LOCOMOBILE WRINKLES.

One of the artists of the SCIENTIFIC AMERICAN recently purchased a locomobile, and as the result of three or four months' experience in night riding, he has devised a few "wrinkles" which are herewith illustrated for the benefit of our readers.

It is absolutely necessary for the driver to keep a close watch upon the water-glass, for although the fall of the water below the proper level does not by any means involve the destruction of the sturdy little boiler used on these machines, it certainly does not lengthen its term of life. The water-glass is located at the side of the driver and to avoid the necessity of his bending over to look at it, the builders place a small mirror on the dashboard, in which the glass is reflected. While the image is clear by day, it is apt to be a little vague at night, and it occurred to our artist that by the use of a powerful, concave mirror, placed in front of and just above the carriage lamp, a strong ray of light would be thrown upon the water-glass and a brighter image reflected on the dashboard mirror. He used a 2½-inch concave mirror, which was attached to the lamp, in the position shown in the accompanying engraving; the result has been very satisfactory.

It is equally important that the driver should be able to read clearly at night both the steam and naphtha gages, which are carried on either side of the footboard. To render the gages more conspicuous, the white enamel face and black pointer were removed and a black face with white figures and a white pointer, made very much broader and heavier than usual, were substituted. At the same time the carriage lamps were extended laterally from the car to allow their rays to fall more fully upon the gages. The quick reading of the gages was further facilitated by making the pointers with a short steel tail, the balancing of the pointer being secured by weighting the tail with a drop of solder. These changes, like the introduction of the mirror, have proved very successful, and the driver can now watch the water level, the steam pressure, and the pressure in the naphtha tank, without his attention being diverted from his look-out duties as driver.

ILLUMINATING THE WATER-GLASS AND PRESSURE-GAGES OF THE LOCOMOBILE.

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TYPES OF AMERICAN INDIAN BASKETRY.

BY OTIS T. MASON, CURATOR OF THE DIVISION OF ETHNOLOGY IN THE UNITED STATES NATIONAL MUSEUM.

At last, after an almost fatal neglect, patrons of savage American fine art are beginning to appreciate Indian basketwork. It is the only aboriginal art that has not been counterfeited; at the same time, it is more ideal than pottery, since form, technique, and intricate patterns must all be fixed in the imagination before the maker takes the first step.

TWINED BASKETRY.—In this paper attention will be confined to a single class or genus of basket technique, which I have elsewhere called "twined basketry" (Smithsonian Rep., 1883-1884, pt. II., 291,306). There are two genera of basketry:

1. Hand plaited, or woven, on straight foundation.
2. Sewed or wrapped, on coiled foundation.

Woven basketry is in (1) checker, as in the bottoms of common splint baskets of rectangular outline; (2) diagonal, or twilled, as in matting, all about the Gulf of Mexico, and in South America; (3) wickerwork, as in the Algonquian and Iroquoian ware; and (4) twined, or wattled, as will be now explained. Twined basketry has a warp of shoots, prepared stems (called osiers, or splints, arranged radially at the bottom and in more or less parallel fashion on the body. In this respect it resembles wicker work. The weft or filling may be with grass, split stems, or split roots; though, in coarser examples, vines and stems with the bark on are often used.

The weft elements are commonly administered in pairs, though in three-ply twining and in braid twining the three weft elements are employed. According to the relation of these weft elements to each other and to the warp, different types of structures result, which may be named as follows:

1. Plain twined weaving.
2. Diagonal twined weaving, or twill.
3. Wrapped twined weaving.
4. Lattice twined weaving, tee, or Hudson stitch.
5. Three-ply twined weaving.

