

INGENIOUS WATER-WHEELS.

BY WALDON FAWCETT.

Probably the most ingenious water-wheels in the world are those that are used for irrigating purposes in the State of Nebraska, in which State, as in other portions of the Great Plains region of the West, the principal source of wealth lies in the soil. The entire section is characterized by exceptional fertility, and the agricultural possibilities would be simply boundless were it not for the insufficiency of rainfall. The strange forms of water-lifting apparatus to be found in the West are largely the product of that necessity which has ever been the mother of invention. Frequently the farmer has found that a water-lifter of some sort was needed in each field, or at every well on the farm; but the aggregate cost of such an installation, combined with high freight rates, has precluded the possibility of the use of factory-made windmills and other too-costly devices. However, ready makeshifts of one kind or another have solved the problem. Native lumber is cheap, and inasmuch as no excessive amount of work is required, an irrigating equipment that meets every need can be supplied at a very moderate outlay.

There are in use on the farms west of the Mississippi almost innumerable different forms of water-lifters. These include the windlass, hand pump, windmill, horse power, gasoline, petroleum, and steam engines, endless chain buckets, current wheels of all sizes, Archimedes screws, jacketed screws, running at high speed, etc. The endless chain and bucket, of which there is a great variety of designs, is an economical and successful water-lifter that is in extensive use, possibly partly because it can be readily taken down and set up again and is not easily injured. This class of apparatus is especially adapted for short lifts. An ingenious water elevator is in use on the farm of John W. Karr near Benkelman, Neb. The apparatus was put up at very moderate expense, the chief component parts being an old link-belt elevator and a second-hand horse power with the necessary tumbling shaft. The well from which the water is taken is about 8 feet in diameter at the bottom, tapering to 5 feet above, and is tightly curbed with boards. The lift of water is not more than 14 feet, and the two horses have no harder work in lifting 27 cubic feet of water per minute than they would have in plowing. The mill has a capacity of fully 40,000 cubic feet of water per day, and this serves to irrigate more than a dozen acres of ground. A similar but larger water elevator is that of William James, near Crete, Neb. By

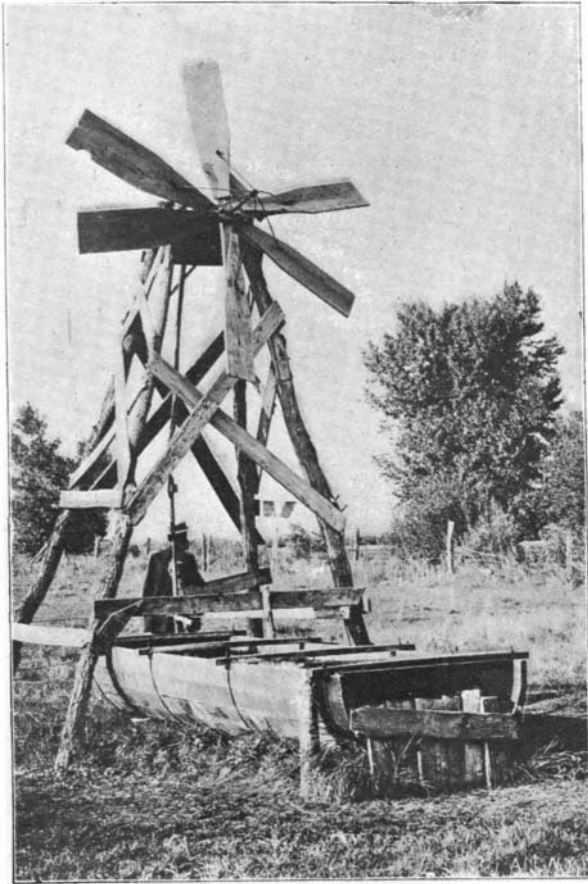
purchasing the ordinary style buckets and chains and adapting them to his own power, this farmer managed to rig up a water elevator capable of discharging 2,000 gallons per minute, the lift being 26 feet. Horse power and steam power are used according

In localities where there are live streams with good currents, the current wheel is very common. Though changed and modernized in many ways the general plan is the same. The force of the current causes the wheel to turn, and in so doing a certain amount of water is caught in boxes or receptacles, carried to the top, and there discharged into a trough. Boxes, paint kegs, barrels, etc., are sometimes pressed into service and attached to the wheel in place of buckets. The larger current wheels which in some cases cost several hundred dollars each, are capable of doing extensive work, and are really engines of economic importance. For instance, the current wheel designed and built by David Hunter near Sutherland, Neb., consists of eight swinging troughs, each of four gallons capacity, hung to the eight paddles. These are emptied in succession as they come to the top. In Sioux County in the same State and on a branch of Hat Creek may be seen a well-built current wheel, which is 30 feet in diameter and capable of irrigating 15 to 20 acres. Farther north, at Hot Springs, South Dakota, there is a magnificent current wheel, 35 feet in diameter, which is said to yield to its owner

a cash money rental of several thousand dollars annually. In the case of this apparatus the stream, although small, is very swift.

