



Science News-Letter

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FORESTRY

New Hybrid Trees to Make Farming of Forestry

By **FRANK THONE**

Viewing with alarm the inroads made upon our forests by the hourly, or even half-hourly, editions of daily papers, and the pounds of bulk of Sunday editions, has become one of the better known of our indoor sports. Not without some reason, either, as a rough test can indicate. Weigh any average Sunday paper. Multiply it by the circulation figures. Multiply that by the number of newspapers in this country that print Sunday editions—six or seven hundred of them. It begins to look like Henry Ford's income tax, but it's just a hint of one of the problems that is plaguing editors and conservation experts alike.

The U. S. Department of Commerce figures for 1925, the last year for which they are complete, show that the United States produced 3,962,217 tons of wood pulp, and imported 1,603,614 tons more, making a total of 5,565,831 tons. Of course, by no means all of this went into newspapers. Magazines and books, of the making of which there is no end, took up a lot of it, and then there was writing paper, wrapping paper, building paper, wall paper, and a thousand and one other kinds of paper and things that are made from paper. In addition, there was a vast deal of paper pulp that never became paper at all, but was turned into the rayon that is advertised in your Sunday newspaper as everything from lingerie to window drapes. Now that the forests are called upon to supply part of our wearing apparel as well as most of our reading matter, and may soon be asked to fill our sugar-bowl too, the problem of replacing our vanishing original stock of trees becomes one of every-increasing importance.

Efforts, and fairly successful ones too, at the solution of this problem are, of course, no new story. Paper companies and lumber concerns, as well as government agencies, have

done something toward the restocking of cut-over lands with trees, especially in the spruce lands of the northern United States and Canada. Forest seeds and nursery-propagated seedlings have become staple articles of commerce, and to cut an acre without arranging to replant it has come

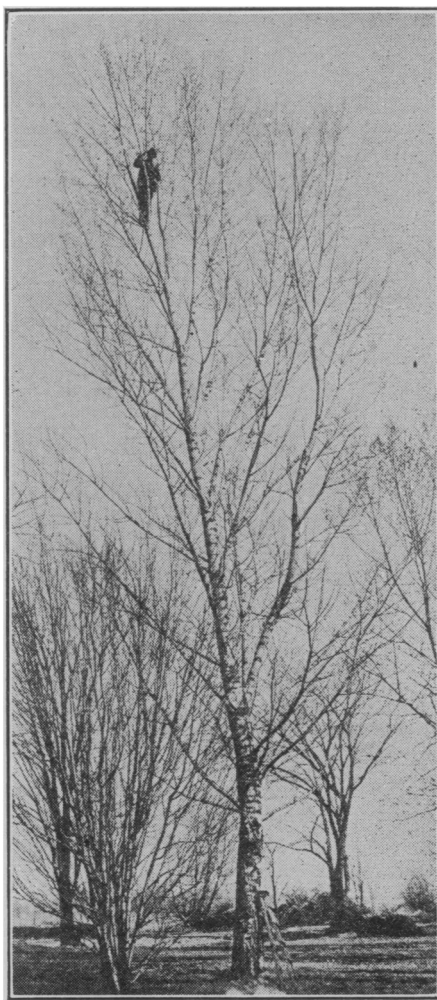
to be regarded as reprehensible by the sons of the old-time lumbermen who used to think our forests "inexhaustible."

Forestry Far Behind Farming

Yet with all the care we have taken, our forestry has remained in one respect very primitive, as compared with our agriculture. The trees we have planted, and are still planting, are exactly the same as the trees that grow in the forests, good specimens of wild species, with nothing done to improve them for human use. In agriculture, man has not done anything of that kind since the later Stone Age, when he gathered seeds of wild grasses and roots of wild vegetables and planted them around his huts. Even before he learned how to write he learned how to breed improved plants, so that the wild form of ordinary corn is totally unknown and the wild form of wheat is a matter of conjecture and of much dispute among botanists. Yet to this very day he continues to plant seeds gathered from unimproved, wild timber trees when he wants a new crop of forest. Some work is now under way, with promising results so far, toward the improvement of certain of our native nut trees, such as the black walnut and the hickory, but this is rather to be classified with the breeding of orchard trees, and falls in with the cultivation of such Old World species as the English walnut and the European chestnut and filbert. A notable success already scored with a native tree is the pecan. But of similar work with trees of value primarily for their wood there has been to date hardly a hand's turn done.

But now, with the fact that we are using our pulpwood from four to six times as fast as we are regrowing it haunting us like a hungry specter, three scientists have combined forces to see whether it may not be possible

(Just turn the page)



THE HIGHER BOTANY: Workers on the problem of growing bigger and better poplars for paper pulp had to climb each tree half a dozen times and conduct delicate scientific operations while perched dizzily on an upper branch.

