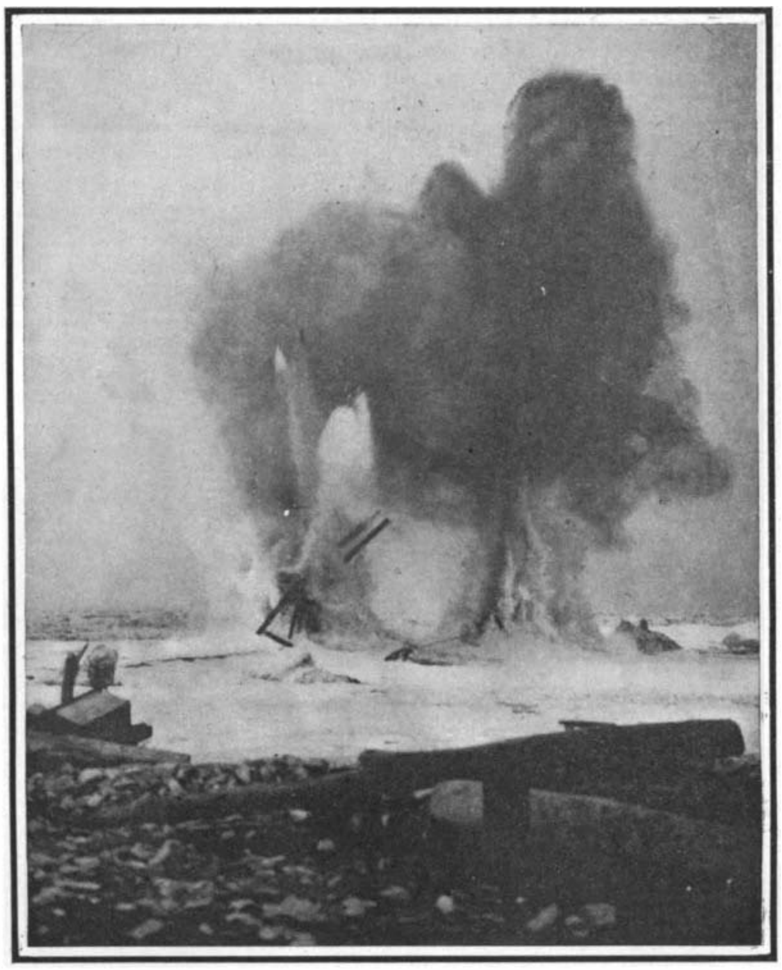
DYNAMITING THE NIAGARA ICE JAM.

BY ORRIN E. DUNLAP.

Scientists tell us that centuries ago the entire Niagara section was in the grasp of a mighty glacier, this ice formation of the past being responsible for the interesting features we now view there. The information dug up by geologists as to the ice period of the past, the Ice Age, as it is termed, is most interesting and forms a chapter that is fascinating. No less interesting is the story of the latest glacial formation that captured Niagara and turned the great gorge and the banks beyond it between the Lewiston escarpment and Lake Ontario into a mighty reservoir, jammed by ice, raised to such an extent that lives and property were endangered to a more pronounced extent than at any time, so far as known, since the whites settled on the banks of the river now accepted as the boundary line between the countries.

Engineers and others have been astonished by conditions that developed at Niagara during the last month. It required the engineering talent of the State Department of Public Works to relieve the situation caused by a remarkable ice jam. On Wednesday, April 7th, a hurricane swept the Lake Erie and Niagara River region. This wind was terrific in its velocity and force. It broke up the ice in Lake Erie and also drove it into the Niagara River channel. Quickly, the river began its work as a transportation agent, and after the first of the ice floe reached the Falls of Niagara hundreds of tons were delivered into the gorge every second. Over both the American and the Horseshoe Falls the ice plunged. Day and night the delivery from the higher to the lower level was continuous. Water, too, was sent into the gorge in great quantities, the effect being that the level of the lower river was rapidly raised from its normal level to a height never before recorded. Normally the river is 343 feet above sea level, but on the night of Friday, April 9th, it attained a height of 382 to 383 feet, and burst in through the windows of the power house of the Ontario Power Company, at the water's edge, on the Canadian side, flooding the station and depositing hundreds of tons of ice on the floor. All the machines were wet and had to be shut down. Despite the fact that the company's electrical engineers and other experts worked hard, the station had not resumed operation the fore part of the last week in April, the work of drying out the big generators of 10,000 horse-power having been found to be a task of no small magnitude. The damage to the company was estimated by it at $100,000, exclusive of the high-grade lubricating oil used to the extent of about 100 barrels, under normal conditions, in lubricating the bearings. While this great power house was shut down, the Electrical Development Company of Ontario and the Canadian Niagara Power Company took on part of the current load. As the transmission lines of the Ontario Power Company's service extend very many miles, the industries were temporarily embarrassed by the disaster.

