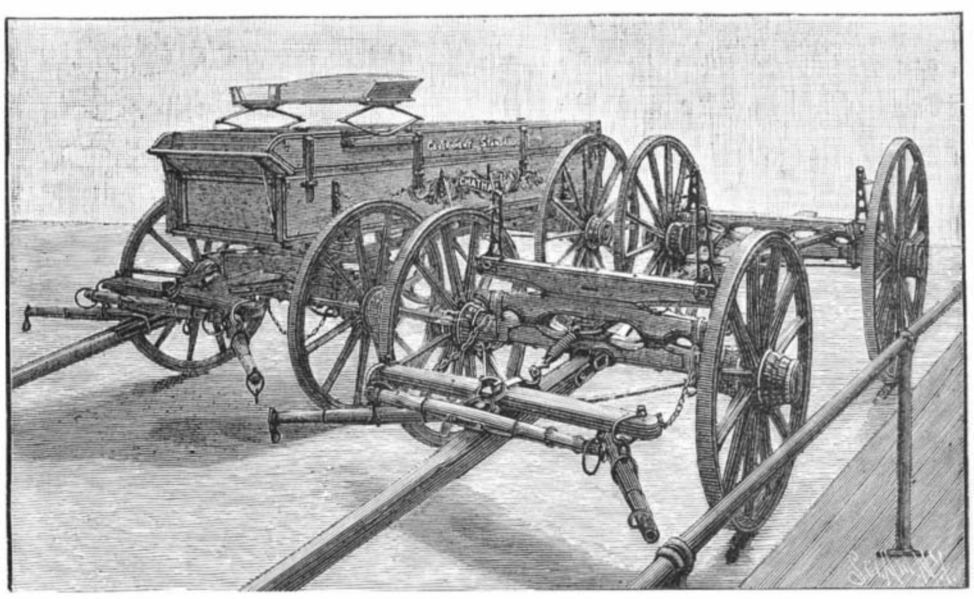
HEAVY WAGONS SHOWN AT THE FAIR.

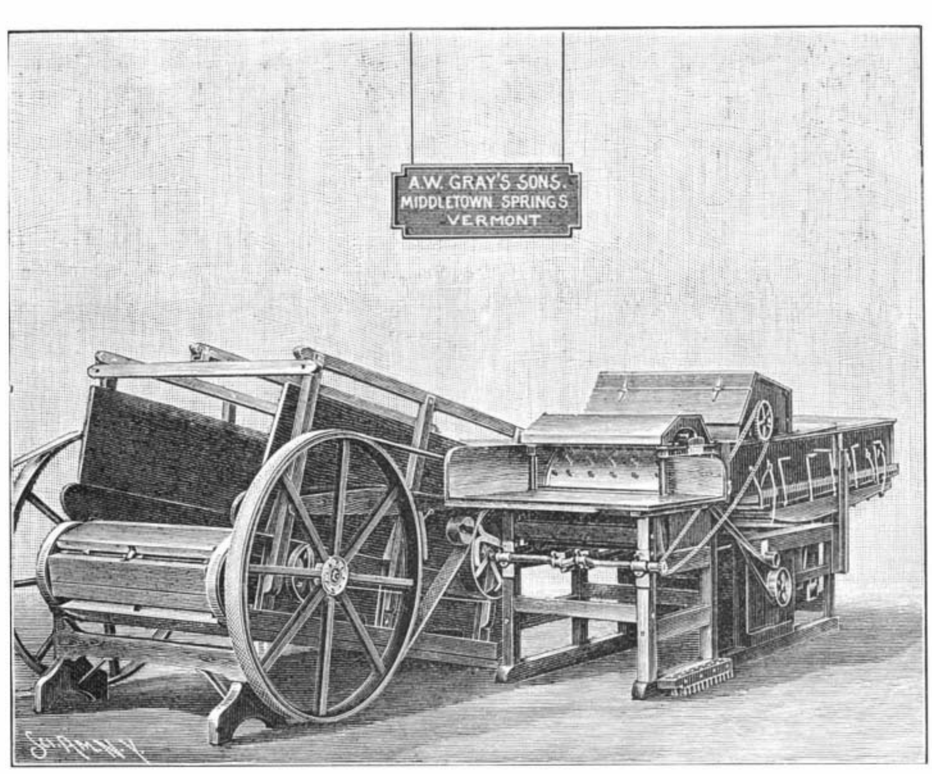
In the display of wagons for heavy work at the Exposition, the exhibit of the Chatham Manufacturing Co. (Limited), ofChatham, Ontario, Canada, occupies a prominent position, and has attracted much attention. These wagons, though not so tawdrily got up as some, are among the best and most mechanically constructed of any wagons shown for the hard usage such wagons get in actual service. The exhibit consists of one "Chautauqua Giant" farm wagon gearing and one complete "Chatham Giant" wagon, there being used on both the peculiar style of arms or thimble skeins patented by Mr. D. R. Van Allen, the president of the company. This thimble skein or arm strengthens the axle through what was formerly its weakest portion, and practically does away with the old time breaking point of axles, also dispensing with the use of truss rods. The arm admits of the sand board and front axle and bolster and hind axle being combined, forming a complete and solid truss, the one reacting upon the other in such a way as to strengthen all the parts. By means of this improvement the wagons of the company adapted to carry the heaviest loads are yet so light that the gearings weigh only one-eighth of their carrying capacity, and the three by ten inch cast thimble skeins or arms have carried five to five and a half tons without straining. Another noticeable feature of this display is the Simpson patent malleable adjustable stake, used on wagons or farm trucks not intended for logging. These stakes on narrow track wagons are adjustable from thirty-eight to forty inches merely by slackening two nuts to a stake, admitting of very much stronger wagon bolsters, because there is no big mortise through the ends, and the iron plating on top of the bolsters runs from end to end. The upper box and seat of the complete wagon is quarter-sawed sycamore, and the lower box is quarter-sawed white oak.



