THE BEGINNINGS OF THE CARRYING INDUSTRY.

BY OTIS T. MASON.

I never see a great passenger or express train approaching a station without thinking of the long and tiresome experiences through which the human mind has passed upward to this concrete climax of inventions.

I take my stand as near as safety will allow, that I may drink in the eddies of the boiling atmosphere with the aroma of civilization which it represents.

There is something wonderful in the iron horse—his glaring headlight, irresistible momentum, extreme docility. On the platform of the locomotive stands the controlling mind, the engineer, one hand upon a lever which sets in motion all this ponderous mass at the rate of even a mile a minute, as Cicero says, "*quadam inclinatione corporis.*" His other hand rests upon the air-brake, by means of which he controls the momentum of five hundred tons, reducing it at will to absolute rest. Who has not imagined, as he whirled along on one of these trains, that he could hear the measured hoof-beats of this horse of progress striking the ties or the iron rails? If we consider all the industries and motives involved in this man's activity, the myriad trades and occupations invoked in the manufacture of train and track, the multitudinous avocations accommodated by and stimulating his movements, the infinite variety of freight, animate and inanimate; bags of letters, the messengers of every want and emotion; endless caravan of passengers of every class of humanity on every possible errand, representing all commercial designs, social and civil structures and functions, we shall have an example of the climax of human endeavor in its most highly organized condition relative to a long series of inventions of which this is only the introductory chapter. Besides these there are thousands of other occupations in which carrying is neither directly nor remotely interested wherein man's handiwork has preceded, initiated, and kept up the higher utilisation of animals and of natural forces.

But we are not concerned at the present moment so much with the tedious and varied manipulations by which the railway train has

been manufactured from the forest and the mine (that would be its ontogeny) as with the millenniums of change through which a common human back-strap or head-band has passed upward through inventive creation into the train and track, the latest common carrier (which constitutes the phylogeny of the railway).

At the lower end of this line of inventions and experiences, neglecting all the mental burdens which often weigh heavier on us than our packs, as we pass downward ignoring wagon trains, mule trains, caravans, couriers, pack-horses, dog travois and sleds, reindeer sledges, donkeys, llamas, and other beasts of burden, we come at last to the primitive common carrier, the pack-man himself and also the pack-woman, for men and women were the first beasts of burden.[1]

Primitive commerce and all the carrying and running involved in primeval arts connected with food, shelter, clothing, rest, enjoyment, and war were accomplished on the heads or foreheads, shoulders or backs, or in the hands of men and women; and civilization, while it has invented many ways of burden-bearing, finds also an endless variety of uses for the old methods. How many thousands of our fellow-creatures are still in this condition of mere beasts of burden? It is, for instance, only a few years since the invention of the passenger and freight elevator began to supplant that caravan of "hod-carriers" who have been since the beginning of architecture carrying upward to its completion every wooden and brick structure in the world.

To get something like an adequate conception of the enormous amount of labor performed by human backs, calculate the weight of every earthwork, mound, fort, canal, embankment, wooden, brick, metal, and stone structure and fabrication on earth. These have all been carried many times and elevated by human muscle. In the light of this contemplation, Atlas, son of Heaven and Earth, supporting on his shoulders the pillars of the sky, is the apotheosis of the human son of toil, and the gaping wonder of archæologists over the hand-made structures of Thebes, Palenque, Carnac, and Salisbury Plain subsides to the level of a mathematical problem. Indeed, the great majority of earthworks, mounds, menhirs, cairns,

[1] Innumerable examples of women as burden-bearers may be cited. See Schoolcraft, Archives, vol. 6, plate opp. p. 560; J. G. Wood, Unciv. Races, vol. 1, p. 330, *et seq.*

cromlechs, and dolmens now to be seen witnessed the exertions of no other artisan than the human carrier.[1]

Considering the activity now displayed in transporting men and productions from one part of the earth to another, it will not be a valueless contribution to science if we trace the natural history of those early occupations and industries, the improvement of whose apparatus and methods stimulated the pristine inventors to make their burdens lighter, to enable the human carrier to bear the load with greater ease, to render his pack-weight proportionate to the length of his journeys, and to adapt his occupation to the ever new exigencies of his environment.

It is a common saying that we must go to nature for our supplies. Equally true is it that we go in vain, unless we descend to the condition of the brutes, if we expect nature to supply us with aught else than that whereon we may exercise the inventive faculty. Indeed, there are innumerable examples of animals transporting materials to distant places in order to utilize them. The beaver, the bird, the lamprey eel, the bee, the ant are all carriers.[2] Many animals also modify natural objects for the purpose of using them. But the two ideas of modifying a natural object for the purpose of making a carrying tool seem to concur only in the human mind. We are the only animals that modify nature to produce a carrying device. Again, these creatures all carry their implements and weapons with them as part of their natural endowment; they do not have to invent them. But the farmer, the artisan, the professional man, even the laborers, go about weighted down with their tools, apparatus, books, or even their carrying implements as ponderous often as the trunk and tusks are to the elephant.

There are two sets of ideas involved in harnessing the human *jument*, which may be studied in part separately, in part together. They are *conveyance* and *transportation*, or the carrying of the man and the carrying of things. The former may be older, for devices in which to carry infants may have been the first in the order

[1] Cf. Lucien Carr. Mounds of the Mississippi Valley, p. 90, for a calculation of the time required to build an earth mound. Reference is made to the coal-carriers in St. Thomas, and to a paragraph by Isaac McCoy in the History of the Baptist Indian Missions, p. 27, for the capabilities in this line of a single tribe of Indians.

[2] For comparison of the engineering skill of beavers and ants with that of the mound-builders, cf. Lucien Carr, "The Mounds of the Mississippi Valley," p. 66.

of invention. (Fig. 1.) The passenger and the freight train express the two ideas exactly, because each, while encroaching on the function of the other, has modifications for its own ends. The subject of mere locomotion involving snow-shoes, canes, staves, alpenstocks, stilts, crutches, and the like will not be here considered, because they are only aids to locomotion and involve little that relates to the beast of burden.