On the morning of April 10th it was found that the river was jammed with ice for nearly every foot of the distance between the mouth and the Falls of Niagara. There was an open spot at the Whirlpool Rapids, but up and down stream from this tumultuous point, the water was hidden under a mass of ice of great thickness, which finally attained a thickness of between 40 and 50 feet.



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The blast that broke the Niagara ice jam.

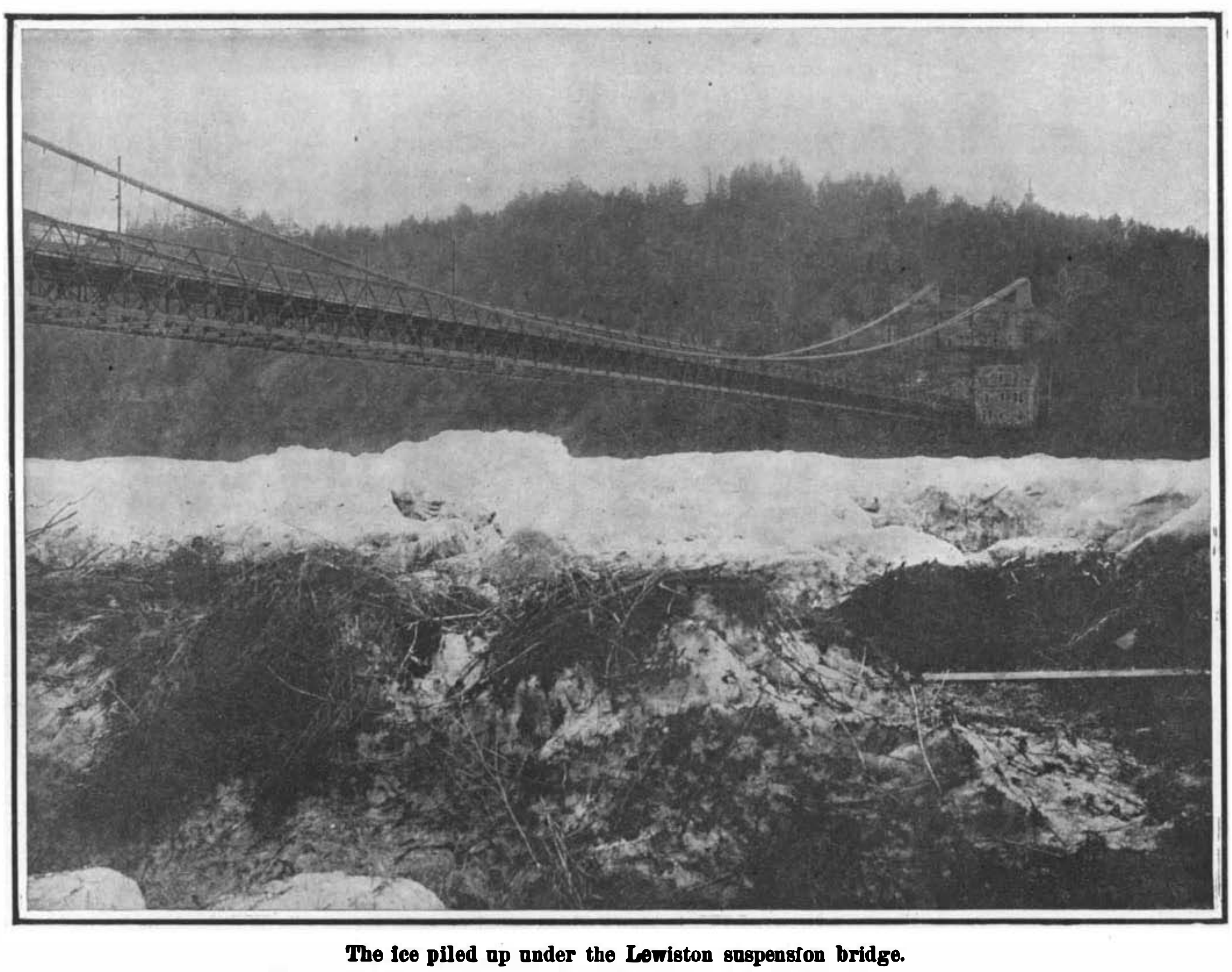
As the water rose to an abnormal height, the ice was carried over the tracks and roadbed of the Niagara Gorge electric railway for miles of its length. As the water receded it left the road buried under from 10 to 20 feet of ice for these miles.

