(g) Cribs of special shape can be built as easily as the regular rectangular form.

Other advantages may occur to readers.

Who originated, and when, this type of crib the writer does not know, but it has been used by Mr. J. L. Weller, engineer-in-charge of the Welland Ship Canal, on the present Welland Canal, and also by Mr. C. D. Sargent, superintending engineer of the Ontario-St. Lawrence canals, under whose directions the crib described above was built.

SEEKS $30,000,000 FOR RESEARCH WORK.

President Butler of Columbia University, New York City, is asking the trustees of the university for $30,000,000 increase of the university's endowment to provide for expansion of Columbia's research activities. One of the projects contemplated is a national industrial research laboratory to which manufacturers throughout the United States may bring their problems for solution. Plans for this laboratory, to be erected on the shore of the Hudson near the university, have been worked out by a committee headed by the dean of the engineering schools of the university. In his report Dr. Butler says:—

"The European war has served at least one good purpose in arousing our industrial managers and our public men from their long sleep of indifference to scientific inquiry and to scientific progress. It has now been heavily borne in upon them that what some American industries waste would support a principality under wiser and keener administration.

"The future of American industry is bound up with the future of American science. The schools of mines, engineering and chemistry, already distinguished in high degree and now upon that advanced plane which invites only the highest type of student and releases time and energy for genuine research, are anxious and ready to undertake with great energy some of those specific tasks which will aid American industry to improve the products, to decrease its wastage, to co-ordinate its processes, and to multiply its resources for dealing satisfactorily with the many-sided human problems which industrial relationships and industrial enterprise of necessity involve.

"The testing and experimental laboratories which are needed in such an undertaking must be placed at the point where transportation, both by rail and by water, is easy and cheap, and where there may be ready access on the part not only of those who conduct the investigations and those who are being trained in methods of research, but also on the part of those who represent or are engaged in the industries whose problems are, at any given moment, the subject of inquiry. It is within the mark to say that a capital sum of $6,000,000 for equipment and endowment is needed in order to deal promptly and satisfactorily with this great group of problems. Every dollar put into such an enterprise would be returned to American industry many times over in the course of a very few years."

The example set by President Butler will be stimulating to those who have been active in Canadian research work.

Railroad construction contracts, totalling 28,000 miles in Russia and China, are pending, and even that amount is said to represent only a small part of the future development in this respect. A conservative estimate places the railroad construction in Asiatic China and Russia at from 60,000 to 70,000 miles in the next decade.

REDUCTION OF HIGHWAY GRADES.*

By Jules Duchastel de Montrouge, M.Can.Soc.C.E.,
City Engineer, Outremont, P.Q.

PEOPLE are generally very quick to protest against any increase in freight rates charged by railways, and generally always find them high, but they always fail to grasp the importance of the saving they can make by having good roads. In the past 80 years, freight rates have been decreased nearly 90 per cent., but taken as a whole, the reduction of cost of highway transportation has been nil.

The question of grades is a very important economic one. It is quite true that in cities, towns and villages, it is practically impossible in most cases to modify any bad grades, on account of the damages that might be caused to the bordering property holders and the heavy costs they are sure to claim through the courts; but in town planning or in the opening of new city districts, the question of grades should be looked into carefully and settled according to well-established engineering rules.

It has been established that a horse of, say, 1,200 pounds will, by exerting a force equal to one-tenth of his weight, draw a load of 2,000 pounds on a level road; on the same road but on a 5 per cent. grade, with the same force against his collar, he will draw 1,000 pounds, and on a 7 per cent. grade, only 750 pounds. What is true in connection with the horse-drawn traffic, is at least equally true in the case of the mechanically drawn traffic.

Another important feature of this question of grades, is the fact that steep grades are more detrimental to haulage on improved roads than on unimproved ones, and this is due to the fact that the tractive resistance on improved roads being low, the grade effect will be proportionately greater in the first case than in the second.

Steep grades are slippery and dangerous in cold weather, hard to maintain, and their surfaces are easily washed away in stormy weather.

Steep grades generally come about in urban municipalities on account of the desire of land speculators to lay out their roads and streets along lines parallel to straight boundary lines, trying in this manner to get out of the subdivision every available square foot of land. We have some very sad examples of these poorly laid-out streets in some of the most beautiful districts in the Island of Montreal, and unfortunately, this state of affairs cannot be remedied, on account of the huge sums it would require. What is more pleasing than curved roadways, ascending slopes of a gentle grade? One sees fine examples of what I mean in the Rosedale district of Toronto, along West Crescent Heights in Westmount, or Cote St. Catherine Road in Outremont.

There should be a law in this province establishing the maximum grade of roadways and streets, as there is a law fixing the width of streets.

Finally, the question of relocation of a roadway to shorten its length, or to avoid sharp turns or steep grades is also an important economic problem. As a rule, this can only be accomplished in newly developed districts on account of the heavy expense entailed. There are cases where straight roads passing over hilly districts have been relocated clear around the hills without little if any additional length, as the length of the vertical curve passing over the hills was just about the same as the length of the horizontal curve of the newly located road.

*Abstract of article in the Calgary News-Telegram.