Although the name might suggest a separate designation, there are many reasons why windmills, where used for irrigating purposes, should be classed with the regular water-wheels already described in detail. In Nebraska is found the heart and center of the windmill movement. The famous Platte Valley, with its broad expanse and shallow wells, is a veritable windmill area. From Omaha west through the State, a distance of half a thousand miles, the traveler is never out of sight of one or more of these unique and interesting devices. There are almost a score of different types of home-made windmills in general use in the West, including what are known as the Jumbo, merry-go-round, battle-ax, and Holland mills, each of which may have four, six, or eight blades, and an endless variety of turbines.

The subject of novel water-lifters in their relation to irrigation enterprises in the West should perhaps not be dismissed without a word regarding a phenomenal class of wells found throughout a large portion of Nebraska, especially south of Platte River. These wells are known by various names, "blowing," "roaring," "breathing," "singing," or "weather" wells, according to the widely separated communities in which they occur. In some sections of the State, notably in Jefferson County, mounds of

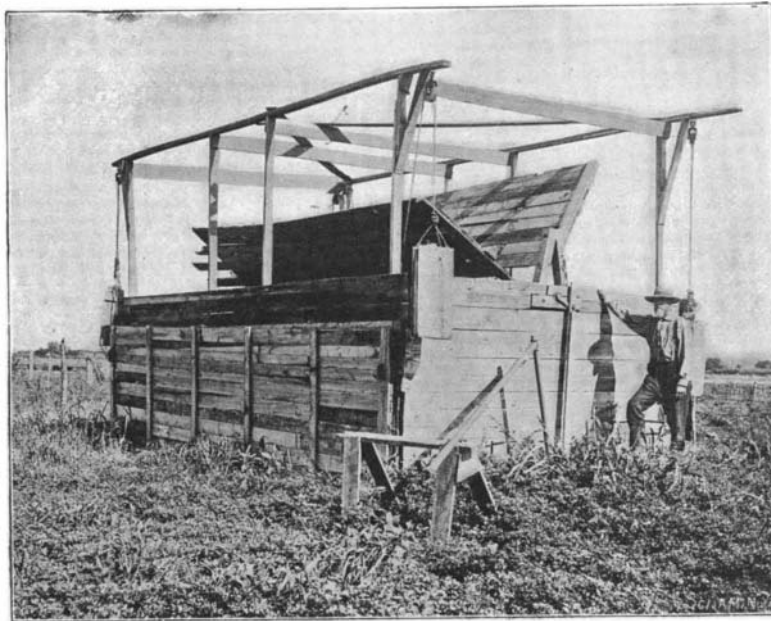


NOVEL WINDMILL, NEBRASKA.



WATER ELEVATOR ON BLUE RIVER, NEBRASKA.

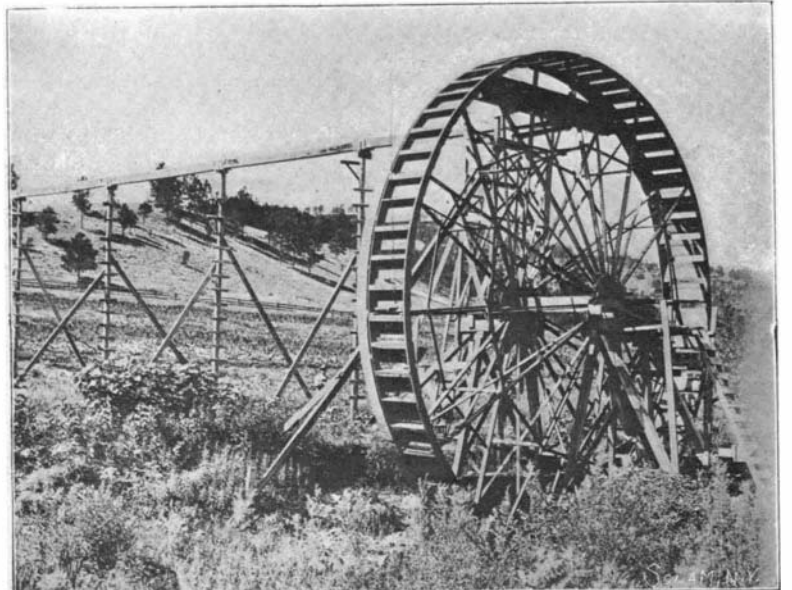
to the amount of water needed. As an example of what may be accomplished by means of these quaint devices, it may be noted that Mr. James first began to irrigate by hauling water from the creek and sprinkling it on the land. Finding this work slow and laborious, he built the elevator above referred to and soon had fifty acres under successful cultivation.