At first the jam was accepted as an unusual, entertaining spectacle, but within a few days it was observed that the ice was rising higher and higher. There was no water in sight, but it was evident that the river was the agent that was sending the ice up, up, up, until it had risen to 50 feet from the normal level of the stream. The flow of the river on the higher level above the falls did not indicate that Lake Erie was discharging an unusual quantity of water at that time. Then the conclusion quickly came that the ice jam had settled to the bottom of the river at the mouth between Fort Niagara and Niagara-on-the-Lake, where sandbars are known to exist to retard the passage of ice and water to the lower lake. This decision made it clear that the Niagara gorge and the river banks beyond were being transformed into a vast storage reservoir, on the surface of which a giant glacier was being elevated day and night as the Falls of Niagara continued to pour their millions of gallons of water into the gorge every minute.

At Lewiston the ice was now attacking a hotel veranda, while up stream boat houses, fish traps, docks, etc., had been swept away, and down stream private pumping stations and docks had been buried or wrecked. The ice was jammed against the abutments of the great upper steel arch bridge at Niagara Falls, and down at Lewiston the top of the glacier was within about 15 feet of the deck of the lower suspension bridge, which originally was erected 65 feet above the normal level of the river. The shed of the inclined railway, Canadian side, near the Falls, was a broken mass of timbers, and the steamers "Maid of the Mist," the little boats that carry people up near the Falls to Rainbow Land in the summer time, were shocked at the persistency of the ice in butting against them, as they nestled high on the slope of the bank.

It was evident that unless action was promptly taken to relieve the situation still greater damage would be done. John A. Merritt, collector of customs of the port of Niagara Falls, asked the United States War Department to instruct the United States Engineers in Buffalo to investigate and suggest a remedy, but nothing was effected. Sanford White, president of the village of Lewiston, wired Governor Hughes, who was quick to hurry the engineers of the State Department of Public Works to the scene. Assistant State Engineer Kunzie made an investigation. He realized that the great river had all or partially ceased to find its way into Lake Ontario. Under his orders, tons of dynamite were hurried to Fort Niagara by wagon that night. On the morning of Thursday, April 22nd, it was being placed in a hole in the ice at the mouth of the river, the purpose being to shatter the ice and open a channel to the lake. The blasting continued throughout that afternoon, and by Friday it was evident that the jam had been broken, the water receding rapidly. On Friday more blasting was done to break up the field, and Saturday added to its destruction. By Sunday the river itself had resumed its work with great vigor and continued breaking up the ice field and opening a channel until all danger was past. Mass after mass would break away and start down the river like a great white ship. The spectacle of the breaking up of the ice was impressive. The ice was seen to be many feet thick above the water line, its depth below being unknown.

The Ontario Power Company was damaged by a backing up of the water close to the Horseshoe. Three miles down stream from the power house two of the power transmission towers supporting the aluminium transmission line were upset by the ice jam, though they had been placed at a point estimated far above the



The ice piled up under the Lewiston suspension bridge.