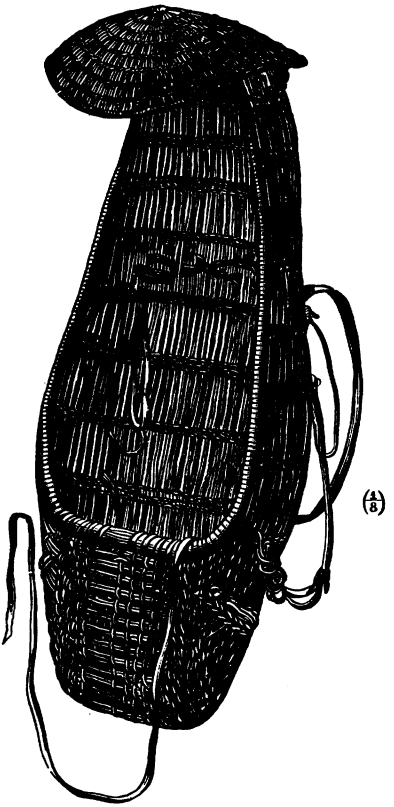

FIG. 1.—Hupa pappoose cradle, with carrying strap. Power, Cont. to N. A. Ethnol., iii, fig. 24.

The cradle-board and other devices for carrying infants will also be the theme of a separate chapter, inasmuch as other ideas are involved, but the methods of human conveyance on the backs of bearers among peoples not highly civilized will receive brief mention.

Many other industries have been created, stimulated, and modi-

fied by the carrying trade. Every one will have a dozen suggested by the mere mention of the subject. One has lately come to the writer's notice, which will serve as a very primitive example. The crudest agriculture in the world is practised by the Pimas and contiguous tribes in southernmost California to procure gourds for the transportation of seeds and water. The women, accompanied by a body-guard of men, go, in the spring-time, to the bluffs or rocky slopes, where a little rich, moist earth fills the crevices, and therein, by the help of a sharpened stick, they insert their gourd seed. In the autumn the women return to these spots to gather the large gourds hanging from their natural trellis, and from them supply their households with a variety of utensils. So the carrier is patron to the farmer.

In the same way has the carrier stood friend to the potter. Among the Pueblos and other pottery-making peoples hundreds of jars are made to be carried on the head or to be swung from the shoulder in a yoke. The potter moulds his vase at the order and convenience of the carrier.

Basketry has also lent its services largely to the carrying industry, and in turn has assumed a multitude of shapes and textures demanded by this occupation alone. (Fig. 2.)

In the National Museum, at Washington, gathered from many parts of the world, are a great variety of devices designed exclusively to facilitate the carrying of burdens by mankind. There are many others in various parts of the world quite as important.

We may approach our task from different points of view, guided by a variety of ruling concepts. It is possible to consider the subject geographically. I was delighted to find this fact recognized by Plato:[1]

"CLEINIAS: Look at the character of our country. Crete is not like Thessaly, a large plain, and for this reason they have horses there and we have runners on foot here. The inequality of the ground in our country is more adapted to locomotion afoot."

The word geography as here used applies to all natural advantages, to materials used in constructing appliances, and to objects carried.

Or we may view the subject ethnically, in relation to tribal patterns, customs, and the prejudices of clan, class, or sex.

[1] "Laws" N. Y (1873), Scribner, vol. 4, p. 156.

Or it may be regarded nationally, with reference to the regulations concerning carriers under the same government and treaties relating thereto between different political bodies.

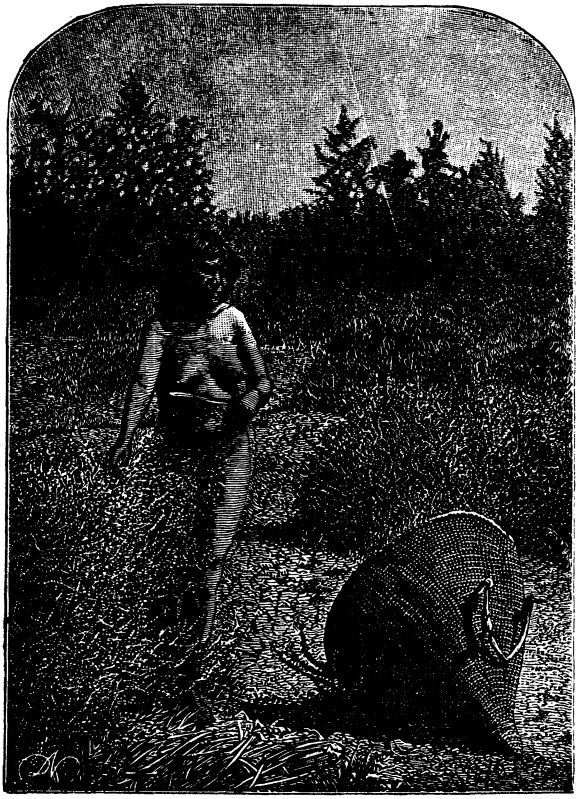

FIG. 2.—Ute woman gathering seeds, her carrying basket in the foreground. Powell, Exploration of the Colorado, fig. 42.

A philogenetic method would lead us to scrutinize the various ways of carrying in relation to the influence of one invention in giving birth to another or in some way modifying the form of another, either in the same category or in other categories.

An interesting method of study would be by crafts, and it would enlist the coöperation of many searchers. For instance, we might ask the fur-trader of Hudson Bay territory to tell us all the ways of carrying peltry that his land had seen, from packing up to the Red

river cart. In like manner, the emigrant over the earth, the peddler or merchant, the woodman, the miner, the fisherman, the farmer could each tell us a wonderful story, beginning with a very simple process and winding up with a story worthy of the Arabian Nights; or, finally, our thoughts could be arranged progressionally in relation to the phenomena, including both what some call natural evolution and also technical elaboration or design.

One of the most interesting chapters in the history is that which portrays the methods of hitching up this animal of burden, the parts of the body utilized, the harness adopted, and the adaptation of these to the burden, the country, and, in short, all the exigencies of the case. With this one idea in mind look carefully over the great works devoted to the ancient monuments of Egypt, Assyria, Greece, and Rome, or turn the leaves of pictorial journals and books of travel, and the variety of ways by which man has grown equal to his burden will be astonishing.

As the study of railroading includes the engine, or motor; the train, or burden; the road and the signal, no less does the consideration of the original freightman, or pappoose-carrier, involve the person, the load, the trail, and the primitive signal. Indeed, the germ of the latest passenger and freight train was in the first human burden-bearer.