In every one of these, except number 5, the wefts make a half turn or twine at each space between the warps, as may be seen on modern waste-paper baskets. This twined weaving has had a wide distribution in time and space. At present it is found among the Aleuts, the Alaskan Eskimo, and the Pacific slope tribes down to the Pueblo country, where it suddenly ceases and is seen no more in America. The ancient mound-builders practice it and so did the Lake Dwellers of Switzerland. Some of the African negro tribes also make twined basketry. To each one of the types named a fascinating variety is given by changing the form and administration of the warps; by using stems, splints, filaments or straws for the weft; by varying the distances in warp and weft, by using different colored woods or dyed materials, and by a sort of overlaying or embroidery, which consists in wrapping the warp elements on the outside with colored straws. Shell beads and other pretty materials are also sewed on the surface. The pictures in the text will make plain the five styles of twining. Figs. 1 and 2 are of a Pomo basket received at the National Museum some years ago from Dr. J. W. Hudson, of Ukiah, California.

The ornamentation on the surface, it is said, represents a trail through the mountains. Several types of twining co-exist on this specimen.

PLAIN TWINED WEAVING.—Figs. 3 and 4, in the two rows at the top, show plain twined weaving as it appears both on the inside and the outside. The next three rows are practically the same, only the interstices enclose two warps instead of one, producing an ornamental band. Inside and outside are alike, as in all plain twined ware. Excellent examples of this are the Aleutian wallets, made of wild rye; Haida hats, of spruce root, and many Pomo examples of willow, carex roots, and circes stems.

DIAGONAL TWINED WEAVING.—This type is produced by carrying the wefts over two warps or more, and on the next round alternating the warp enclosed. The technique is shown on the lower half of Fig. 3 for the outside, and on the lower right hand corner of Fig. 4 for the inside. Enlarged illustrations of this twining appear on the left hand side of Fig. 5 and the right hand side of Fig. 6. Good examples of this are to be seen on Haida and Thlinkit basketry, on basket bottles of the desert region of the West, but it blooms out in the Pomo ware, under the name of chuset.

WRAPPED TWINED WEAVING.—I have elsewhere given this the title bird-cage twine, because, as in old fashioned wire cages, the warp forms a lattice work with one of the wefts laid horizontally across the inside, making rectangular interstices, and the other warp is wrapped about the intersections. The technique is well explained by figures 4, 5 and 6. This type of twined weaving is not widespread, being confined on the Pacific Coast between the 30th and 50th parallel. It is seen in Makah, Quinault and Chehatis baskets, in Wasco Sally bags, and, in all its glory, in Hudson's Pomo, under the name of lit. It lends itself most kindly to difficult patterns.

TEE TWINED WEAVING.—This style of twined basketry is confined to the Pomo, of Russian River, California, and should be named after the discoverer of the Hudson type. There are, in fact, two warps and two wefts. The warp consists of vertical stems, as in plain twine, overlaid on the outside by a horizontal stem forming square interstices.

Fig. 1.—Pomo Indian Basket, Russian River, Cal.

Fig. 2.—Bottom of Basket.

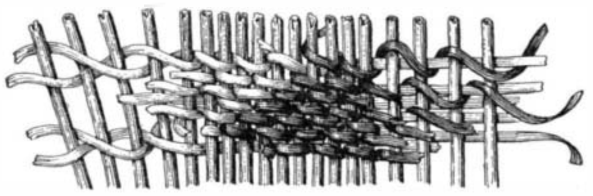

Fig. 5.—Outside Technique and Lit Twine.

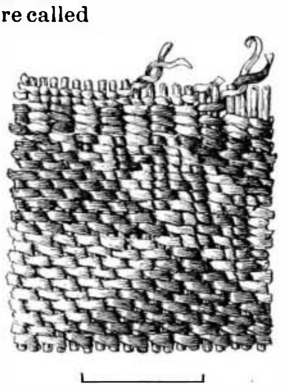

Fig. 3.—Texture of Pomo Indian Basket.

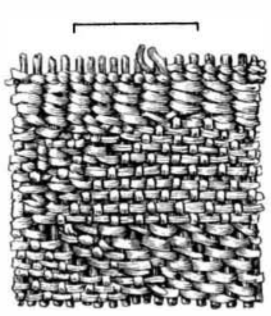

Fig. 4.—Inside Technique.