JUMBO WINDMILL AT CUSHMAN PARK GARDENS, NEBRASKA.



30-FOOT CURRENT WHEEL ON BRANCH OF HOT CREEK, NEBRASKA.



35-FOOT CURRENT WATER-WHEEL NEAR HOT SPRINGS, NORTH DAKOTA.

earth are heaped up around the curbing and pump to check the wind, and frequently when snow is used instead the mass is speedily riddled by numerous blow-holes.

There are periods when these wells blow out for consecutive days and an equal period when they are reversed. This is tested with the flames of candles and by dropping paper, chaff, feathers, etc., into the casing to see it blown out with some force or else drawn in. When the wells are blowing audibly the water rises to a higher level than before, and when the conditions are reversed and air is drawn in, the water is lowered. In the case of many wells a reverse of the current is noticed as it is morning or evening and according as the temperature is high or low.

Experience has taught the people that the blowing of their wells is premonitory of an approaching storm, hence the name "weather" wells. The citizens have elaborated many explanations, some of them as interesting as ingenious, but the generally accepted theory is that the phenomenon is due largely to atmospheric pressure. An elaborate investigation to determine the exact character of these wells will, it is expected, soon be undertaken, under the auspices of the United States government.

THE TRUNCATED MAN.

This remarkable person, who was exhibited in Paris at the time of the Exposition, is one of the rare examples of a human being who has been from birth deprived of his arms and legs; he was born in France in the department of Morihan (Brittany), his father and mother being in easy circumstances and living upon a small farm. Both the parents are of good constitution and physically normal. Their son, now about twenty-five years of age, has no apparent trace



THE MANTIS RELIGIOSA—NATURAL SIZE.

of arms or legs, and hence is generally known by the name of l'Homme Tronc, or Trunk Man. Outside of this remarkable peculiarity, the rest of his body does not present any marked variations from the normal; the head is somewhat large in proportion to the body; the capillary system is but little developed, and the head shows a premature baldness. His parents have always taken great care of him, and he lives in a normal way (apart from the use of his members), as none of the essential organs of life are wanting; he eats, drinks, and digests like another person, but if left to himself he would undoubtedly die, as it is impossible for him to move his body in order to procure food. It may be thought that his condition would react upon the mind, and that he would be of a sad disposition and place but little value upon existence; on the contrary, he seems to be satisfied with life. The writer questioned him upon this point and he responded

that he was quite contented with existence; he does not suffer from want of occupation, as might be supposed, as he has different kinds of work to keep him busy. One of his chief occupations is that of making small tables and chairs, and other objects, by nailing together pieces of wood which have been previously cut out for him. One of the engravings shows him engaged

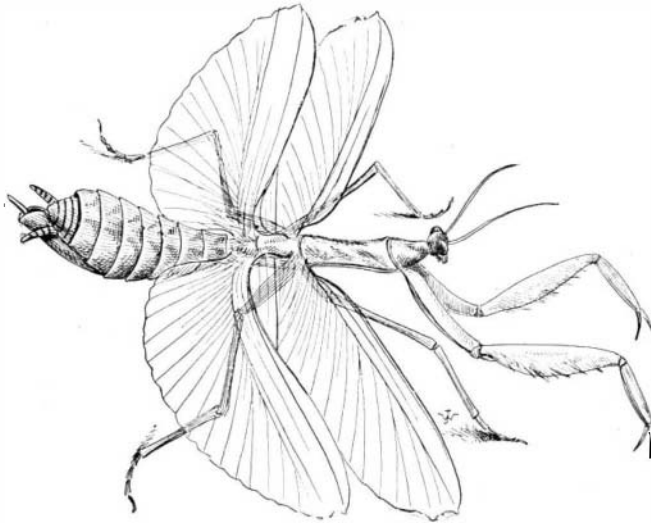


The Toilet.

in this work. He takes a nail in his mouth, plants it in the wood and drives it in very adroitly; he also threads a needle with his mouth, and can take up a glass or metal cup which is given him to drink and empty it without spilling a drop. He seems to be sufficiently intelligent, without being particularly so. At the time of the Exposition he was put on exhibition in a small hall near the grounds. For two of our engravings we are indebted to Lectures pour Tous.

