the auditor of Poweshiek County, who has furnished me many facts and figures, I learn that trappers speak of a white variety, counted by them particularly wary and hard to catch.

One caught in Grinnell was marked with hinder parts white and fore parts brown.

To those who have not seen the pocket gopher, it may be well to state that they are a small rodent of about the same color as, and perhaps a shade larger than, the domestic rat.

They have no external ears, have small bead-like eyes, a short tail, and powerful fore-legs, armed with strong claws for digging; and, what is very characteristic, they have large extensible cheek pouches or pockets. The presence of the gopher is made known to you by its mounds of earth, about the size of large ant-hills, rather than by its own presence, for it is rarely indeed that they are seen.

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## WIND-STORMS AND TREES.

TWO very severe wind-storms have recently swept over Iowa which injured trees of all kinds, but especially some of the conifers. I have no record of the velocity of the wind in the storm of several weeks ago. It was less severe, however, than the one of last Friday. According to the weather office observations as reported in the *Iowa State Register* of April 2, the maximum speed was sixty-four miles an hour at 2 P.M. in Des Moines, Iowa. The gale started at daybreak, "By 11 the wind had reached an average velocity of fifty miles an hour, and it was approaching the danger-point. It kept gradually increasing until 2 P.M., when the wind-gauge at the top of the Federal building swung around to an average velocity of sixty-four, with sudden flaws above the 100-point." The weather observer, Mr. Schaffer, states that at the period of its greatest velocity the amount of pressure thrown against houses, glass, etc., was fifty pounds per square foot. The wind on Friday came from the south-west, and later shifted to the west. The severe wind-storm of several weeks ago came from the north. As usual in storms of this kind old and poorer branches fell readily, and trees suffered severely in consequence of the injury because of the many open wounds. I shall give a few illustrations how different trees were affected. On the college grounds, there are cultivated a large number of European as well as native trees. A few old trees were blown down, but these were partly decayed in the interior. Both gales seem to have been hard on some of the conifers. In some cases the ground was strewn with green leaves and short branches. In point of greatest injury Norway spruce (*Picea excelsa*) stands first. The branches broken off varied from one to six years' growth, mostly two and three years. It is also noticeable that many of the branches did not break at the beginning of the year's growth but in the middle. In many cases the branches are stripped of their leaves in the direction of the wind, — south, west, and north sides of the tree. The Scotch pine (*Pinus sylvestris*) is also affected, but in this case branches only, as a rule, were severed from the plant. The branches vary from one to six years' growth, occasionally more, but mostly within this limit. The same tendency to snap off in the middle of the year's growth may be observed. Few leaves were blown off.

Black spruce (*Picea nigra*) stands next. Some branches and leaves were broken off, though not nearly as many as in the other species.

White spruce (*Picea alba*) was also affected, but it seems able to stand the severity of the wind much better than the Norway spruce and Scotch pine. It is followed closely by the Hemlock (*Abies Canadensis*),—injury mostly confined to the leaves. There is only a single tree on the ground, which grows in a somewhat less exposed place than the white and Norway spruce, so that it may not be a fair test.

Red, or Norway pine (*Pinus resinosa*), some branches blown off and but few leaves. White pine (*Pinus strobus*), few leaves, a number of branches.

Balsam Fir (*Abies balsamea*) has suffered less than any of the above, a few branches were blown off.

Austrian pine (*Pinus Austriaca*) and Dwarf Mountain pine (*P. pumilio*) have lost few leaves and branches. The red cedar (*Juniperus Virginiana*) should be classed with it. An occasional branch of *Larix europœa* and *L. laricium* may be found.

On the whole, the deciduous trees have fared better than the evergreens. Some species of willows (*Salix*) have lost many branches. The cottonwood (*Populus monilifera*) and soft maple (*Acer saccharinum*) have lost some branches. Honey locust (*Gleditschia triacunthes*, hackberry (*Celtis occidentalis*), hard maple (*Acer barbatum*), green ash (*Fraxinus viridis*), *Cratœgus punctata* have not suffered.