THE WORLD'S COLUMBIAN EXPOSITION—EXHIBIT OF HEAVY WAGONS OF THE CHATHAM MANUFACTURING COMPANY.

A. W. GRAY'S SONS EXHIBIT OF "HORSE POWERS."

The exhibit made by A. W. Gray's Sons, of Middletown Springs, Vt., at the World's Columbian Exposition is an especially fine one in a line in which manufacturers in this country have always held a leading position. It comprises horse power, grain thrashing and wood sawing machines, the horse powers being used for running a wide variety of machinery in wagon shops, bakeries, dairies, for pumping, grinding apples for cider, cutting feed for stock, operating grist mills, etc. The planks of the platform on which the horse walks, in the horse powers, are fastened together on the under side by a steel gear, connected by steel rods, which serve as axles for rollers, moving with the platform, the gear meshing with pinions on a shaft from which power is furnished to the various kinds of machinery. The speed of the band wheel with horses walking ordinarily fast is ninety revolutions per minute. These horse powers with grain thrashing outfits may be conveniently moved from place to place to do thrashing on different farms as desired. Drag saws and machines for sawing logs, and circular saw machines, adapted for most convenient and efficient operation by these horse powers, have also been for many years a leading specialty with the firm, which was established over fifty years ago, the present proprietors having been brought up as boys in the shop. Besides having a practical familiarity with every part of the work, they have invented and perfected many of the devices in use in the machines. The illustrated catalogue which they send on application gives full detailed information of the construction and operation of the machines.



THE WORLD'S COLUMBIAN EXPOSITION—"HORSE POWERS," THRASHING MACHINES, ETC., SHOWN BY A. W. GRAY'S SONS, OF MIDDLETOWN SPRINGS, VT.

The United States Leads.

The United States is now the leading manufacturing country in the world. We have far outstripped all other nations in the magnitude of our industrial operations. It is almost incomprehensible that in ten years the increase in capital invested in manufactures should exceed the total invested only twenty years ago. The value of our manufactured products increased about 60 percent; add 60 per cent to the output of 1890 and we would have $12,700,000,000 in 1900—but that is too much to expect. The same rate of growth in mining interests in this decade as in the last would make our mineral output in 1900 nearly $1,200,000,000, while a smaller percentage of gain, only equaling in volume the total increase in 1890 over 1880, would bring the figures to over $950,000,000. If our coal miners add to the output of 1890 as many tons as they added to that of 1889, ignoring in this the percentage of growth, 317,000,000 tons will be the production of 1900. No other country in the world ever advanced in population and wealth as the United States is doing. The progress of the past shows no signs of halting. In fact, the development of our foreign and domestic trade and commerce and of our industrial interests is steadily broadening out.