The task of duly appreciating rude inventions is not easy, and some of the statements herein made may seem trivial. Living in the enjoyment of so many privileges in the matter of conveyance and transportation, we shall find it hard to realize the former condition of things unless we transport ourselves to savage and barbarous lands or out-of-the-way country places. In a thriving city one no longer thinks of walking. The cheapest hand laborers ride to their work in cars of palatial splendor drawn by horses, steam, or electricity. Men and women flit around on cycles. It is considered vulgar to carry a parcel. The servant girl buys a few cents' worth of tawdry stuff and has it brought to her in a parcel-dispatch wagon that is covered with forty coats of lacquer. Everywhere the old régime is changed in our civilization. We get an inadequate conception of the early history of human backs by contemplating the service that nature is at present rendering to the comfort and convenience of our race.

It would hardly be worth while to mention the clothing and adornment of mankind as a load to be carried were it not for the fact that

in some cases, such as the brass wire of the Africans and the mail of the mediæval knight, as much as one hundred pounds are borne by a single individual. Counting all humanity, it is safe to say that two millions of tons of apparel and personal ornament are constantly worn to supply artificially what nature has given gratis to other animals, either in the way of hair or wool to keep them warm or plumage to increase their attractions.

It is impossible to enumerate every form of burden-bearing, but to show the almost endless variety in which inventive genius has displayed itself in loading the human body the following enumeration is introduced:

METHODS OF BEARING BURDENS.

1. *In the hand.*—This method is universal. In the house, at the station, on the street, wherever one turns, light parcels are flitting in every direction, which in the aggregate amount to an enormous mass, carried principally in the right hand. At the other end of human history the act repeats itself. For we can scarcely frame a conception of man primeval without a club or stone weapon or rude spear in one hand, and here again the right hand has been selected to do the work.[1] (Fig. 3.)

2. *In both hands.*—It is really easier to carry in both hands than in one, even though the load be larger. So it is a common sight to see a man or a woman dividing the luggage into two parcels, bearing two buckets or baskets, sometimes held apart with a hoop. In raising a load to the shoulders both hands are used. It is amusing to watch the potters on the Egyptian monuments—to see the multiplicity of attitudes they assume in the application of the two hands to burden-bearing.

3. *On the fingers.*—This is a kind of fine art in carrying. In the old descriptions and pictures of royal cupbearers the salver is delicately poised on three fingers. The climax of this plan is the summer-resort waiter's feat of bringing the food of half a dozen individuals borne aloft on the ends of his fingers in a huge tray.

4. *With a baldric.*—The modern tourist hangs his opera-glass, satchel, haversack, &c., to a strap passing over one shoulder and under the opposite arm. The hunter carries his game-bag in a simi-

[1] The writer has examined a great many savage weapons and tools that will fit only one hand. The proportion of left-handed is not more than one in fifty for men, and he has never seen a left-handed woman's implement.

lar manner. Among hurdy-gurdy players and fruit peddlers the strap hangs on the back of the neck and the load rests against the stomach. The hands are then free to make music, handle the merchandise, or even to help in carrying the load. The baldric is now a military ornament especially, and may never have had extensive use among savages.

FIG. 3.—Hand basket of Micmac Indians, Nova Scotia. Mason, in Smith. Ann. Rep., 1884, ii, fig. 96.

5. *Hung to a belt.*—Combining the belt with the baldric, the soldier carries his weapons. It is common to see small objects hung to a belt before, behind, or on either side. This is not an easy way to carry a heavy burden; yet, among semi-civilized peoples it is the place for transporting treasures—in short, the first step in the insurance of carrying treasures. Also, the broad sash of many peoples

serves admirably for holding children, victuals, weapons, papers, and things not to be exposed.

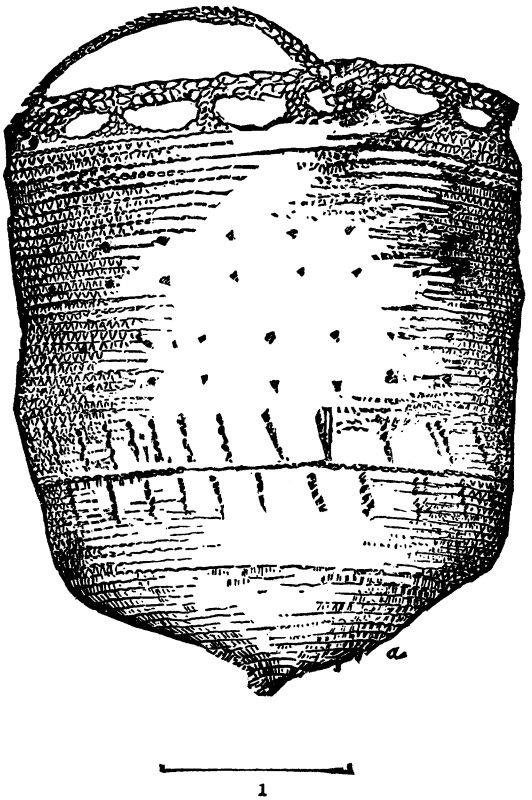

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FIG. 4.—Aleutian twined wallet for tackle. Mason, Smith. Ann. Rep., 1884, ii, fig. 1.

6. *On the arm.*—This might be called the retail method of carrying. One sees every moment about the farm boys and men using this method of carrying, and on the busy street multitudes of men, women, and children are ever flitting to and fro with loads. These vary from a few ounces to several pounds, and are borne under the arm, on the forearm, on both forearms. In the stores it is the same thing. The arm seems to be the vehicle for retail conveyance. To vary this style a little we must increase the load and basket and watch the market people as they trudge along with fifty pounds of food hung on the elbow, resting on the hip, and the body bent to get

the centre of gravity poised exactly. The writer has never seen in any book of travels a savage man with a load hung to his arm like a great hook and himself twisted around so as to throw a part of the weight upon his hip. This must be a product of civilization.

7. *Hung from the shoulders.*—This is the favorite device of farmers and others who carry small loads in a bag. One of the indelible recollections of country life is of the farm hand carrying grain, plaster, and other things about the premises in a sack suspended from his shoulders. The same man on Saturday afternoon trudges homeward from the mill and the store with the week's provisions for his family carried in the same manner. The peddler of small wares, the laborer moving with his little property, the hunter returning with his game, the woman of southern climes with her child, all are examples of the importance of the shoulder in the economy of transportation when used merely as an accessory to the back. The universal sack of our negro population as a place for everything, including unclaimed poultry and stolen chattels, is a good example of this method of carrying, which has come down to us from the remotest antiquity. Travelers state that a Peruvian miner will ascend one hundred or more feet of rude ladder with three hundred pounds of ore in a skin bag hung from his shoulder.

