favor. The proportions for engine parts are 62 per cent. of copper, 37 per cent. of zinc, and 1 per cent of tin. While slightly cheaper, it is, as a rule, more uniformly reliable, and the tensile strength of rods is nearly as high, usually 26 tons to 28 tons per square inch. Still, we use 123,000 tons of the ore, and pay for it the very substantial price of three guineas a ton. The metal itself costs from £80 to £100 per ton, so that only great advantage would justify its use. We have to import this ore, our native production being now under 2,000 tons, although some years ago it was 12,000 tons. That, however, was at a time when copper was dear, owing to syndicate manipulations, and then even manganese ore brought nearly £4 per ton. One-half of our supply comes from Russia, a fourth from Chili, and a considerable proportion of the remainder from France. Of the world's supply of 408,079 tons, Russia provides 240,181 tons, mined in the Ural and Southern districts, but principally in the Caucasus. Ten years ago the output was only a tenth what it now is, and the increment has been steady. Germany occupies second place, with a total of 41,854 tons, taken from the Wiesbaden and Coblentz districts close by the Rhine. The production has increased fivefold in 10 years, yet the value is only double. The price per ton has indeed declined in four years or so from about £5 to about £2 per ton. Chili comes third, due to the output of Coquimbio and Atacama, the ores from which give 50 per cent. of manganese, and for it we pay nearly £4 a ton. Their total output is about 40,000 tons, of which we take three-fourths France has 11 mines, close to the borders of Spain, and the total has increased to 32,239 tons, but is of a low grade, the value being 30s. a ton. Japan, that land of great resource and energy, takes fifth place, and the ore is of high grade. In five years their production has increased from 945 to 13,945 tons. The United States produce 9,547 tons, got principally in Virginia, Georgia, and Arkansas states. Greece has rather decreased her proportion, the total being 9,172 tons. Turkey mined 9,000 tons, while on the borders of Austria-Hungary and Bosnia, there are deposits whence the former get 2,743 and the latter 6,484 tons. Portugal finds 6,848 tons of the world's annual supply, Spain 7,684, Sweden, 3,269, and Colombia 3,950 tons. New South Wales, New Zealand, Queensland and Canada have commenced the mining of manganese ore, and it is to be hoped the colonial supply will increase.

LITERARY NOTES.

We have received from the Association of Civil Engineers of Cornell University the volume of their transactions for 1898 The transactions make a volume of about 200 pages, illustrated by a number of interesting engravings and diagrams. Among the articles of very special importance are those on towns' water supply by E. Kuichling, C.E., and European practice in the disposal of the waste of large cities, by J H. Furtes, Mem. Am Soc. C E., the present and future prospects of gas for lighting, heating and power purposes, by Henry R. Lordly, C E

In 1894 there was published in New York a Canadian novel which Current Literature termed the greatest American book of the year. The New York Herald, Times and other papers paid great attention to it. The title was "The Untempered Wind," and the author Joanna E Wood This novel is now published for the first time in Canada by the Ontario Publishing Co. of Toronto, which house also issued in the early part of the year Miss Wood's subsequent novel "Judith Moore." Paper, 50 cents.

The Hunt cable railways for handling coal and merchandise are described in a profusely illustrated catalogue, No. 9,803, recently issued by the C. W. Hunt Co., 45 Broadway, N.Y. Among the plants of which pictures are given is the locomotive coaling plant of C P R. at Jackfish Bay on Lake Superior. Catalogue No. 9,806 from the same firm gives details of the automatic railways and coal elevators erected by this firm.

George H. Dobson, of North Sydney, C.B., has written a pamphlet, entitled Ocean Routes and Modern Transportation, which is worthy of consideration by the Dominion Government. Mr. Dobson argues that if Canada's ocean transport facilities had been equal to those of the United States during the past sixty years, this country would have secured a large proportion of the emigrants who went to the United States.

"The Chemistry of Paints" is a pamphlet describing the process of manufacturing white lead and paints followed in the works of Harrison Bros. & Co., Philadelphia, Penn. This firm is one of the oldest in the United States, having been in business since 1793.

The International Correspondence Schools, Scranton, Pa., has sent out a handsome pamphlet describing the origin of the schools and their present condition. A good deal of space is given to a description of the various publications of the schools which are now being issued in bound volumes.

The Herald, Halifax, N.S., has issued a forty-page pamphlet on the Canadian possibilities in Atlantic freight and passenger carrying, entitled "Ocean Routes and Modern Transportation."

We have received for review the "Pioneers of the Klondyke," which is an account of two years' police service on the Yukon by M. H. E. Haine. The book is handsomely illustrated.

THE STEAM ENGINE.

BY WILLIAM GOLDING.

If an ordinary vertical steam engine be converted into a steam elevator by removing the cross-head and putting in its place a platform which shall be loaded with bricks or other units of weight, and steam be admitted below the piston, the platform with its load will ascend; if, however, the steam be shut off when the platform has ascended one-eighth the length of the cylinder, the platform will cease to ascend. As is well known, the steam which has raised the platform through one-eighth of the desired distance, is capable of much further duty; but as the load is constant, no utilization of the steam can be effected, unless the load, in some manner, be lightened. If one brick be removed, the platform with the remaining part of the load will ascend to a point where the steam and the load again become equal; where it will remain. If another brick be removed and the operation continued, the platform will continue to ascend and convey some part of the load to the top. Now it is very certain that all of the work done after the flow of steam was cut off, was accomplished by the expansion of the original steam. And this gain or economy as usually computed is sixty per cent.; yet not one-half of the theoretical gain can be discovered in any practice, and none whatever when the load is constant.

It is usual in estimating the power of the steam engine to compute the average pressure that has been exerted upon the piston as the thrust; and to assume that this pressure has been transferred to useful work. The fallacy of computing the average pressure is illustrated in the pumping engine and the direct piston-elevator, and in the locomotive, as in all of these applications the load is constant and the initial pressure always in demand. Where the load is elastic as in the screw propeller or paddle wheel, operated by engines especially adapted to such duty, a large percentage of the average pressure on the piston may be computed. But where uniform periphery speed is required, as in a mill, the percentage of average pressure to be computed in estimating the actual power developed will be governed by the percentage of irregularity tolerated in the periphery speed of the rotary parts. In fact, if the periphery of the fly-wheel travels with absolutely perfect uniformity of speed throughout each revolution, the load is practically constant and no economy can result from expansion, no matter what point of the stroke the steam may be cut off. To maintain a uniform periphery speed of the rotary parts, it is necessary that the power be uniformly applied to each division of the circle. To this end it is suggested that the greatest measure of economy will be attained by using a cylinder with permanent cut-off for each expansion, each piston to follow at equal divisions of the circle. As in this practice the full economy of steam expansion with perfect uniformity of periphery speed and against a constant load will be attained.

The subject of the fly-wheel, as a part of the steam engine, is not generally understood; and, perhaps, more failures to give satisfaction by otherwise perfect engines may be traced to the mal-proportion of fly-wheel than to all other causes. The fly-wheel is nothing in itself. It neither produces nor consumes. It can only store power by running faster, and can only part with power by running slower. To illustrate: if a single engine is to be constructed to run a mill, and is intended to cut off one-eighth of the stroke, a very large fly-wheel will be required, in order to preserve uniform periphery speed. In this case, the pressure on the piston will vary twice during each revolution, from initial to terminal, to such an extent, that in order to insure even an approximation to uniform periphery speed, a fly-wheel of unheard of proportion would be required.