Contrast our position and condition with Europe; with resources surpassing those of all Europe, with wealth-creating possibilities in soil, minerals, timber, and climate unequaled by Europe, and practically without limit to their profitable utilization, with a homogeneous population of 65,000,000 people unvexed by the arbitrary regulations of half a dozen different governments, and free from the drain of standing armies, the United States justly commands the wonder and admiration of the world.

Great Britain is no longer the manufacturing center of the world, for we have taken the foremost position in that line. Its vast iron and steel business is yearly increasing in cost of production, while ours is decreasing. It cannot meet the world's growing demand for iron and steel, because it cannot increase its production to any great extent. It produces less pig iron now than it did ten years ago. Much of its ore it imports from distant countries. Its cotton is all imported. It spends about $750,000,000 a year for foreign foodstuffs. On the Continent every nation is burdened with debt, and none of them can hope to pay off its obligations. Measured by their natural resources and advantages for continued growth against their debts, and the many disadvantages under which they labor, they are practically bankrupt. In all of them the cost of production and living must steadily increase. In the United States we have scarcely laid the foundation for our future greatness. In natural resources we are richer than all of Europe; we are paying off our debts faster than they are due, we have barely scratched the ground in the development of our mineral wealth, and our agricultural growth can scarcely be limited.—*Engineering Magazine.*

Manila Sugar.

In a paper on the Philippine Islands by Mr. H. A. McPherson, and published in *The Sugar Cane*, it is stated that the canes of that country are very rich, and that with better appliances the product, which is now very poor, might be made equal to any in the world. Agriculture is carried on almost entirely on the metayes or share system, the owner of the land providing the implements, animals, machinery and seed, and the produce is divided between the owner and the laborer, and it is said that the latter rarely gets a fair share. The laborer is generally in debt to the landlord for advances and there is usually a balance against him at the end of the year. The landlord, however, also suffers in the same way, he working on borrowed capital, advanced by local capitalists.

The cultivation of sugar is practically confined to four islands, Luson, Panay, Negros and Cebu, the first supplying what is known as Manila sugar, the second and third Ilo Ilo and the last Cebu sugar according to the ports from which it is shipped. None of the sugar is of very high grade, owing to the absence of high class machinery. Each district produces what is called dry and wet sugar, the former being divided into various grades. The Manila sugar is what is called clayed, which means that after the juice is boiled in open pans the mass is poured into an earthenware receptacle like an inverted cone and a thin layer of liquid mud is then put on top, the moisture of which gradually percolates through the mass, washing the molasses from the crystals and carrying the bulk of it through an aperture at the bottom into earthern jars below. After standing for some weeks or months, the sugar is ready for further manipulation on the dry grounds, which are entirely in the hands of the Chinese, who purchase the raw material from the planters. When they are opened the sugar is almost white at the top and gradually becomes darker toward the bottom; the white and dark sugars are mixed together in certain proportions according to the grade which is to be produced. It is then spread on mats to dry in the sun, for which one day is sufficient in dry, hot weather. When dried, it is packed in mat bags and is ready for shipment.

The Brown Wire Gun.

First Lieutenant G. N. Whistler, U. S. A., gives some interesting details in regard to the Brown segmental wire-wound gun, over the tests of which, on August 25, at Sandy Hook, he presided. The muzzle velocity was 2,875 foot seconds. The muzzle velocity of 2,875 feet per second, Lieutenant Whistler says, shows a muzzle energy of 3,557 foot tons, or 856 foot tons per ton of gun. This is the highest record, he declares, ever obtained with any gun. The muzzle energy per pound of powder is 169 foot tons, according to Lieutenant Whistler, and which, he says, has never been exceeded so far as he knows in a 45 caliber gun under similar conditions of loading. The gun which was tested fired a projecilte weighing 62 pounds. The gun is a 5 inch weapon, 45 calibers long. This is 5 calibers longer than the most high-powered ordnance rifle now in use in the navy. Long calibers are unhandy, particularly at sea; but the increased calibers length insures a longer and more thorough burning of the powder, so that the chances of unignited grains of powder being thrown out are reduced to a minimum. The record of the Brown wire gun, so far, shows that the projectile fired with Leonard smokeless powder would penetrate 16·08 inches of wrought iron.