8. *On the shoulder.*—The shoulder alone plays a leading part in transportation. There is no lack of examples of women pursuing this method. The miller takes a sack of grain on his shoulder, places his palm on his hip, and moves on to his hopper, or he reverses the process with a sack of flour from the mill to the farmer's wagon. (Fig. 4.)

In great shipping houses lines of porters carry sacks of grain to the ship in the same way.

Again, the hod-carriers, antecedent of all modern elevators, with seventy-five to one hundred pounds of bricks or mortar on his back, has been for ages all over the world transporting upward the material of the builder.

Look, moreover, at the coolies of the Orient. More than a million Chinese make their living as professional carriers. In the cities are the porters and others who carry rice, etc., on the shoulder in sacks or burdens upon a pole, half the weight at either end.

Writes a friend:

"The average load of a coolie is 100 pounds, and with this he travels thirty miles. Kinkiang is an important place for the export of tea.

The tea districts are situated about sixty miles from the town and the coolies bring in the chests in two days, each man carrying a load of 100 pounds. The weight of a load and the distance over which a coolie travels may be different in the north and south. I have not been able to make inquiries elsewhere but at this port."

In Shanghai 140 pounds is an ordinary burden. For long distances 100 pounds is the load and twenty miles the ordinary day's journey. The bearer has a staff in his hand and rests *ad libitum* by balancing his burden on top. One hundred pounds twenty miles equals a ton a mile per day. Now, if there are a million coolies, there are each day in China a million tons of freight moved one mile on the backs of professional carriers. The ancient Egyptians practised this mode of carrying extensively.[1]

9. *On the scapulæ.*—The grain carriers or lumpers who load vessels with wheat or corn may frequently be seen with a full sack resting on top of their backs. They run up a plank to the hatch, toss the sack in the air, mouth downwards, and catch the lower corners so as to save the sack and dump the grain into the hold.

The English porters and furniture men have a knot, padded with something soft, which they place around the forehead and on the scapulæ. They are then ready to take on the largest pieces of furniture, such as bureaus, sideboards, &c. The higher forms of this art of carrying on the scapulæ is the Holland yoke, a device which enables the bearer to bring the hands into play.

10. *On the back.*—The back is the natural resting place for the burden. The lowest savages know this, and inventive genius early began to devise apparatus for harnessing this part of the body. (Fig. 5.) In Africa, on the Andes, in Mexico, throughout the civilized world, the peaceable carrier bears on his back the commerce of the race. In war the soldier fastens his knapsack to his back and shoulders, leaving his arms free to do their work. Children play at pick-a-pack, passengers are landed in shallow ports, persons of means pass over difficult places in the manner described by Cassius:

> "I, as Æneas, our great ancestor,
> Did from the flames of Troy upon his shoulder
> The old Anchises bear, so from the waves of Tiber
> Did I the tired Cæsar."

[1] See Rawlinson's "Herodotus," ii, 136, illustrations.

11. *On the head.*—This process is usually called toting, and is especially characteristic of women[1] of the lower classes and of negroes.[2] The traveler may see the dairy-maids anywhere in Europe carrying twenty-five pounds of milk on the head, women in Iceland carrying loads of unsavory codfish on their heads, and Italian peddlers of all sorts use the head for a carriage. (Fig. 6.) In the southern part of the United States fifty pounds is the "toter's" steady load. Men and women constantly bear that amount. A slater's assistant mounts a ladder with fifty pounds of slate on the head. The farm woman totes a tub of water holding ten gallons, the whole weight being one hundred pounds. The head-ring is seen among the Zuni Indians as a means of keeping the load on the head and relieving the pressure. Pads of various kinds replace the ring where toting is for long distances.[3]

FIG. 6.—Zuni woman carrying bowl of food, using the "milkmaid's pad." Cushing, in the 4th annual, Bu. Eth., fig. 538.

12. The forehead and the bregma are also parts on which to hang harness. In civilization the yoke has passed from the forehead of the ox to his scapulæ. Comparing the head-strap of all our Indian tribes with the neck yoke of the Holland woman, it is permitted to see the same process of improvement antedating the domestication of the ox and possibly suggesting his harness. (Fig. 7.)

13. *In pockets.*—This method of conveyance is scarcely worth mentioning from the civilized point of view; yet, when we con-

[1] See illustration of Kaffir women carrying fagots in Wood's "Unciv. Races, vol. I, p. 91.

[2] "All along the road we met numbers of men, women, and children going to the Badagry market, with palm-oil, corn, yams, fowls, firewood, &c., which they carried in heavy loads on their heads, according to the universal custom of this country, though the Golahs and others in that region carry burdens on their backs." Bowen, Cent. Africa, p. 103.

[3] Wood mentions the Bechuana habit of "Bogale," or drilling young girls in carrying loads of wood long distances and jars of water without spilling a drop. Unciv. Races, I, p. 26.

sider the endless variety of small merchandise carried in the pockets of men and women and remember that all these pockets are for no