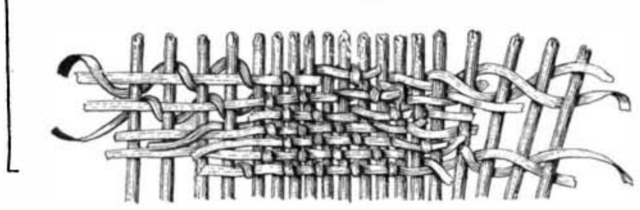

Fig. 6.—Inside View of Diagonal and Lit Twine.

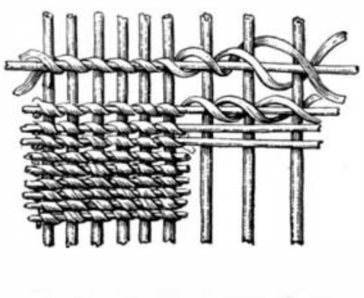

Fig. 7.—Outside View of the Pomo Tee or Hudson Stitch.

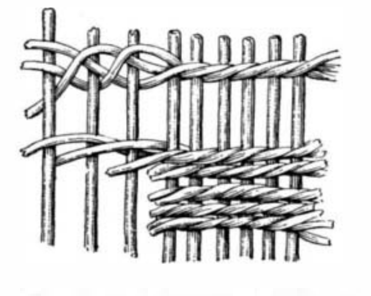

Fig. 8.—Outside View of Three-Ply Twined Weaving.

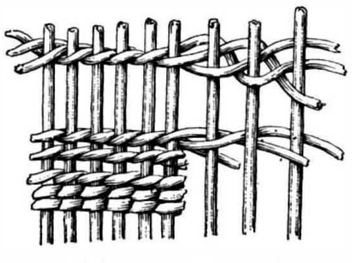

Fig. 9.—Inside View of Three-Ply Twined Weaving.

TYPES OF AMERICAN INDIAN BASKETRY.

These two warps are held compactly together, as shown in Fig. 7, by plain twined weaving with two weft elements. On the inside, tee ware does not differ in appearance from type one, but on the outside the stitches have a wrapped look. On all tee ware the ornamentation is in bands of two colors.

THREE PLY TWINED WEAVING.—The bottom of Fig. 2 is in three-ply technique, which is better set forth in Figs. 8 and 9. It is, in fact, a variety of diagonal work, since two warp stems are necessary to each stitch. The woman holds three weft filaments or splints in her left hand, makes a third of a turn with them, catches with her right hand one weft over a warp stem, then makes another third of a turn, catching a weft over a warp, and so on. The result is plain twined weaving on the inside and diagonal twine on the outside. The process is never reversed so as to bring the plain stitch on the outside, since that would leave a bungling job on the interior. Braided twine is only a fanciful variety of this type and is seldom used. Three-ply twine is found nowhere covering the entire surface of a basket, but it is employed for bottoms and for strengthening bands, especially in the great interior basin.

Members of the Bascuada Fraternity should leave no stone unturned to ascertain beyond the shadow of a doubt for each basket the name of the Indian tribe to which the maker belonged, the botanical and Indian name of every plant employed, and the meaning of every design. Later on we shall discuss plated ware and coiled ware.

* * *

Cost and Limitation of Electric Vehicle Traction.

BY ALTON D. ADAMS.

Though the electric vehicle follows every movement of the operator's hand, it is as truly driven by the power of the great engine at the distant generating station as is the dynamo on its shaft. At each transformation between the engine and the distant moving vehicle a portion of the work done in the steam cylinder disappears as useless heat. The electric generator probably delivers ninety per cent of the mechanical work expended at its shaft in the form of electrical energy. The vehicle battery may return about eighty per cent of the watt hours which it absorbs from the generator, and the driving motor ought to change three-fourths of the energy given out by the battery into motion at the wheels. On the basis of these figures the work done by the vehicle motor should be $0{\cdot}9 \times 0{\cdot}8 \times 0{\cdot}75 = 54$, or fifty-four per cent of the horse power hours delivered on the dynamo shaft.