The ice is here shown within 15 feet of the bridge, the floor of which is 65 feet above the water.

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danger line. For miles the poles of the Gorge road were swept away and the wires torn down. The damage to the roadbed is unknown at this writing, but the company is hopeful that it will not be too severe. Hundreds of men have been set to work clearing the ice and debris away, and every effort will be directed to a resumption of travel over the line at the earliest possible moment. It is hoped that the road will be ready for the usual summer traffic.

Old residents below the Lewiston mountain agree that the winter of 1844-45 brought a mammoth jam, but as industry was not then so active along the river as it is now, and as there were no great bridges and power stations endangered, the record made was not so notable as that of the big jam of 1909, which will long be remembered as a warning to engineers that all the freaks and possibilities of the mysterious Niagara are not yet known.

The Budde Hydrogen-Peroxide Process for Sterilizing Milk.

The problems confronting a public pure milk supply are only too well known. The greatest difficulties arise from the fact that trade milk is drawn from so many quarters and such a varied assortment of sources, and then promiscuously mixed, that even if the supply from one set of cows should be pure, it is immediately contaminated by its admixture with the product from other doubtful cattle. Sterile milk in the generally accepted sense of the word is practically impossible to obtain. Numerous methods have been evolved for treating milk so as to render it perfectly innocuous. Scalding and boiling are the most commonly favored means for destroying germs, but heat destroys the character of the article, and in artificially fed children is invariably productive of rickets and other serious infantile maladies. In pasteurizing milk no two dairymen adopt the same degree of temperature.

Within recent years the tendency has been toward the use of a powerful antiseptic, such as hydrogen peroxide. Although highly successful in its results, the use of an antiseptic requires care, since otherwise the requisite effect is not achieved or the taste of the milk is quite changed. A Danish chemical engineer, C. Budde, D.Sc., of Copenhagen, has for some time been prosecuting his investigation along these lines, and after prolonged experiment has succeeded in evolving a process which has received the indorsement of such eminent bacteriologists as Prof. Von Behring, Dr. Rideal, Prof. Tanner Hewlett, and other well-known luminaries at the leading institutions of Europe. So effective is it in its application, that Buddeized milk, as it is generically termed, is becoming extensively consumed not only in Denmark, but other European countries and Great Britain.

Although it appears somewhat elaborate in comparison with the popular dairy methods the process is so inexpensive as to enable the purified milk to be sold at the customary price. The milk upon collection from the various farms is brought to a central depot, where it is raised to a temperature of 122 deg. F. In this heated condition it passes through a centrifugal cleaning machine similar in design to a separator, but having only one outlet, the cream not being separated from the milk. This operation not only removes all particles of dirt suspended in the milk more effectively than ordinary filtering, but also serves to arrest any bacteria that may be adhering to the foreign articles and to the minute motes of the tissues of the cow which are always present in milk. It may be mentioned in passing that such cleaning the inventor maintains to be necessary in any milk treatment, since experiments have proved that the bacilli adhering to these different particles are the most resistant. Striking illustration of the extent to which dirt is present in milk is afforded by the amount of residue that is found in the bowl of the centrifugal cleaner after the raw milk has passed through.

From the cleanser the milk passes into a water-jacketed glazed earthenware vat, in which it receives the predetermined quantity of hydrogen peroxide (H_2O_2). The temperature of the water jacket can be raised to the requisite degree and maintained thereat merely by the admission of steam. The vat is fitted with a mechanical stirrer, which is actuated from time to time to create and maintain a homogeneous mixture. The peroxide is perfectly harmless when taken in small quantities. The amount used by Dr. Budde is very minute. The chemical is added to the fluid when heated to the temperature of 122 deg. F.

The effect produced upon the milk by the hydrogen peroxide is that the enzyme catalase, first isolated by Loewe at Washington in 1901, attacks the hydrogen peroxide, and immediately decomposes it into water and oxygen. The result is that the one volume of oxygen thus released—hydrogen peroxide consists of two equal parts of hydrogen and oxygen—immediately seizes upon another atom of oxygen. Consequently, for a very short moment the oxygen is in the form of unic atoms, and exercises a far greater inclination than ordinary oxygen to combine with the oxidizable substances present, which fact explains the well-known powerful oxidizing qualities of the hydrogen peroxide. It is imperative that the H_2O_2 be chemically pure.