IN New York all the bonded warehouses are at present packed solid with foreign goods, waiting the improvement of the times, there being now comparatively little demand for such merchandise.

Some Egg Hatchings.

BY C. H. BENNETT.

Some years since, by way of recreation, I became interested in microscopy, and, having secured a suitable outfit, I decided to turn my attention along the line of entomology and kindred subjects. Having a wide-range battery of objectives, including several high powers, I was prepared to observe the minutest forms of organic life, and had soon trespassed (my work was so unsystematic and unscientific that I can but call it trespassing) on the field of insect oology. My ambitious watchfulness soon made me quite expert in gathering and mounting a variety of eggs, ranging in size from silkworms' to mosquitoes'. Each new acquisition yielded a rich harvest of delight, for my microscope revealed a diversity in size, form, color, and markings fully equal to those larger varieties we are accustomed to find in the nests of birds.

I had frequently noticed on the flanks and legs of horses that were not thoroughly groomed a profusion of bot fly (*Æstrus equi*) eggs, and, awaiting the proper time (August), I picked from the legs of a patient nag a number of hairs each ornamented at the end with one of these minute yellowish specks, with a view of submitting them to microscopic examination as a means of satisfying my curiosity. No sooner had I focused my instrument on these almost invisible objects than they instantly developed into forms of most marvelous beauty.

So entirely unique were they, differing from anything that had previously come under my observation in every detail, that I at once determined to mount them for preservation. I therefore carefully folded them in a bit of paper and placed them in my pocket, where they remained a month before I found leisure to mount them. On removing them from the wrapper I once more placed them under the microscope, that it might assure me they were just as I left them a month before.

Convinced that they were in their normal condition, I then proceeded to arrange them in an orderly position before sealing them in their crystal tomb, and, to make it less tiresome for my eyes, I condensed the light of the lamp on the objects with an ordinary reading glass.

While thus manipulating them I was annoyed by a slight motion among the hairs to which the eggs were attached, and turned my breath away, under the impression that it was the cause of the disturbance. This, however, seemed to make no difference in the embryonic commotion, and for a moment I was thoroughly mystified.

Without waiting for further developments of a spiritualistic nature, I again appealed to my microscope to satisfy my curiosity. Placing the whole collection under a two-thirds objective, I was inexpressibly delighted to see fully one-fourth of the larvæ in the very act of opening their shells. It instantly occurred to me that in using the reading glass in arranging the eggs I had not only condensed the light, but also the heat of the lamp sufficiently to produce the wonderful result which my faithful microscope had revealed.

It is needless to add that I lost no time in hermetically sealing the objects of my delight in the glass cells prepared for their reception, where all signs of life soon ceased; and, as a result of this simple accident, I have a slide showing part of the eggs unopened just as they were gathered, while others show the grub with his head and half his body protruding from the shell.

It may also be interesting to the young student of nature to know that the egg of the bot fly is not broken at all in hatching. The grub simply pushes a cap or lid from one end of his little cell and crawls out. Indeed, the shells are so strong that I have found it quite impossible to crush them between thumb and finger.—*The Outlook.*

Animal Vocabularies.

A good deal has been said about the probable existence of definite vocabularies in the language of the lower animals, and I believe one has gone to Africa to study simian speech. This is all well enough, but there is no need of going beyond the barn yard to hear a definite animal vocabulary of a considerable number of words. Hear the rooster's warning cry when he sees or hears indications of danger. It is a definite sound, and perfectly understood by every hen and chick. Drop food to the mother hen. She quickly inspects it, and if approved, tells the little ones to eat, by uttering her well known "Coot, coot, coot!" If she decides that it is not fit to eat, she as plainly tells them to let it alone. The other day a green worm fell from a tree near a brood of chickens. Every chick ran to seize the morsel. The mother gave one quick glance at the insect and said, "*Skr-r-r-p!*" Every chick stopped instantly. But one willful child, loth to believe his mother's assurance that it wasn't fit to eat, would make him sick, etc., started a second time, to pick up the worm. "*Skr-r-r-p!*" commanded the hen sharply. Even the willful child obeyed this time, and the whole brood walked off contentedly. Discuss as we will the particular reason for the hen's cackle before and after laying, the fact remains that it is a definite utterance, as plainly understood by both gallinæ and homines as any expression in human speech.