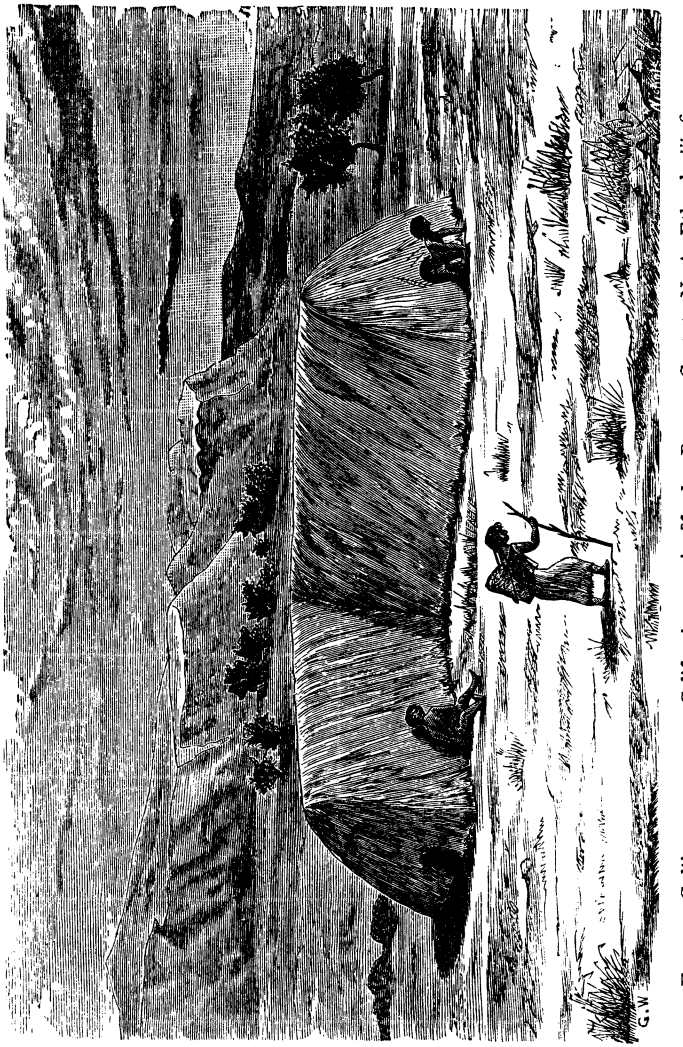

FIG. 7.—Gallinomero woman, California, carrying food. Powers, Cont. to N. A. Ethnol., iii, fig. 20.

other purpose than to serve as instruments of transportation, we cannot omit including it. We must remember also that the Oriental, especially the Corean, has pockets in his sleeves having the ca-

pacity of a half bushel. The Turk and the Arab stows away as much as this in the ample folds of his robe, and any boy who has stolen fruit can add his testimony.

14. *Men combined.*—Two men bearing a log or burden on their shoulders, four or six men carrying a bier or stretcher,[1] two or more men with a palankin borne among them, a set of bearers in Madagascar and elsewhere with relays, a company or a regiment of men carrying an immense stone in India, as figured by Count Wurmbrand, a lot of men setting up a barn frame or telegraph pole, all illustrate the utility of combined effort to transport a heavy mass. There is no doubt that the great works of modern times, whose existence and utility depend entirely upon the co-working of thousands to make and to maintain them, were foreshadowed and completely outlined in the days when hand-work alone was the force employed. Herodotus ascribes the beginning of the first canal between the Nile and the Red Sea to Neku and the completion to Darius, the Persian. A hundred and twenty thousand Egyptians lost their lives in Neku's reign.[2] Peons entering some Mexican city or slave trains from the heart of Africa often reveal a long row of men and women coöperating in carrying a great weight. The same is true of the pulley, answering to a compound hod, by means of which one man transports a single weight much too heavy for one.[3] In an account of Cheops' causeway, "Some were required to drag blocks of stone down to the Nile; others drew them to the range of hills called Libyan; a hundred thousand men eat bread constantly, and were relieved every three months by a fresh lot."[4] In Munich those who carry large sacks use an implement like M to grasp, as it hurts the hands to lock fingers under the end of the sack. They stand face to face and grasp the rounded sides of this wooden buckle, slide it under the sack, lift it up, and steady it with the free hand, which carries it along and gives it a toss in unloading.[5] In this

[1] Rawlinson's Herodotus, ii, 77, figure. The transportation of the disabled with reference to conveyance by human bearers. By James E. Pilcher, M. D., Ph. D., J. Mil. Serv. Inst., IX (1888), 222–242.

[2] Rawlinson's Herodotus, ii, 158, with notes.

[3] Rawlinson's Herodotus, ii, 124.

[4] Rawlinson's Herodotus, ii, 277; iii, 377.

[5] Theo. A. Mills. See Prescott, Conquest of Mex. (Philad., 1874, I, 145) for the transportation of the calendar stone from the mountains beyond lake Chalco a distance of many leagues over a broken country intersected by water-courses and canals.

country men carry pianos by means of a shoulder-strap and a peg that goes into the hole left by unscrewing the legs. Two men can carry a piano thus.

15. *Hauling.*—The simplest form of traction among men may be seen in the small boy dragging his wagon or sledge. With the arms alone for traces the primitive man dragged his game over the ground or ice to his distant home. Even two or more might co-operate in this primeval team. The next step would be the use of a line, perhaps of rawhide, perhaps of fibre. Along the edge of some quiet water they walked, those pristine tow-men dragging their rafts or rude boats from the pebbly beach. Here began that immense industry now carried on in the canals of the world.

The ways of fastening one's self to this traction or tow line are many.[1] The simplest is the grasp of the hand. Others may be seen bending to their work with the line over the shoulder, around the waist, or tied to a becket or bricole. A curious variety of this tracking is seen on Russian rivers, where an anchor is carried up-stream in a small boat and dropped. The cable passes back to a windlass or a heavy barge, by which the great mass is moved up to the anchor. A delightful specimen of helpless modern invention is a picture in Baker's "Ismailia."[2] Steamer Number 10 has balked among the rank vegetation of a canal, and she is being hauled along by a hundred or more naked Africans dragging at a cable. In the Southern States formerly the great shad nets were drawn ashore by a gang of 50 to 100 negroes, who wore each a becket with a Turk's-head knot, which the seine-hauler knew how to attach or detach in a second.

A species of tracking practised on the upper Missouri and other northern rivers in the fur-trading period before steamboat days has been called to the writer's attention by Dr. Washington Matthews, U. S. A. It is called cordeling.[3] The goods of the trader are

[1] Hinds' Labrador, vol. 1, pp. 77, 94.

[2] N. Y., 1875, opp. p. 53.

[3] "The British fur companies held the trade of these Indians until 1807, when Manuel Lisa ascended the river in keel-boats to the Mandan villages and beyond. Until 1832 goods were brought up the Missouri river chiefly in keel-boats or Mackinaw boats, which were *cordeled*, or towed by men with great labor against the rapid current of the river. Two summers, at least, were always occupied in dragging a boat from Saint Louis to the head of navigation, the crew sustaining themselves chiefly by hunting." Ethnography of the Hidatsa, p. 30.

loaded upon a boat and the craft dragged by a tow line along the margin of the stream. These articles were traded for furs until the boat had gradually exchanged its freight of civilized wares for peltry. Then the craft was easily floated back to St. Louis, its starting point. Mention is made of this process by Lewis & Clarke, Prince of Wied, Brackenridge, and other travelers of the pre-steamboat days.