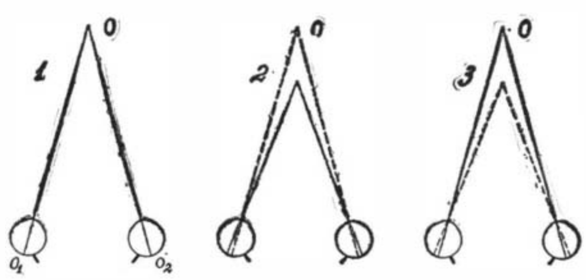
The product has been subjected to prolonged searching tests by eminent Swedish, Danish, Austrian, and German scientists and bacteriologists, who have pronounced an eminently favorable verdict thereon. Possibly the most striking of these investigations were those carried out by Dr. Th. Begtrup Hansen at the Silkeborg Tuberculosis Sanatorium in Denmark in comparison with raw and pasteurized milk. The results of these observations were completely satisfactory. It was found that the patients partook of the Buddeized milk readily and found it agreed well with them; it was well absorbed and possessed good nutritive value; and in certain cases of gastric and intestinal disease agreed better with the patients than pasteurized milk, while no ill effects arose from the method of sterilization. Its greatest advantage, however, was its sterility, while the fact that it insured the destruction of tubercle bacilli in mixed milk from several cows, such as ordinarily exist in trade milk, i. e., that generally provided for the public, was especially commented upon.

WHY DRUNKEN MEN ALWAYS SEE DOUBLE.

The first answer to this is properly that they do not; for in order to see double, one must have two good eyes with accompanying sets of nerves and cerebral organs; and as there is nothing to prevent a one-eyed person from getting drunk, all drunkards do not necessarily see double.

Having, however, made this restriction we may consider the causes of seeing double in drunkards or others; and incidentally touch on why it is that we see at all.

The eye resembles in many things a photographic camera. There is a chamber which receives light only through a convex lens, having a diaphragm in front thereof; the interior surface is dark, and there is a receiving surface for the image. Furthermore, within certain limits the distance between the lens and the receiving surface is adjustable to suit the distance of the object depicted, and the opening in the diaphragm in front of the lens is adjustable in diameter. The lens makes on the receiving surface an inverted and diminished image of the object seen. This surface is very complicated; although the layer (itself the innermost of three forming the wall of the camera) composing it is only about 0.4 millimeter equaling say 0.016 inch in thickness, it is made up of no less than ten layers. First comes a layer of pigment; then a



layer composed of alternate rods and cones, or tenpin-shaped bodies, lying radially; then a layer of a sort of skin, then one of grains; then one of fibers; as the eighth coat comes a layer of gangliar cells, then one of nerve fibers, and at last the inner skin; all these within a thickness of about 1/60 of an inch. The compound layer is in communication with a certain portion of the brain by means of a nerve, which starts from a point between the axis of the eye and the nose, and crosses the nerve coming from the other eye, so that the nerve of the right eye goes to that particular portion of the left half of the brain which is devoted to the sense of sight, and that from the left eye goes to the right side. Where the axis of each eye cuts the receiving surface (called the retina) there is a point that is specially sensitive to sight. Where, however, the nerve itself enters the eye and spreads out to form the retina, the eye is perfectly blind.

When we wish to see distinctly, we automatically so adjust the eyes laterally, by converging them more or less (they are always to greater or less extent convergent in the case of normal eyes) that the image formed in each falls upon the sensitive point of the retina. If the object is too far off to enable us to get a distinct image thereof in either eye, we can do one of several things. We can bring it nearer, so as to throw its sharpest image on the retina instead of before it; or we can by contracting the eye muscles bring the retina nearer the lens; or we may use a concave lens to throw the image farther front in the eye; or, last of all, we may do with the eye what we may do with a camera—reduce the convexity of the lens itself.