My horse has a low whinny which means "water," and a higher-keyed, more emphatic neigh means food. When I hear these sounds I know as definitely what she means as if she spoke in English. This morning, passing along the street, I heard that same low whinny and, looking up, saw a strange horse regarding me with a pleading look. I knew he was suffering from thirst, and no language could make it plainer.

The language of the lower animals is not all articulate. It is largely a sign language. The horse does a deal of talking by motions of the head and by his wonderfully expressive looks. He also, upon occasion, talks with the other extremity. A peculiar switch of the tail and a gesture, as if threatening to kick, are equine forms of speech. The darky was not far wrong who said of the kicking mule, "It's just his way of talking!"

The dog can not only "look volumes," but can express whole sentences by wags of the tail more readily than can the waving flags of the signal corps. All that is necessary is to learn his code. We expect our domestic animals to learn our language, and punish them cruelly if they fail to both understand and obey our commands; yet, notwithstanding our higher intelligence, we fail to learn their language, by means of which we might better understand their wants and dispositions, and thus control them by kindness and sympathy, instead of by harsh and arbitrary treatment. I see horses passing along the street, which are saying by every look and motion that they are suffering acute torture from a too short check rein. Their drivers are often people who would be shocked if they could comprehend their own cruelty. But they do not understand horse language, and some of them do not seem to have horse sense.

The language of animals is a neglected subject. The facilities for its study are within the reach of all, and no previous preparation is required. The study can be pursued without interfering with other occupations, and even a little systematic observation will bring large returns in both pleasure and profit.—*Charles B. Palmer, in Science.*

How to Preserve Cut Flowers.

In the hot, dry days of summer one often finds the flowers in vases, although freshly gathered, in a drooping condition, the result, it may be, of plucking them at the wrong hour, or of improper attention afterward. They who would keep their bouquets bright and vivid throughout the day should rise betimes, for there is no freshener like the dew of the morning, whether for blossom or complexion. Poppies, fleeting and frail, if plucked before the sun has dried the dewdrop at their hearts, and quickly placed in water, will last sometimes for two days without falling, and the same is true of other tender garden flowers. Should the basket of cut flowers show signs of drooping, dip the bunch head downward into the water and give it a gentle shake. This is very efficacious in reviving flowering shrubs brought from a distance, when they become wilted before reaching home.

The Japanese have made a special study of this branch of the art of flower arrangement, and have special rules for different plants. If the wistaria is to be used in decoration, its cut stem is burned and then immersed in spirits. The hydrangea and the lespedeza should also have the cut ends burnt to charcoal before immersing in water. All flowers which suck up water with difficulty are improved in vitality by treating the ends of their stems with fire or hot water. Land plants derive benefit from burning, but water plants require boiling water.

When the Japanese use the bamboo in decoration, which is their frequent custom, they cut it at a very early hour, four in the morning, and remove the bottom division or knot, leaving the upper division untouched. They then fill the tube with fifty-eight grains of cloves stewed in hot water and seal up the bottom. It is then laid horizontally until the liquor inclosed is cool, after which it is ready for use. When the colored maple is employed, the leaves are immersed in water for an hour before using. The very dark red ones are particularly hard to preserve, but the lighter ones are more enduring. The willow has its cut stems spliced off and then bound up with a drug they call senkin, the branch afterward being left in water overnight.

The morning glory, of which the Japanese make great use, is carefully cut in the evening after the flowers are tightly closed. The sleeping buds are then gently wrapped in soft paper by their dexterous fingers, and this is not removed until the following morning, when the arrangement is made. Begonia Evansiana should be cut in the early morning, the buds removed with a sharp knife, and the whole immersed in water before arranging. Monochoria vaginalis, when cut, should have about one inch of the end immersed in hot water until the color changes, and it must then be dipped deeply in cold water, after which it is ready. The same treatment is applied to Senecio Kaempferi.