Before cordeling, even, there was a method of ferriage of the most primitive character practised on the Missouri river. The bull-boat was a contrivance used as a primitive ferry. It was made as follows: A number of elastic poles were firmly inserted in the earth in a circle the size of the gunwale of the boat, and a horizontal pole was lashed to these a few inches from the ground. The tops of these poles were bent inward, each opposite pair being firmly and neatly lashed together at a height from the ground to correspond with the depth of the craft. This done, a buffalo-bull hide, depilated and thoroughly soaked, was drawn down and stretched over the frame and the edges secured to the horizontal pole which served the purpose of a gunwale. The ends of the poles were then cut off, the vessel was turned over, any little crevices were stopped, and the ferryboat was ready to launch;[1] and this is the way the apparatus worked: Whenever an Indian wished to cross a river in his bull-boat he placed therein his luggage and babies, and, fastening a rawhide line to his gunwale, he swam across the river with the other end attached to his body. Behind the craft swam his wife or daughters, pushing the boat as much as possible against the stream. Indians have told the writer that oblong bull-boats were formerly used, before the days of steam, whenever longer journeys were to be taken. This practice would be perfectly in keeping with the birch bark canoe journeys of the tribes north and east, where the vessel was only an improved bull-boat, in which birch bark took the place of rawhide.

According to Herodotus (I, § 1) Cleobis and Bito were honored by Solon with the second place of happiness among men. "There was a great festival in honor of the goddess Juno at Argos, to which their mother must needs be taken in a car. Now, the oxen did not come home from the field in time, so the youth, fearful of being too late, put the yoke on their own necks and themselves drew the

[1] Cf. Lewis & Clarke's Travels, London, 1817, vol. 3, p. 348.

car." Without dreaming of their distinguished company hundreds of rag-pickers, small-truckmen, and peddlers are pulling and pushing wagons and carts about the streets, sometimes alone and often hitched by the side of dog or donkey.[1]

16. *Throwing or tossing.*—An immense amount of material is moved by various methods of throwing with or without tools. It is a process of rapid transit in which the material alone moves without the necessity of a track of any kind. Doubtless many will remember the old fashion of passing buckets of water at a fire before the invention of engines. The negroes in southern cities move many thousands of watermelons and other produce from the vessels to the warehouses or wagons, often hundreds of feet, by tossing them from one to another, standing ten feet apart. It is a simple step from this to the shovel, the fork, the hoe, or the rake used on every farm and in connection with almost every business in the world.[2] In the oldest forms of embankment the laborers doubtless carried the dirt in sacks or baskets. To this day the fellaheen of Egypt follow the primitive method.[3] But in all military operations, canal and railroad work, excavation in cities, the shovel is the vehicle of transportation and the navvy or his technical representative is the beast of burden.

17. *Caravans.*—It is only a step from the single carrier to the organized train under the direction of a leader performing in common a task

[1] The Egyptian sculptures abound in representations of human traction in every attitude in which it is possible for a man to be attached to a rope. See Rawlinson's Herodotus, II, 72. See also in Rawlinson's Five Monarchies, N. Y., 1871, p. 402, from Layard, a spirited picture of men moving a human-headed bull. We have here in one picture men drawing sledges, others drawing hand-carts filled with ropes, and others fixing rollers, working levers, holding props and guys, carrying rollers, relays coming to relieve their fellows, taskmasters with clubs, and the boss on the front of the sledge marking time for those at the ropes. All the draught men have bricoles or beckets as individual harness.

[2] Dr. Samson reports a curious combination of the spade with traction. "In spading up the ground a fellah pressed the spade into the earth, while a woman on each side, by means of a rope attached to the handle, raised the spade with its load and turned it over."

[3] "I saw in the delta of Egypt a common occurrence, young women and girls digging in the canals, shoveling the black, dripping mud with a bit of wood and their hands into palm-leaf baskets, putting the dripping baskets on their heads so that their hair and faces were all matted with slime, toiling up the sides of the canal to empty their loads, while a taskmaster with a whip would cut their bare legs as they passed if in weariness they loitered."—*Dr. G. W. Samson.*

which would be dangerous to one or in which mutual help is needed. No one supposes that the caravans of historic times were invented at a single effort. The caravansaries, the wells, the armed guard, the joining of forces at difficult places are complicated affairs which are the resultants of many trials of much simpler character.

In the old slave-hunting days in Africa the same method was practised with slaves. A lot of negroes would be captured and driven to the coast for sale, but to save freight each individual was loaded with ivory, gold dust, and other commodities. On arriving at the coast the trader sold out the whole concern and returned to repeat the process.[1] In southern Mexico and Central America the trade from the interior is brought to the coast on the backs of peons marching *en traine* under a leader.

18. In all the early accounts of settlements in our country trails are not only mentioned as the veritable war-path, but commercial trails were also known. This introduces us to the whole subject of roads, the series being paths marked by stakes or blazed trees, unkept roads, highways, turn-pikes, plank roads, paved streets, tramways. In these rude trails or paths are many obstacles—declivities, streams, chasms. To overcome these, inventive genius has devised bridges, fords, steps, graded ways, tunnels, &c., part of the outcome of the packman's industry.[2]

19. *Relaying.*—An important element in transportation is resting and relaying.[3] In most rude carrying-devices the greatest effort is put forth in rising from the ground or in getting the load in place. The organ-grinder and the coolie carry staves on which they rest their load when they are fatigued. The Damara girl lifts her load from her head, and holds it aloft on both hands while she proceeds on her journey. The soldier shifts his weapons, the Malagasy-bearers replace one another under the poles of the *filanzana*, or carrying chair, without interrupting their journey. The Montezumas had relays of runners between the sea and the City of Mexico, so as to receive fish and other lowland products in a fresh condition.

20. *Couriers.*—From this inquiry must not be omitted the courier, swift messenger of tidings, earthly prototype of Hermes, who was

[1] See reference to selling boat and cargo in Herodotus, vol. I, p. 194.

[2] Mommsen's "Rome," N. Y., 1869, I, 177. For an excellent account of the swinging bridges of Peru, cf. Squier, Incidents of Travel, &c., N. Y., 1877, 544–547.