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Hybrid Trees

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to find some answer besides increased acreage of the ordinary, familiar types of trees. Their ambition is not to make two trees grow where one grew before, but to make a quick-growing, right-shaped, large-sized tree grow where a little crooked one grew before.

These three men, Dr. A. B. Stout, of the New York Botanic Garden; Dr. Ralph H. McKee, of Columbia University, and E. J. Schreiner, who conducts research for the Oxford Paper Company, financial backers of the experiments, first looked about for the best tree genus to work on. They did not have to look very far. Paper mills have appetite mainly for two trees, spruce and poplar. The wood of these two trees best satisfies the requirement of the paper industry for fibers that are long and tough without being hard, that are fairly uniform in diameter, that come apart readily when put through the mill, and that are not messed up with resin or deposits of other disagreeable and bothersome chemicals. Spruce is most used now; nearly two-thirds of the world's paper-pulp product is made from it.

Poplar the Best Paper Tree

But it has not always been so. When wood-pulp was first used on a large scale in newspaper manufacture, Dr. McKee states, poplar was the favored genus. Later, due to the fact that its price became a little higher per cord than spruce, the change was made to the latter wood. This new spruce paper was found to give a harsher and harder paper, which more rapidly wore out the type. In consequence, in order to have fresh and clear types, the system of casting whole pages as solid plates, known as stereotyping, was developed, and this was soon followed by the invention of the linotype, and that by the mono-

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News-Letter Features

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Hybrid Trees

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type. It was another case of necessity being the mother of invention—in fact, of three inventions very important in the development of the modern newspaper. Yet in spite of the predominance spruce came to have in the newsprint paper field, poplar persisted as the ideal paper material, and even now the higher grade of paper used in magazines consists of about 70 per cent. of poplar pulp to 30 from other sources.

Poplar then was the tree genus settled on by the co-operating scientists as the object of their effort to make big trees grow where little ones grew before. There are a considerable number of poplar species, distinct from each other yet united in a kind of botanical cousinship, and quite capable of producing offspring if artificially crossed. This was fortunate for the plans of the three men, for it permitted them to exploit that well-known though little understood biological phenomenon called "hybrid vigor."

Everyone is familiar with at least one hybrid: to-wit, the mule, a cross between the donkey and the horse. Everyone knows, too, that the mule excels either of his parents in a number of qualities desired in a beast of burden. If it were not so, this grotesque animal would not have been called into existence. The mule's superior strength and endurance are commonly credited to his hybrid birth—examples of "hybrid vigor." Though we are not so familiar with the facts, a majority of our cultivated plants are hybrids—crosses between distinct species, as in most of our fruit trees, or at least between definite varieties, as in many of our farm and garden crops. Hybrid vigor in these plants very commonly expresses itself in rapid growth with resultant bigness: twelve-foot cornstalks from ordinary six-foot parents, two-hundred-pound pumpkins from mere twenty-pound ancestors, chrysanthemums big as cabbages as offspring of flowers no bigger than ordinary field daisies. If hybrid vigor will do this with field and garden plants, reasoned the three scientists, why not with trees? Why not get a sixty-foot tree where a thirty-foot one grew before?

Good facilities for working on the artificial hybridization of poplars were found at the New York Botanical Garden, at Highland Park in Rochester, N. Y., and one especially desirable tree, the northern form of the necklace poplar, grew on the grounds of the agricultural experiment station

at Geneva, N. Y. Having one workplace a considerable distance south of another was an advantage, for trees could be worked over when they first came into bloom in New York City, and a week or ten days later when those at Rochester came on, the work could be repeated there to make sure of getting results at one place or the other.

Acrobatic Botany

Cross-breeding poplar trees is not an easy job, to be done safely and comfortably on the ground. The best blossoms are borne on the uppermost boughs, and the work involved a vast deal of climbing. The workers had first to shin up the female, or seed-bearing tree, and tie paper bags over the flowers before they opened. This was done to prevent strange pollen from drifting in and spoiling the experiment. Then they had to slide down again and climb a male, or pollen-bearing tree, to get the precious yellow dust with which to fertilize the caged female flowers. Then up the female tree again, to distribute the pollen. Later on, when the fertilization had "taken," they had to go up again and take off the protecting paper bags. After the seed had begun to set, they had to make another ascent, to tie on cheesecloth bags this time, which would prevent the seeds procured at the cost of so much trou-