The prickly poppy (Argemone Mexicana) is treated by having its stem tightly tied around with soaked paper at a point five or six inches above the cut end. This end should then be burnt with a flame, after which the paper is removed, and the flower is ready to use. The yellow water lily (Nuphar Japonicum) should be selected from a shallow spot, and cut during the heat of the day. A liquid composed of cloves boiled in tea should then be blown into the cut stem, and thus the vitality of the flower is prolonged. Whether this treatment is also desirable for the white pond lily, Mr. Conder, who is my authority for Japanese practices, does not state, but it would be worth while to experiment, if thereby this lovely flower could be longer retained in perfection.

The great Japanese irises, if cut while in bud, will open freely in water, and last longer than if allowed to open out of doors, where the sun promptly wilts their beautiful blossoms and curls the tender petals almost before they have expanded. Nasturtiums, too, suffer from being gathered while the sunlight is hot upon them, but in the early morning, with the dew still damp upon their leaves, they can be found nestling in the shadow with half-open heads just in the right condition for our vases. The fragile heliotrope plucked at this hour will retain its freshness, whereas if culled when the sun lies fierce upon it, it will droop and turn black in the shadiest parlor.

Flowers and plants wilt because water is transpired by leaves and petals more rapidly than it is taken up through the stem. On a dry, hot day leaves and flowers often wilt on the plant. Even when not actually wilted they may contain barely moisture enough to hold them in shape, and when cut under these circumstances they wither at once unless they are put into water instantly, when they will often become more plump than they were before cutting. The stems of plants when cut begin immediately to change structure, and form a callus at the wound, which interferes with the absorption of fluids. It is advisable, therefore, to cut the stems off a second time while under water, so that all the channels through which water rises may be without any obstruction. As there are many substances besides water in the juice of plants, some of these odd Japanese practices may have some value. At least, they are worth trying.—*M. C. Robbins, in Garden and Forest.*

Tempering Mainsprings.

For some time past an Illinois concern has been engaged in a series of experiments in tempering mainsprings with a view of reducing the defects in their manufacture to a minimum. As the result of these experiments, a new process has been devised which is said to make these small springs almost perfect. Thin sheet steel rolled to a suitable thickness for the manufacture of the desired spring is split into ribbons, considerably wider than the finished spring. They are then carefully and solidly wound on arbors against a face plate, so that they resemble solid disks. The face plates are then placed upon a lathe and the edges of the spring ground until all cracks, no matter how minute, have been removed, leaving the wound ribbon a perfectly smooth and polished disk of metal. The other side is treated in the same way, and the result is a ribbon of thin steel perfectly solid on its edges and the same thickness throughout.

As the thickness of a mainspring is between 0·008 and 0·009 of an inch, the degree of heat at which this bit of steel will take a proper temper is a fine point. To secure the even temperature required, a clever electrical apparatus has been invented. A vertical tube, thoroughly packed by asbestos to prevent its being affected by the outer air, is heated by means of an electric current, which is governed by a rheostat to regulate the temperature. An opening at the top of this tube is just large enough to admit the steel to be tempered. At the lower end of the heating tube is placed the chilling bath, which is supplied with oil from a pipe, the flow being steady and even. By an ingenious arrangement, the oil is fed to the bath on both sides of the moving ribbon of steel at the same time, thus subjecting every part of the wire to a uniform chilling temperature.

The metal passes through the heating tube into the chilling bath without exposure to the air, the intervening space between the tube and the chilling medium being covered by a second tube with an air-tight connection, which forms a muffle. In this way there is secured a ribbon of steel without cracks on its edges or scales on its surface, perfectly even and straight and of uniform temper. As the wire is heated by radiation and has no opportunity to become oxidized, "pitting" is altogether prevented. Experts speak highly of this new process, and it would seem as if the days of the perfect watch spring were near at hand.—*Bos. Jour. Com.*

OLD SPRUCE FOR VIOLINS.—The ancient Hammond house in Marblehead, Mass., is being torn down, and some of its spruce timbers, which have been protected from rain and wind for more than 200 years, are being eagerly sought after by violin makers for use in the manufacture of their instruments.