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## RUSSIAN SUNFLOWER INDUSTRY.

THE sunflower, as a garden plant, has been known all over Russia for many years, but only in certain districts has it been cultivated on a large scale as an industry. The first cultivation of sunflower seed for commercial purposes began, says the United States Consul General, at St. Petersburg, in 1842, in the village of Alexeievka, in the district of Berutchinsk, government of Voronezh, by a farmer who was the first to obtain oil from the seed. This farmer soon found many followers, and the village of Alexeievka soon became the centre of the new industry. The government of Voronezh is even now the chief district in European Russia for the growing of the sunflower. Besides the district of Berutchinsk, this plant is cultivated on a large scale in the districts of Novokhopersk, Ostrogoshk, Bobroosk, Valouisk and Korotoiaks. From the government of Voronezh the cultivation of sunflowers spread to the adjacent governments of Tamboo and Saratov, where there are large fields cultivated with this plant, particularly in the latter government. The people of the province of the Don and the governments of Simbersk and Samara are more or less engaged in this trade, in fact in the entire south east of Russia the sunflower furnishes a prominent product of the farm. Two kinds of sunflower are grown in Russia — one with small seeds, used for the production of oil, and the other with larger seeds, consumed by the people in enormous quantities as dainties. In the district where the seed is cultivated on a large scale, the plant has been continually grown on the same soil for many years in succession, thus producing a special disease of the plant. The sunflower seed is used principally for obtaining sunflower oil, which, owing to its nutritious qualities, purity, and agreeable flavor, has superseded all other vegetable oils in many parts of the country. In general, the cultivation of the sunflower in Russia is considered to be very profitable. At the average yield of 1,350 pounds to the acre, and at the average price of ¾d. a pound, the farmer receives an income of about £4 an acre, and this income can

be increased in those districts where the grower himself engaged in producing the oil from the seed. The substance remaining from the oil manufacture, or sunflower cakes, being used as cattle food, is also a valuable product. These cakes, however, have a comparatively small demand in Russia, but are largely exported to foreign countries, principally to Germany and England. The government of Saratov, for instance, exports about 2,000,000 pounds of sunflower cakes to different countries, where a further quantity of oil is extracted from them before being used for cattle food. The sunflower shells being used for heating purposes, form an article of trade in several districts. The seed-cups are not wasted, but are used as food for sheep. The peasants in the government of Tambov are increasing the cultivation of the sunflower owing to the following reasons. There is a steadily increasing demand at home and abroad for the seed, thus making the industry a profitable one, especially as Russia is the chief source of supply. As above mentioned, the sunflower is cultivated principally for the oil. If the cultivation is made with care, and if proper precautions are taken in drying, cleaning, and pressing, sunflower oil is equal to the French table oil in color, flavor, and taste. At first sunflower oil did not meet with public favor in Russia, but later on, owing to its good qualities and cheapness, it took the place of the oil of poppy seed; but for a long time hemp-seed oil competed with it, owing to the fact that the lower classes, who for many years had used the hemp-seed oil in the preparation of various dishes, and who had learnt to relish it, were not disposed to give it up. Now, however, public opinion has changed, and sunflower oil is preferred by the masses to all other table oils in Russia. The process of oil-making is as follows. The seed being brought to the oil mill, is thoroughly cleaned and sorted. They are passed under millstones, specially prepared for the purpose, in order to release the seed from the shells. After this the seed is properly dusted and put under a press, and, later on, into a mixer, where the seed is turned into a compact mass very much like paste, which passes into vessels heated by steam. From these vessels the paste is taken out and wrapped in a thin web, made of camel hair, and put under a press, by which the oil is squeezed out and conducted by pipes into tanks. The total number of oil mills in Russia was, according to the last account, 104. From this number 85 were applied solely to obtaining sunflower oil. In 24 of these mills steam is used, and in others only manual power. The largest mill is at Saratov, and it produces 1,500,000 pounds of oil annually. There are two kinds of oil obtained from the sunflower seeds. The better kind is sweet, and more expensive, the inferior having a bitter taste. The difference in price of these two qualities is about one halfpenny a pound. The oil remaining from the oil production or the waste, and not used as food, is applied exclusively to certain industries. The sunflower stalks, gathered from the fields, and dried in piles, have entirely replaced firewood; in fact, these stalks are preferred even to pine-wood, producing a quick and hot-flame fire. About 2,000 pounds of such firewood are gathered from an acre of land, thus adding a great boon to a district where wood is scarce. Sunflower shells are also used for heating purposes, not only in private houses, but in large factories as well. They are burned in ovens specially prepared for their consumption. The ashes of the sunflower contain a large percentage of potassium. The experiments of Hermbstedt have proved that 1,000 pounds of dried stalks yield 57.2 pounds of ash; and from 1,000 pounds of ash are obtained 349 pounds of the best potassium. As a food for cattle, sunflower cakes are looked upon as the best in Russia; they are considered better even than hemp or rape-seed cakes. According to chemical analyses, the sunflower cakes from the Government of Saratov contain: Azotic substances, 42.31 per cent; oil, 14.7 per cent, and ashes, 5.12 per cent. The dried seed-cups, if ground, are used in many districts as food for cattle, and particularly for sheep, with great success.

