ur knowledge of electrical matters, it is not wise to predict what may or may not be done in the next few years in the way of electrical heating, but we do know that water power will not develop heat without its transformation into electrical energy; so that unless this transformation is made, a water power plant will have to be supplemented by a steam heating plant in all cases where heat is required. If not a steam heating, then hot air, stoves, &c., which all mean fuel.

Now, if steam is to be used at all, it might just as well be used as economically as possible, and to raise steam to a high pressure costs less proportionally than it does to generate a low pressure. If, therefore, high pressure steam be used in steam engines, and their exhaust be availed of for drying or heating purposes, it might very well be that the expense incurred would compare very favorably with the total interest and other expenses of a combined water power and steam heating plant. And the comparison would be all the more favorable to steam as steam became necessary in larger quantities for drying and less comparatively for power. There are other industries again which necessarily produce combustible refuse, which they must consume in some way, such as tanneries, planing and saw mills, and other wood-working industries. Unless they have some local demand for such refuse it becomes very necessary to burn it up to get it out of the way. In all such cases it is questionable whether water power would have any value at all.

In appraising the comparative values, therefore, of a water privilege in relation to steam working, it becomes necessary to regard the whole question from a strictly commercial standpoint. The total first cost by the two methods must be reliably estimated, with their probable maintenance and operating costs. Due consideration must be given to the cost of extra haulage and handling, where the water power is not on the transport line, and be debited against it. The heating problem is a factor, and the cost of fuel, and if the careful discussion of the matter leads to the result that steam is the more economical, then no arguments based on the "sin of wasting power at our doors" should be allowed to influence it. It is obvious that no particular rules can be laid down by the application of which the value of water power can be determined from tables like a logarithm. Every case must be determined on its merits, and the above illustration showing how the merits may vary widely in 32 miles, serves to emphasize the importance of careful investigation and logical calculation.

AUTOMATIC BOX MACHINE.

A MARVELOUS piece of automatic machinery for the purpose of making boxes has been invented by W. T. McRae, of Philadelphia, Pa., and recently set up for a practical test, after working five years on its perfection, says the Philadelphia Record. It is known as the "Eureka," is novel in its design, and does its work in an entirely new way as compared to the old machines designed for this work. It is fed from four sides with boards which have been previously cut the desired size; and a box is turned out at every revolution of the machine, the wooden cubes being thrown off at an astonishing rate. A single operator, who need not be a skilled person by any means, can work off 1,000 boxes an hour, the work of the attendant being only to feed the press with the wood. The machine may be readily adjusted in a few minutes to make a box of any size within reasonable limits. One press, for instance, is made to take in all the various sizes of cigar boxes; while for larger ones another size machine is made. After the machine is started its action is automatic, and at each revolution a box is shot out, one following the other so rapidly that the question of carrying them off becomes an embarrasing one. The box as turned out is complete, with the exception of the lid. Lock-corner boxes are as readily handled as the straight-edged one, the hammers used in nailing them being taken off and plates substituted which squeeze the parts together instead of nailing them. The capacity of this machine is said to be nearly ten times that of the box-making machines now in use.

The Review of Reviews makes a striking assemblage of cartoons illustrating the war question. The reproduction of Spanish, Cuban and Mexican cartoons are especially interesting. The pages of the May Review devoted to this department will have a unique historical significance in years to come.

THE SPRUCE GALL-LOUSE.

Prepared for the Bureau of Forestry by WM. BROWN, TORONTO.

IN the spring of 1897 many spruce trees in and around Toronto were found to be more or less injured by a pseudo-gall insect. The galls were enlarged and deformed buds of the previous year, usually towards the tips of the twigs. Investigation showed that these galls were formed by a small insect, popularly called the spruce gall-louse, the Chermes abietes of entomologists. A short account of this destructive pest, as then known in Ontario, appeared in the annual report of the Clerk of Forestry for the Province of Ontario for 1897. Since then it has spread with astonishing rapidity and has been detected at many points, from Peterborough to the County of Bruce, where it was lately detected by Dr. Hunter on native spruce trees in a swamp in the township of Culross. It has also been found on native spruces in Muskoka, near Utterson station. So far it would appear that unless this insect is checked by some artificial means it will soon destroy our ornamental spruce trees and hedges and, extending northwards, do immense injury to our spruce forests.

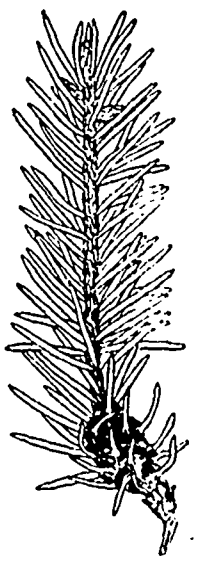

FIG. 1.