[3] Hinds' "Labrador," vol. 1, p. 43.

succeeded later by horses, dromedaries, carrier-pigeons, ships on the sea, steam cars on land, and last of all the telegraph. His modern survival is the district and telegraph messenger boy. I have seen somewhere the picture of a naked Kaffir running at full speed, bearing in one hand a pair of assegais and in the other a rod split at the upper end to receive a letter, carried thus to keep it from being soiled by contact with his naked body.

In ancient Mexico, says Prescott, "Communication was maintained with the remotest parts of the country by means of couriers. Post houses were established on great roads, about two leagues distant from each other. The courier, bearing his dispatches in the form of a hieroglyphic painting, ran with them to the first station, where they were taken by another messenger and carried forward to the next, and so on until they reached the capital. These couriers, trained from childhood, travelled with incredible swiftness, not four or five leagues an hour, as an old chronicler would make us believe, but with such speed that dispatches were carried from one to two hundred miles a day."[1]

There is no doubt that all of these various devices have had their influence in shaping and deforming the human body. Students of craniology and anthropometry should have their attention called to the fact that among savages the use of carrying-pads, straps, and other devices about the head commences just as soon as the child can walk, with little loads at first in small baskets, wallets, nets, frames, or what not, when a forehead strap for the top of the head is employed. Even though these marks may not be hereditary, they cannot escape the notice of the craniometer.

It should not be overlooked that this human pack animal possesses the greatest versatility. In the case of your train, hundreds of men

[1] Conquest of Mex., Phila., 1874, vol. 1, p. 43. For an exciting account of couriers with lighted torches proclaiming the new cycle, *id.*, 130. Compare C. A. Murray, Travels in N. A., N. Y., 1839, vol. 1, p. 193, who says that an Indian of his party travelled a hundred miles in four and twenty hours. Prescott also alludes to Plutarch's account of the Greek who brought the news of victory to Platæa, 125 miles, in a day; to pedestrian capabilities of man in a savage state collected by Buffon; to Marco Polo's account of couriers in China in the thirteenth century; to Anderson's account of government couriers in China in 1796. Conq. of Mex., Phila., vol. 1, p. 44, note. "Nothing in the world is borne so swiftly as messages by the Persian couriers." Herod., Urania, 98. In this case horses were used as in the pony mail formerly in use across the plains, but the man or courier went on.

load the cars, carrying burdens on back and trucks; men manipulate the senseless and purposeless thing looking so proud and capable; men unload the train, and, indeed, put the fiery steed to bed. Not so in primitive culture; the man-beast feeds, waters, and curries himself, gathers and adjusts his own load, changes himself into propeller, trackman, carrier *ad libitum*, besides adapting himself to a multitude of subsidiary occupations not here under consideration. Indeed, the man is engineer, engine, freight car, truck, wheelbarrow, horse cart, dray, tow-path, mule, &c., all combined.

The mean effect of the power of a man unaided by a machine, working to the best possible advantage and at a moderate estimation, is the raising of 70 pounds one foot high in a second for ten hours in a day.

Two men working at a windlass at right angles to each other can raise 70 pounds more easily than one man can raise 30 pounds.

Mr. Bevan's results with experiments upon human strength are for a short period:

With a drawing knife	a force of	100 lbs.
" auger, both hands	"	100 "
" screw-driver, one hand	"	84 "
" bench vice, handle	"	72 "
" chisel, vertical pressure	"	72 "
" windlass	"	60 "
" pincers, compression	"	60 "
" hand-plane	"	50 "
" hand-saw	"	36 "
" thumb-vice	"	45 "
" brace-bit, revolving	"	16 "
Twisting with the thumb and fingers only and with a small screw-driver	"	14 "

By Mr. Field's experiments in 1838 the maximum power of a strong man exerted for 2½ minutes is 18,000 pounds raised one foot in a minute.

A man of ordinary strength exerts a force of 30 pounds for 10 hours in a day with a velocity of 2½ feet in a second = 4,500 pounds raised one foot in a minute = one-fifth of the work of a horse.

A foot soldier travels in one minute in common time 90 steps =

of crafts made locomotive, cars, tracks, and all other appliances. 70 yards; in quick time, 100 steps = 86 yards; in double-quick time, 140 steps = 109 yards.

He occupies in the ranks a front of 20 inches and a depth of 13 inches without a knapsack; the interval between the ranks is 13 inches.

Average weight of men, 150 pounds each, 5 men can stand in a space of one square yard.

A man travels without a load on level ground during 8½ hours a day at the rate of 3.7 miles an hour, or 31¼ miles a day. He can carry 111 pounds 11 miles in a day. Daily allowance of water for a man, one gallon for all purposes.

A porter going short distances and returning unloaded carries 135 pounds 7 miles a day. He can carry in a wheelbarrow 150 pounds 10 miles a day.

The muscles of the human jaw exert a force of 534 pounds.

Dr. Dwight observes: Indians will travel with a facility, a celerity, and a freedom from fatigue unknown to the people of Europe. Their couriers or runners are said to go at the rate of one hundred miles a day. Two Choctaws followed my father five hundred miles to steal from him two valuable horses. When I asked how they could be willing to take so much trouble for such an object, he observed that they had no other business, and that roving was their favorite enjoyment.[1]

The number of pounds that a man is able to lift or carry a short distance hardly enters into this investigation, but rather belongs to feats of strength and agility. A naval officer tells of a Swede who, wishing to show his captain how nicely he had polished a brass cannon, took it on his shoulder and carried it upon the bridge. The weight could not have been less than a half ton. The following example of woman's strength, by Captain Healy, involves also the idea of ingenuity and the conquest of natural forces: A woman volunteered to bring in her boat a stone for an anchor to his launch which required two strong men to lift; weight guessed to be eight hundred pounds [that is too high]. She first filled her boat with small branches of spruce; then, choosing a part of the bank where her boat rail would be on a level with the ground, rolled the stone over on the pliant boughs. Afterwards the spruce boughs were re-

[1] Hodgson's N. Am., vol. 1, p. 250.

moved one by one to allow the stone to slip to its place in the boat.[1] [From Healy's account I infer that she first filled her boat with water and used the buoyancy of the water to help her in moving the stone. He says that they understand this.]

As to the amount one man can carry, Prof. Asaph Hall, of the United States Naval Observatory, communicates the following:

When I was nineteen years old I could carry a barrel of flour from the wagon into the house without putting it down, a distance of three rods, and up six stone steps; but I could not do this with a barrel of cider. If we put my carrying strength equal to x we have therefore barrel of cider 7×7, barrel of flour. It was the custom in Litchfield county, Conn., forty years ago, to use one hundred and twelve pounds for a hundredweight. A common test of strength among the young men was to string ten half hundredweight on the shanks of a fork for a lift. There were many men who could lift five hundred and sixty pounds.