## FLEXIBLE TUBING.[1]

AT a meeting of the London Society of Arts, held on Wednesday evening, March 23, Mr. G. R. Redgrave gave an interesting lecture upon the subject of flexible tubing. After a passing reference to rubber tubing, leather hose, and similar ancient forms of this tubing, he proceeded to describe the flexible metallic tubes which had been invented by Mr. E. Levavasseur. This gentleman is, it appears, a jeweller, and many years ago invented necklaces and bracelets made out of tubes produced by coiling together two strips of gold and silver. One of these strips had a channel section, and the other, of a semicircular section, served to unite adjacent coils of the channel section together, and form a complete tube. About six years ago the idea occurred to him that flexible tubes could be formed on the same principle out of strips of metal, the tightness of the joints being secured by a strip of rubber. Many different forms of section for the strip were tried, the first being a sort of double channel section with which a great amount of flexibility was secured, but the heavy strain thrown on the rubber caused it to wear rapidly. In a later form the strip used was somewhat of the shape of a figure 8, which gave a more perfect interlock, so that the disruption of the tube could only be effected by the strips splitting under the strain. The rubber, too, was better protected and there was less chance of its working out. But this tube was less flexible than its predecessor, and suffered from the same defect in that the tightness of the joint depended upon a perishable material. Other forms of strips were tried in succession, and finally one has been arrived at in which a perfectly tight joint is secured without the use of any packing whatever, metallic surfaces only being in contact. The tubes thus formed are found to be tight under both high and low pressures, the form of the strip being such that the greater the pressure the tighter the joint. These tubes have been successfully used for conveying petroleum oil gas at a pressure of 300 pounds per square inch, and a small tube $\frac{3}{4}$-inch in diameter formed out of a strip 14 millimetres wide and .6 of a millimetre thick, only yielded at a pressure of 2,000 pounds per square inch. The tubes, moreover, will stand a partial vacuum. Their flexibility is such that a $\frac{5}{16}$-inch tube can be bent to a radius of 4 inches, and a one-inch tube to one of 6 inches. The tubes, moreover, can be trodden on with impunity, and would almost stand a cart being driven over them, a load of 18 hundred-weight on one inch of bearing surface being required to compress a 1 inch tube to an oval section. The difficulties of manufacture have been considerable, long flexible strips of a soft and uniform metal being required. Thus the $\frac{3}{4}$-inch tubes are made out of a strip 14 millimetres wide and .6 of a millimetre thick. At present such strips cannot be obtained of a greater length than 6,000 feet to 7,000 feet, and as 10 feet of strip are required for each 1 foot length of tube, the greatest continuous length that can be produced at the present time is limited, but it is thought that by means of electric welding this difficulty will

[1] From Engineering.