Both eyes may be moved either upward or downward, or to the right or to the left, in the plane in which they lie. They may also be made more or less convergent; but it is impossible to direct one of them upward and the other downward. If we converge them so that the two images fall on the sensitive point of the corresponding retinas, we get in the brain a sharp image. If, however, from any cause, we are not able to move the eyeballs so as to have this image fall on the respective sensitive points of the retina, we see double. This is shown in the annexed sketches, in which Fig. 1 represents the position of the two eyes as properly fixed on an object O, the images O_1 O_2 coming at the sensitive point of each retina. In Fig. 2, however, the eyes are too much, and in Fig. 3 too little convergent; so that in either case the brain sees two objects instead of one.

This seeing double can be caused by temporary or permanent paralysis of either the inner or the outer lateral muscles of the eyeballs. For permanent paralysis there may be any one of several causes; for temporary paralysis also, among these latter being the excessive use of alcohol or of tobacco, or of both together, or the effect of poison, as for instance lead. Under the influence of strong drink, the controlling muscles of the eye, like others of the body, are not under command; hence, some drunken subjects stammer in their speech, others stagger in their walk, and others see double.

One-third of All Proper Names Derived from Parts of Speech.

The surnames which appeared upon the schedules of the First Census show a very great preponderance of English and Scotch names. A large proportion of all the names are adaptations of nouns, verbs, and other parts of speech, and in general represent the simplest Anglo-Saxon terms. Inspection of the nomenclature of the surnames of the First Census suggests the preponderance of the distinct Anglo-Saxon element. About 30 per cent of the entire population was represented by names adapted from parts of speech. Upon a classification, according to the meaning of the names, it appears that the origin of practically all was connected with daily life and surroundings. Classified by meaning, most of the proper names derived from parts of speech which appear in the First Census schedules fall under the following topics: Food, eating, drinking, clothing, sewing materials, household utensils, nations, towns, cities, nationality, kinds of men, condition, appearance or state, bathing, ailments and remedies, occupations, parts and conditions of the body, relationship, games, religion, music, literature, kind of house, building material, belongings, surroundings, furniture, tableware, merchandise and commodities, money, color, objects of nature or features of landscapes, trees, plants, and flowers, fruits, nuts, weather, beasts, birds, flying and creeping creatures, the ocean and maritime subjects, war, death, violence, and time.

The Current Supplement.

"The Making of a Cold-Drawn Steel Tube" is the title of an article which opens the current SUPPLEMENT, No. 1740, and which shows how it is possible to produce homogeneous ductile steel tubing in large quantities. "Wireless Telegraphy in Navigation" is discussed from the standpoint of the recent process invented by Lieut. Lair of the French navy. Sir Oliver Lodge writes illuminatingly on "Chemical Affinity." The Bottomley seed and soil nitrogen bacteria for leguminous crops is explained by our English correspondent. F. W. Henkel discusses the question as to whether or not there is a trans-Neptunian planet. Prof. E. Rutherford's brilliant paper on "Some Cosmical Aspects of Radioactivity" is concluded. The name of F. W. Lanchester is known to everyone interested in the coming science of aeronautics. It was Mr. Lanchester's studies of bird flight that first interested the late Samuel P. Langley in the matter of solving the problem of artificial flight. In the current SUPPLEMENT appears the first installment of an excellent paper by Mr. Lanchester on "The Fight of Birds," in which he sets forth with rare skill and clearness the mechanics of natural flight. Dr. M. Dorset contributes a good paper on "Some Common Disinfectants." Lovers of musical instruments will read with interest Juseppe Marangoni's history of the double bass violin. This is the first time any attempt has been made to trace the history of the largest of orchestral string instruments. Some illustrations of old-time double basses accompany Mr. Marangoni's paper.

One of the electric railway systems of Washington, which runs through a fruit district, is carrying on a campaign of instruction to the owners of the orchards. A special train runs over the line to carry experts who lecture on the best method of raising and handling fruit. The schedule of this train is published in all the stations along the line so that the lecturers will have a good audience at every stop. On a recent trip of this special train, professors from the University of Idaho and Washington State Agricultural College lectured to large audiences along the line and gave practical demonstrations of spraying, pruning, and planting fruit trees.