A knowledge of the relative cost of energy, as furnished by the horse and by the steam engine, is consequently the first step to a correct appreciation of the possibilities in electric vehicle traction.

A fair conclusion from the best data at hand and from experience seems to be that a good horse, traveling at from six to eight miles per hour when in motion, and with frequent stops, can do on the average, day after day, about 6,000,000 foot-pounds of work daily. This work corresponds to a daily travel of about nineteen miles over well-paved, nearly level city streets, drawing a wagon that weighs with load from 2,000 to 25,000 pounds, the constant pull or traction on the part of the horse being taken at 60 pounds.

The conventional unit rate of work, or horse power, is 33,000 foot-pounds per minute; but it is well known that this rate is much beyond the continuous daily performance of the average horse. A low figure for the daily maintenance of a horse may be taken at 60 cents, covering all regular expenses and divided about as follows: Feed, 35 cents; rent of stall, 10 cents; attention, 10 cents; and shoeing, 5 cents. Allowing the horse one day of rest in seven, which will be necessary in order to maintain the assumed rate of work, his useful service per week will be $6{,}000{,}000 \times 6 = 36{,}000{,}000$ foot pounds, or eighteen horse power hours.

The weekly maintenance charge for the horse is $60 \times 7 = 420$ cents, so that the cost of his work per horse-power hour is $420 \div 18 = 23{\cdot}3$ cents. As most electric vehicles will probably be supplied with energy from regular central stations, for the present at least, the public power rates are a satisfactory basis for comparison with animal power. Electrical energy is now sold from many central stations for power purposes at not more than 3¼ cents per horse-power hour, and there is no reason to suppose that a higher rate will be charged for service to electric vehicles. On the contrary, the ability of the electric vehicle to draw its energy from the generating station at the times of light load when most of the equipment would otherwise be idle, will insure it the lowest rates made for any service. As a matter of fact, the charging rates for automobiles at certain times of day in New York city are now materially below the above figures.

Taking the efficiency of vehicle batteries at 80 per cent and of the motor at 75 per cent, as stated above, their combined efficiency becomes $0{\cdot}80 \times 0{\cdot}75 = 0{\cdot}60$, or 60 per cent, so that for each horse-power hour exerted by the motor on its vehicle the battery must draw $1 \div 0{\cdot}6 = 1{\cdot}66$ horse-power hour from the generating plant. The cost per horse-power hour of energy actually expended in propelling the vehicle, as is the work of a horse, is therefore $3{\cdot}33 \times 1{\cdot}66 = 5{\cdot}53$ cents. Comparing this sum of 5·53 cents with the amount found above, covering the same work on the part of a horse, shows the unit of work applied to a vehicle by the horse to be $23{\cdot}3 \div 5{\cdot}53 = 4{\cdot}2$ times as expensive as when the same work is applied by the electric motor.

Having noted the costs of driving power for horse and electric vehicles, and the great saving effected by the latter, it remains to determine the nature, arrangement, weight, and capacity of the electrical equipment. The main necessary difference between the electrical and the horse vehicle lies in the addition of a storage battery and an electric motor. The battery is charged from any proper source of electrical energy and if not used will retain its charge for an indefinite time. The nature of the battery is such that its energy can be drawn from it either very slowly or quite rapidly, as desired, which well suits it to the irregularities of practical service. When necessary the battery is capable of exerting a power several times greater than its normal rating during short periods, but the efficiency or ratio of energy given out to that required for a charge is reduced somewhat, while the very high rate of work is kept up.