THE MANTIS RELIGIOSA IN ROCHESTER, N. Y.
BY N. HUDSON MOORE.

Some two years ago a farmer living in one of the nearby villages, brought into the city of Rochester some curious growths which he had found on his



MANTIS—NATURAL SIZE.

growing corn. They were identified as egg-cases of a Mantis, and were supposed to be those of the common southern variety, Stagnomantis carolina, although it was several hundred miles farther north than any specimens of this insect had been found before. The following year many more of these cases were found. Indeed, in one part of the city, near a school-house, there were so many of them that the children gathered them as playthings, and a small paper-bag full of these cases was given to a nature student for purposes of observation.

These particular cases were gathered during the winter and kept in a warm room. By Easter Sunday the young Mantids were pushing their way out, and, unfortunately for lack of proper food—flies being scarce—several hundred of these valuable insects perished. In the meantime it had been discovered that these insects did not conform to the descriptions of S. carolina, and some of the cases were sent to Cornell Experiment Station, where the young were raised. To determine accurately what species of Mantis these newcomers were, some adults were sent to Mr. Scudder, an expert, for identification.

Like everybody else he supposed at first that it was the carolina variety out of its range. But, he says, after trying to run it down to Stagnomantis, he turned at last to the Old World tables, and found at once that it was a Mantis, and by comparing specimens, the common European variety, Mantis religiosa.

Unlike most of our European importations in the insect world, notably the cabbage butterfly and Hessian fly, this most recent addition to our fauna is a valuable acquisition. It is insectivorous and destroys

large numbers of grasshoppers, caterpillars, mosquitoes, and flies. It is a most interesting insect to observe, even the egg-case itself being quite a notable affair. This is whitey-brown in color, and has a regularity that is very beautiful. Up the center of one side runs a braided effect, which seems entirely wonderful when you consider how the case is made.

The female selects some twig or stem suitable for her purpose, and emits the "foam-like" material which dries and forms the case. She holds it in position and moulds it into shape with her hind legs and the tips of her outer wings. When you hold it in your hand and observe its structure this seems hardly possible, and the eggs are not put in hit or miss, but in a definite manner.

As may be seen from the illustration the case is formed of many scale-like bands overlapping each other. They do not lie absolutely flat, but stand up a little. Underneath these scales the eggs are placed each in its cell, well protected and quite concealed from view. In our first sketch the young Mantids are seen emerging each from his own cell. They bear no resemblance at first to the mature insect, each coming out wrapped in a casing, and looking like a mummy in its grave clothes. It must take a vigorous effort for each little creature to expel itself, and it then remains quiet for several hours till this first skin is shed. After this is accomplished it appears with its full complement of legs, and looking like a tiny edition of the adult Mantis. Over one hundred and fifty were counted as they came from the case, those eggs deposited last hatching first.

It would seem as if each female had done her duty in making and filling one of these cases, but the same one has been known to make two, and one specimen made three, the last one being small and quite irregular, and then she died.

Like other members of the order Orthoptera (which includes the walking-sticks and grasshoppers), these insects are often difficult to distinguish from the



EGG CASE—NATURAL SIZE.

leaves or bushes when they lie in wait for their prey. The Mantis away from its leafy surroundings is showy and large. Its body is long and slender, the first segment of the thorax being of unusual length. Its front legs are powerful members, armed with stout hairs which assist in holding its prey.

Some of the adults are brown, some a leaf green, apparently without regard to sex. They often remain in the same position for hours, with the front legs raised in the attitude of prayer—hence the name—waiting for the first unwary insect which comes within reach. If the insect does not come within seizing distance they crawl, or

rather slide slowly toward it, and then make a quick pounce, holding the insect firmly in the strong front claws, while it is eagerly devoured. Grasshoppers seem a particularly agreeable diet, and one Mantis will easily dispatch three or four at a meal, beginning at the head and working backward, discarding only portions of the hind legs, wing-tips and some of the internal organs.

We had two of these Mantis in a cage for observation. They lived there peaceably for several days, fed

on a diet of flies and beetles. Just before leaving them for the night several fresh flies were added and matters seemed all serene. Whether a quarrel came up in the night, or whether the fly diet proved unsatisfactory one may not say, but the next morning the green Mantis was monarch of all she surveyed, and in one corner of the cage were a pair of brown forelegs. She probably



Taking an Airing.



Making Toy Furniture.

THE TRUNCATED MAN.