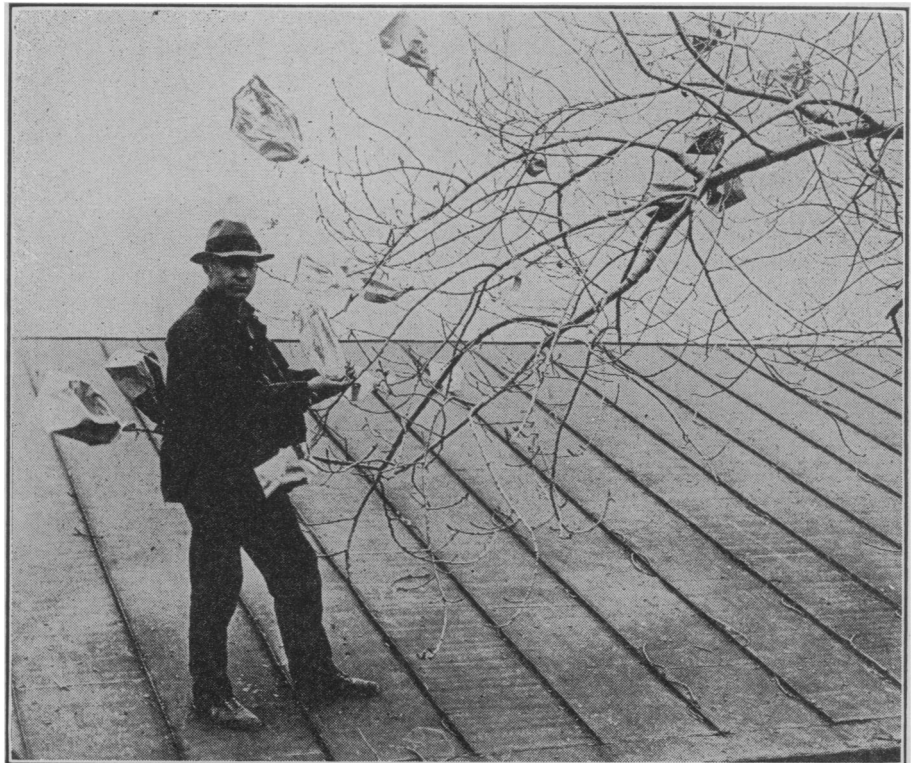
ble from drifting away on the wings of their web of cottony threads. Finally, when the seeds were ripe, they had to go up the trees once more, to harvest the crop. This human-squirrel program had to be gone through for dozens of trees. In a few instances the trees had accommodately thrown their branches over the roof of a building, so that the workers had a ready-made platform. But mostly they had to do their own climbing.

The precious crops of hybrid seeds secured, they were planted in flat trays of soil, and later set out in flower-pots, and watched as solicitously as though they were the costliest of orchids. Then the three companions had to wait a couple of years, measuring rates of growth, to see whether the hoped-for speeding-up due to hybrid vigor had materialized. In a gratifying number of cases it had.

Trees to Be Farm Crop

The best of their hybrid seedlings promise to give trees of at least 18 inches diameter in 18 years, and a total yield of 100 cords to the acre. Part of the crop will be harvested at the end of ten years, to thin out the forest, and the balance when the trees have matured at eighteen. Such rapid growth and such a yield puts

(Just turn the page)



BAGGING THE BRANCHES before the fruit is "hatched." Each twig of female catkins had to be isolated in a paper sack to prevent the experiment from being spoiled by the intrusion of wind-borne pollen from strange trees. A convenient roof here relieved the experimenter from shinning up the tree as usual.

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Hybrid Trees

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tree-growing into the agricultural class as an industry—makes it possible to reckon in periods of a few years instead of generations or centuries. Its effect on paper-making and the other industries that depend on wood-pulp should be nothing short of revolutionary.

One difficulty that breeders of hybrids often have to face troubles the poplar-growers not at all. Many hybrids, like the mule, are sterile, and others that can produce offspring bring forth all sorts of odd and bizarre broods—they do not "breed true," as the geneticist puts it. But hybrid plants can be propagated by grafting, as apples and oranges are, or they may even be vigorous enough to strike roots from cut twigs. Of the latter class, fortunately, are the poplars. They root from cuttings more easily than roses or geraniums—as easily as willows. All the would-be poplar-forest owners needs to do, therefore, is to stick a row of hybrid poplar stakes into suitable soil. Presently he will see them throwing out green leaves and shoots, and in a few years he will have a grove of trees, all as much alike as though they were branches on the same individual; for they are, after all, parts of the same individual that have achieved separate lives of their own.

For the three researchers who thought of exploiting hybrid vigor in the interest of pulp-wood growing there still remains the task of propagating their stock to the point where they can produce cuttings by the carload, and of convincing forest land owners, who are sometimes a bit conservative, of the real value of their discoveries. Unlike many scientists, they will probably live to see monuments to their endeavors, in the form of scores of thousands, perhaps hundreds of thousands, of acres of flourishing hybrid poplars.

Science News-Letter, May 14, 1927

The world's most effective fire fighting system is claimed by Paris.

More than 700 species of flowering plants have been found north of the Arctic Circle.

The receding of Niagara Falls may drain off Lake Erie, in the course of geologic time.

The sardine canning industry in the United States has grown chiefly as a result of the European War, when imports were cut off.

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