An advantage of the battery is that, being made up of small units, any desired capacity can readily be secured by the addition of just the necessary number of cells. This property of small variations in capacity is in contrast to the necessities of horse traction, where, if one horse is not enough, for a given work, another must be added, and the capacity thus doubled. At present there is material variation in battery weights per unit of capacity with different makers, the general rule being that the lighter the weight of battery per horse-power hour output the shorter its life. There is some compensation for the shorter life of high-capacity batteries in their tendency to a lower first cost. Moderate figures for battery weight and capacity may now be taken at one horse power rate of work for each 300 pounds of battery at normal discharge, and one horse-power hour capacity for each 90 pounds of battery. On these figures the battery working at normal rate will be discharged in the number of hours indicated by $300 \div 90 = 3{\cdot}3$. If, however, the battery is worked at less than its greatest normal rate, so as to be discharged during six or eight hours, its efficiency is increased and an output greater by 15 to 25 per cent obtained from a single charge. If the object in any case is to equip an electric vehicle with the smallest practical weight of batteries, it can be done by allowing the full normal rate of discharge at average speed, and the battery weight will then be a very moderate item.

If, however, the battery is thus discharged at its maximum regular rate, the time of action will be short before a new charge is required, as indicated above, and the efficiency may be as low as 60 to 70 per cent. There are, no doubt, some vehicles intended for short periods of use and high speeds, in which light weight is of enough importance to warrant the constant use of batteries at their full normal discharge rates. The great majority of vehicles, however, require to be in use during times and over distances between charges that preclude the constant use of batteries at their maximum rate of work, and for these cases the batteries must be selected on their horse-power hour capacity, rather than for their maximum horse power or rate of work. The construction of efficiency or cost of operation is of more moment with the average vehicle than a few hundred pounds of weight one way or the other. Numerous tests on a variety of both light and heavy electric vehicles show that the energy consumption per ton mile on fairly level roads may be safely taken at an average value of 0·16 horse-power hour, so that $90 \times 0{\cdot}16 = 14{\cdot}4$ pounds of a battery having a capacity of one horse-power hour per 90 pounds of weight are required per ton-mile of vehicle travel. Thus, a vehicle that is to travel twenty-five miles between charges, and weighs complete with passengers and load 2,000 pounds, should have a battery weighing about $14{\cdot}4 \times 1 \times 25 = 300$ pounds. The relation pointed out between weight of battery and the ton-miles of vehicle travel shows that the amount of battery required for any particular vehicle depends directly on the distance to be traveled between charges and the total weight carried. If, therefore, the above vehicle may have its battery charged once for each fifteen miles of travel, the battery weight may be reduced to three-fifths of its necessary weight for a travel of twenty-five miles, that is, to about 216 pounds. Or again, if the total weight of vehicle fully loaded can be kept at 1.000 pounds, it may travel twenty-five miles between charges with one-half the previous weight of battery; that is with 180 pounds. When it is desired to reduce battery weight simply through frequent battery charges, a limit is soon reached unless speed of operation is cut down along with the length of runs. This last condition is due to the fact that the battery should weigh about 300 pounds per horse-power rate of work required. Take, for example, a vehicle that weighs one ton complete and may be charged once for each ten miles run. The ton-miles of this vehicle are $1 \times 10 = 10$, and the weight of battery to drive it this distance is $14{\cdot}4 \times 10 = 144$ pounds, but on the basis of 300 pounds of battery per horse-power rate of work the battery in this case should only be called on for a rate of $144 \div 300 = 0.48$ horse-power. One horse power hour develops 1,980,000 foot pounds of work, so that 0·48 horse-power hour will furnish $1{,}980{,}000 \times 0{\cdot}48 = 950{,}400$ foot-pounds.

The 0·16 horse-power hour previously found necessary per ton-mile develops $1{,}980{,}000 \times 0{\cdot}48. = 316{,}800$ foot-pounds, so that the greatest regular speed for this vehicle should only equal $950{,}400 \div 316{,}800 = 3$ miles per hour. At this speed the vehicle will cover the ten miles in $10 \div 3 = 3{\cdot}33$ hours, which is about as short a time as should be allowed for the full discharge of a battery.

