

THE irregularity of title of this article, I hope, will be sufficient apology for the rather haphazard arrangement of the following subject matter.

The introduction of streets, with curved boundaries, has been the natural development required to meet the desire of the land-owner to utilize the full possibilities of his property. Either from necessity, as is the case with many tracts, or for esthetic reasons and other practical demands, the design of each parcel is a law unto itself, and presents many intricate and important problems, each of which has to be considered with respect to its relation to the whole.

Unfortunately, the land surveyor has allowed the landscape architect to take practically full control of this field, with the result that where expense is not the first consideration, the design of very few large tracts of land comes to the surveyor.

Looking for the cause of this condition, it would seem that the land surveyor has been so thoroughly drilled with the rectangular systems, as exemplified by the township systems of the past one hundred and fifty years, that we have great difficulty in appreciating the possibilities of certain parcels to other than straight line designs, particularly as the average client demands a maximum frontage, irrespective of other considerations. The cost of subdivisions under the rectangular system is also so much less, that generally no other layout appeals to the owner. Personally, I know from experience that it is very difficult in placing a layout not to give undue weight to the probability of re-surveys.

We all appreciate the very great difficulty of making resurveys in subdivisions where the roadways are segments of circles. How the resurvey of any lot may be a problem of great difficulty not infrequently requiring the rear limit to be located by angular deflections from bearings on a registered plan, that we suspect were never calculated, and probably read with nothing more accurate than a protractor.

With the foregoing considerations in mind, it is hard to blame the surveyor for a certain hesitancy in designing curved layouts, and probably accounts for the reckless freedom with which the landscape architect has entered the field.

The design of a proposed plan of a subdivision, naturally, depends upon the topography of the proposed site requiring a general plan of the property in question, with more or less accurate contours, and the location of such important features as buildings, sometimes fences, trees, adjoining roadways, etc. Generally this work costs about $1 per acre on parcels exceeding 50 acres. Some form of general triangulation should be used, and from the triangulation points general topography can be readily located by stated readings. I have found a 5-foot rule of great service on this work, as no sight will be over 500, and the rule saves the transportation of a heavy and awkward rod. A great advantage in locating fences on your preliminary plan, is the very good check that it is upon the progress of the actual stake-out. It is impossible to have too many checks, and there is none so easily and cheaply secured as a few fence lines.

*Paper read before the Ontario Land Surveyors' Association.