creased, to 15,000 c.f.s., we get exactly two days, 48 hours, of maximum flood flow containable in the reservoir, and this would be the maximum relief afforded for the length of the lower river from this one reservoir, a relief that would reduce the 1913 maximum two days' flow in Galt by more than half.

It is, however, very desirable to also control the flood flow coming from the Conestogo. On this tributary the results have not yet been so fully worked out as for the Pilkington basin. No such capacity as that is found practicable on the Conestogo, but there is one site, fairly upstream, with drainage area of not over 250 sq. miles (the drainage area to St. Jacobs is 312 sq. miles) where it is approximately estimated that a capacity of one billion cu. ft. can be obtained. This, together with the No. 2 Pilkington dam (smaller than No. 1) would give better flood control in the lower river, in that a much larger volume could be held back, even if for shorter time. In this manner a volume approximating 20,000 c.f.s., the combined flow of both main river and Conestogo tributary, could be held back for 24 hours.

As to maintenance of flow for the low-water months, 2.6 billion cu. ft. of water would give a continuous flow of 300 cu. ft. per second for three months and ten days. In that period rainfall at various times could be expected, making up not alone for evaporation in the reservoir but also contributing to flow. On the other hand, evaporation appears, as far as observations of stream flow have gone, to have large diminishing effect on run-off, in the Grand River watershed.

At Belwood the mean discharge for the months of August and September, 1913, was only 5 c.f.s.; at Conestogo, drainage area 538 sq. miles, 24½ c.f.s.; while at Eugenia Falls, on the Beaver River, on the steep slope to Georgian Bay on the north side of the table land, the main discharge for the same time, with only 74 sq. miles of drainage area, was 30½ c.f.s., a very remarkable difference, due to two main conditions, the much greater declivity of the Beaver drainage area, and the fact that it contains swamps and is otherwise still largely wooded.

A reservoir above Elora and Fergus is very desirable in the complete scheme. At Belwood the drainage area is 270 sq. miles and the valley deep and apparently well defined. Investigations so far have not given a sufficiently favorable reservoir site.

One feature greatly simplifying the problem on the Grand River is that there is only one large flood in the year, in the spring on snow melting. The great floods in Ohio and Indiana last year were also in the spring, in March, but were caused by rainfall, almost wholly.

There was rainfall of 5.31 in. in 47 hours, 3 in. in 20 hours after the first saturation. Three inches of run-off in the drainage area of Galt would produce 9,500,000,000 cu. ft. of water to pass which, even in 36 hours, would mean a continuous, uninterrupted flow of 40,000 cu. ft. per second, greater than any maximum that has occurred here. Waves lasting for hours only would much exceed even this discharge. There is no record of any such discharge in the Grand River valley. At the present day it would mean destruction of property on an unprecedented scale. Precipitation in the central parts of the United States and Canada is largely from the Gulf of Mexico, as this was. It spread over a large area in Ohio and Indiana. Why did it stop at Ohio? The cool belt of equable temperature over the Great Lakes, around the Ontario Peninsula is, no doubt, a barrier against extreme meteorological disturbances.

It may be accepted as now established that flow regulation on the Grand River, control of destructive floods and maintenance of flow in low-water period, by impounding surplus waters, whether in one or more reservoirs, is economically practicable.

SAFE LOADS FOR ROPES AND CHAINS.

THE accompanying table shows the safe loads which can be carried by wire rope, crane chain and manila rope of various sizes, when used in different positions and combinations. This very useful information has been compiled by the National Founders' Association and published as a part of a safety bulletin recently issued. The following are from among the valuable pointers the bulletin contains:

Chain hooks and similar parts should slowly bend if overloaded and thus give warning of their unsafe condition. They should therefore be well annealed, and never tempered or hardened. A brittle part will snap outright and drop the load.

It is clear that hoisting appliances should be suitably designed and well made. It is yet more important that their use be carefully and intelligently supervised and their original strength maintained. There is evidently not so much danger when handling unusually heavy loads, for such operations are, as a rule, under the care of the most capable men, who anticipate the extra risk by careful preparation. Hoisting accidents more frequently occur when ordinary loads are being handled by ordinary men, and when the usual facilities are either too light, wrongly employed, or weakened by wear or use.

It is of first importance that men using hoisting accessories should know the strength of the same. It is not sufficient to know the size, unless the grade is also known. While 1,500 lb. may be a safe load for a single sling made of ⅜-in. plow steel wire rope, such a load would be excessive for an iron wire rope sling of the same diameter. This wide range of strength also occurs in different grades of chains and other accessories, but the difference is not readily apparent. It is therefore dangerous to provide several grades of slings and hooks in the same shop. Furthermore, a new workman, fresh from a shop in which only the strongest slings and hooks are employed, is liable to assume that the appliances in the new shop are equally strong. The safety of workmen, therefore, requires that all slings of equal size should be of equal strength, and of maximum strength, and that other details are proportionately strong.

While workmen who are accustomed to the use of slings acquire, by long experience, a valuable knowledge of the strength of chains and ropes under varying conditions, this should not be left to guesswork. It is advisable to post in conspicuous places in the shop, especially at the chain racks, and, where possible, at the point of operation of each crane, a chart showing the loads which can be safely supported by slings of various sizes, whether used normally or in a manner that decreases their lifting capacity. From a study of satisfactory crane practice in various large plants, a chart of safe loads has been compiled, which is published herewith. The loads recommended in this chart are more conservative than those usually specified, because it is intended to recognize the possible existence of slight, unobserved weaknesses in slings and the liability of excessive strains which may be applied to slings through misjudgment or accident.

It will be noted that the safe loads shown upon this chart are based upon the use of 6 by 19 or 6 by 37 plow steel wire rope; the best grade of wrought iron, hand-made chain; and four-strand long fibre manila rope. Here