Motors of either two, three, or five horse-power at normal rating are used on most vehicles thus far built, and the approximate weights of these sizes may be taken at 150, 200, and 260 pounds respectively. The motor power ratings above given are subject to an increase of as much as 100 per cent during a few minutes at a time without material injury to the motor. As the energy required per ton-mile is very nearly the same for large and small vehicles, the cost of operation for any desired loads and distances can be readily calculated on the basis of 0·16 horse-power hour per ton-mile. For example, a vehicle weighing 1,000 pounds complete with load will consume energy to the value of $0{\cdot}5 \times 0\;16 \times 3{\cdot}33 = 0{\cdot}266$ cent per mile of travel, on the rate of 3·33 cents per horse-power hour for electric energy, as above stated.

Allowing a horse to travel twenty miles per day with the 1,000 pound vehicle, the cost per mile is $60 \div 20 = 3$ cents, on a charge of 60 cents per day for horse maintenance, thus making the cost with horse about eleven times that with electric power. With the horse the cost of light and heavy loads per mile varies constantly and cannot fall below a certain minimum per day, no matter how small the work done. The horse has a certain radius of action for a given load which cannot be regularly exceeded. The electric vehicle has a daily radius of action much greater than that of the horse, and within wide limits is nearly independent of the load for its speed.

* * *

Archæological News.

Thirty thousand copies of the "Logia" have already been printed by the Egyptian Exploration Fund, and the demand is still continuing.

Prof. Lanciani, the archæologist, has received the Royal Gold Medal at the Architectural Congress. He is the second representative of Italy to receive this medal. In 1849 it was presented to Canina for his literary work in connection with art and architecture.

Princeton University has received from Mr. McCormick a collection of Indian pottery, stone implements and articles used in religious ceremonies of the Hopi Indans of Arizona. This gift will supplement the large collections which the University already possesses of Mexican and Peruvian pottery.

An interesting collection of stone implements has been obtained from the Nile Valley by Mr. Seton-Karr. The material is chiefly yellowish-brown or pearl-gray, opaque, earthy chert, and is but rarely of the translucent, chalcedonic variety as found in the chalky formation of England. The collection contains a large number of types, which may be classed as bracelets, ax-like tools, leaf-shaped flints, knife like instruments, hoes or agricultural implements, scrapers, cores and flakes.

Dr. Wolfgang Reichel, whose work on Homeric armor is familiar to all classical archæologists and Homeric scholars, has just published, says The Builder, a tract on "The Cults of the Gods in pre-Hellenic Days" (Ueber Vorhellenische Götterculte), which opens up a new chapter in Mycenæan and Homeric archæology. From a careful scrutiny of Mycenæan "finds," he has come to the conclusion that in Mycenæan days the object of worship was, in the main, not the image of the god, but his throne on which invisible to mortal eyes, he took his seat. Schliemann himself long ago drew attention to the number of little empty terra-cotta seats or thrones found in graves at Tiryns, Mycenæ, Menidi, Nauplia. A similar empty throne appears on a gold ring found at Mycenæ, and is approached by three female figures with gestures of adoration. These seats, or thrones, Dr. Reichel believes, were originally altars, and it will interest biblical scholars to learn that the "ark of the covenant" is supposed to have been such a movable throne. Just such a portable throne is described by Herodotus (vii., 40), as accompanying Xerxes on his military expeditions. Again and again in his account of antiquities, preserved in very primitive sanctuaries, Pausanias notes these imageless thrones. The famous peplis of Athene was, Dr. Reichel thinks, laid on such a throne on the knees of the invisible goddess. In a word, he holds that Mycenæan worship was aneikonic. His theory is supported by a mass of carefully-collected evidence, and, whatever may finally be thought of it, deserves attention.