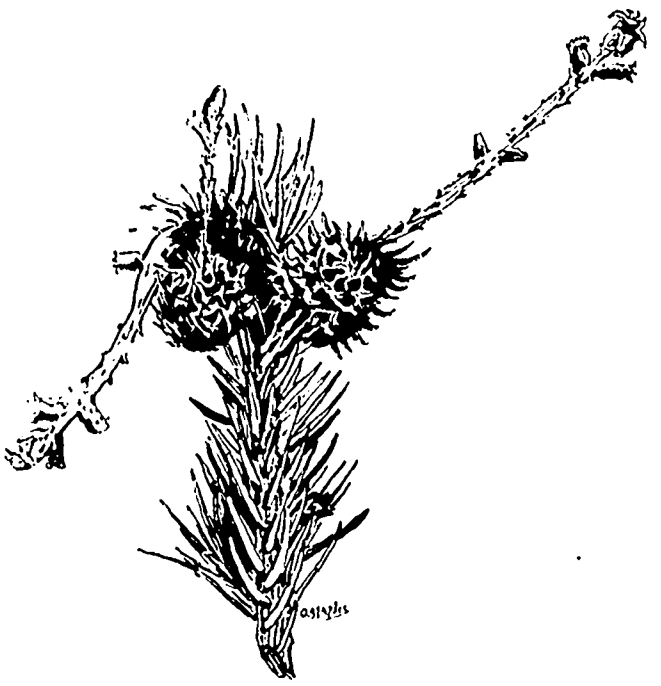

FIG. 2.

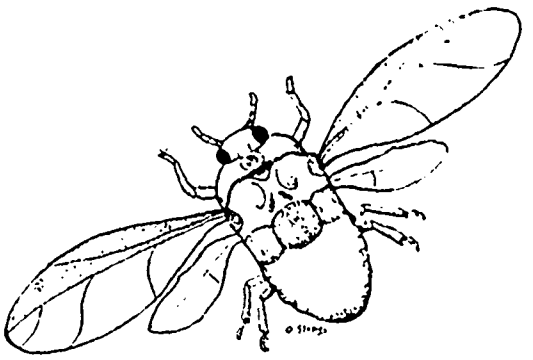

FIG. 3.

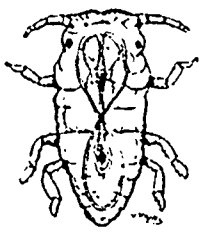

FIG. 4.

The trees already attacked by this spruce gall-louse in Ontario are the European spruce, Picea excelsa, the double spruce or black spruce, Picea nigra, the white spruce, Picea alba, and the balsam fir, Abies balsamea, and it may also be found on the hemlock, Tsuga Canadensis. This insect is native to Northern Europe and was introduced into the United States on imported spruce trees and thence into Ontario, or it may have been introduced here direct from Europe, as for many years there has been an annual importation of young European spruce trees into Ontario.

At Toronto the full grown insects the producers emerge from the galls, the scales of which open to give them exit, about August 1st. On emerging they are slightly imperfect, but in one day ample wings are developed which enable them to fly long distances. After distribution the female settles on a spruce leaf and lays under herself—about thirty-five eggs and then dies, resting on the eggs. In about a week the young six-footed larvæ are hatched. They crawl about and find immature buds into which they burrow and of course remain quiescent during the winter. But in the following spring their presence in the bud causes it to develop into a "gall" instead of a normal twig. The lice in the galls give birth to other living lice so that about thirty individuals are found under each scale of the gall. The galls are usually irregularly spherical and often more than a half inch in diameter. When growing they are of a yellowish green color, but during the winter they assume a reddish brown tint, which they retain until the end of May, when they usually fall from the tree. This is the usual form of this gall, but there is another form, not a gall, in which the injury is done in the leaf axils. As these insects in the feeding stage are within the gall, and the gall is perfectly water tight, so that no fluid can penetrate, poisoning is out of the question, and as in the migrating larval stage, they do not eat, poison is equally useless. Of course in this larval stage soap emulsions might be of some use, if applied abundantly at the proper time. But without any doubt the cheapest and best plan as yet tried in Ontario is to clip off the galls as soon as they are noticed say in June and always before the first of August, while the producers are in the galls, and immediately burn them up. When a tree is too much infested to be dealt with in this way it should be cut down and burnt at once. Of course there is no use in doing this after the producers are out of the galls. Several cases are known where this plan was carried out with very satisfactory results, and it is respectfully recommended that all those having spruce trees in charge should carefully see to the clearing of the trees and the extermination of this formidable insect pest. As some of our nurseries are affected, buyers of evergreen nursery stock should be very careful to see that the young trees are perfectly free from this insect pest.

DESCRIPTION OF PLATES.

Fig. 1. Gall infested twig as usually seen in the fall season before the death of the part of the twig above the gall.

Fig. 2. Infested twig of European spruce, two-thirds natural size, collected April 16, 1898, from a badly infested tree growing in one of the Toronto public parks, showing the parts of the twigs above the gall dead, the leaves having fallen off, the usual condition found in the spring season.

Fig. 3. Mature, winged fertile form, from a microscope mount, enlarged 25 dia., collected September 1, 1897. In this final stage of development they do not eat, but their ample wings enable them to fly long distances before ovipositin, and hence the alarmingly rapid distribution.

Fig. 4. Immature gall producer, from a microscope mount, enlarged 25 dia., immediately after issuing from under the scales of the gall, August 18 1897.