THE PROFESSIONAL CARRIER.

A new epoch in the history of the human beast of burden commences with the appointment of professional bearers or professional common carriers. It is brought about by the differentiating process of advancing society. As soon as a body or caste of men are allowed to give their whole time to a pursuit their efficiency is quadrupled; the unsuccessful drop out of line; advantages are handed down; powers of perception and skill are strengthened; all sorts of devices for packing, padding, shifting the load, resting, relieving, relaying, combining effort, are thought of as measures of self-protective necessity. The professional carrier is more likely to have been the inventor of the beast of burden, having to suffer more in his own back and legs by reason of his daily burden. The Bajuli of the Romans were professional porters: "Ferri proprie dicimus quae quis suo corpore bajulat; portari ea, quae quis in jumento secum ducit; agi ea, quae animalia sunt. Gaj. Dig., 50, 16, 235, &c. Bajulos dicebant antiqui, quoso nunc dicimus operarios." Fest., p. 29. In late Latin, a bearer at a funeral. Ammian., 14, 7. The Greek equivalent is *Βαόταχτής*.

PEDDLERS.

This chapter would not be complete without a passing mention of the peddler as a beast of burden who enters on his work as a professional for the purpose of commerce. The coolie, for instance,

[1] A. G. Corwin, 1887, p. 49.

is a carrier pure and simple. He takes up his burden at the instance of another and lays it down for the same reason. The peddler combines employer and employed, retail buyer and seller with common carrier. Col. C. C. Jones says: "The primitive merchant-men engaged in this traffic were held in special repute, were generously treated, and had at all times safe conduct through the territories, even of those who were at war with each other."[1] The peddlers of the Middle Ages held a conspicuous place in the social order, special laws were enacted on their behalf, and they enjoyed immunities not accorded to warriors and statesmen. Julius Cæsar attributes the bravery of the Belgians to the absence of peddlers, "*minimeque ad eos mercatores saepe commeant, atque ea, quae ad effeminandos animosi pertinent, important.*"

THE PREHISTORIC CARRIER.

Although we have no evidence in the remains of early prehistoric man that carrying apparatus of any kind was employed, yet the existence of mounds, earthworks, and walls of many sorts of material far from its original source, of relics in old camp sites, indicating that the former occupants lived very much as do those tribes from which the specimens hereafter to be described have been collected, attests the use of similar harness and methods of conveyance and transportation. Indeed, nothing is more probable than that the first men and women on earth bowed their backs and foreheads to those loads which their descendants have borne unremittingly and will continue to carry in spite of and, forsooth, because of the progress of invention. (Fig. 8.)

The whole world is covered with megalithic monuments in the erection of which it is extremely doubtful whether any living beings were used except men. In the Easter Island are immense platforms on which stand images weighing from three to twenty tons. These have been hewn out in the crater of a volcano and moved in some instances several miles over a region as rough as it can be. On the monuments of Egypt are exhibited teams of men hitched to long cables dragging a sledge on which sits an enormous statue. Rollers were used and greased tracks, but we look in vain for the pulley. The immense buildings on our own continent from Central Mexico to Southern Peru were the sole work of man. Without a draught

[1] Cf. C. Rau. "Die Tauschverhältnisse der Eingebornen Nordamerika's." Archiv. f. Anthrop., V. (Antiq. So. Indians, 64, 243.)

animal he brought together the material for his splendid palaces and temples and put every stone in place with his own hands. We may go further than this. Long after horses, camels, oxen, mules, and donkeys were used as beasts of burden the wagons and wheel conveyances were so clumsy as to be practically useless in transporting heavy loads. All over Asia and, indeed, in many parts of Europe the inconvenience of clumsy carriages kept rapid transport in the hands of human bearers.

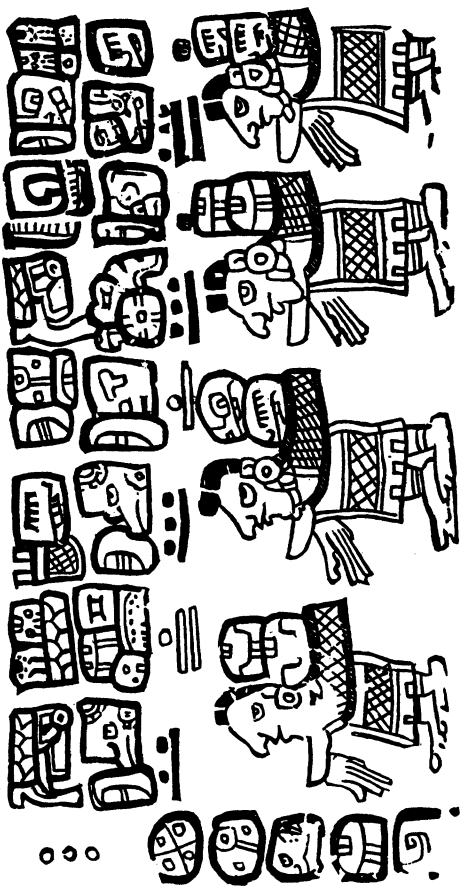

FIG. 8.—Ancient Mexican carriers. Cyrus Thomas, MSS. Troano Cont. to N. A. Ethnol., V, pl. 20.

To one who believes implicitly in the universal domination of invention throughout all human activities, the temptation is great to pass beyond the study of the human bearer to those intermediate

stages between the same and the shifting of the load to vehicles and the backs of animals. As interesting would be these connections to the technologist as to the naturalist are those intermediate forms that now and then appear to confirm his theories of creation.

The forces of nature, the wind, the water-fall, the expansion of steam, the electric current would form another series, the last in the climax, in which the wind acts directly like a hand; the water, through machinery, as a hand turning a crank; the steam, through change of form and the element, like a hand winding a spring; the electricity, through chemical changes, like a hand discharging a gun.

CURIOUS SYSTEM OF NAMING CHILDREN.—The rules of the Patent Office requiring applicants for patents to give their full names, this requirement was recently made of an inventor who styled himself *J Mor Krieser.* In response there came a sworn statement from the applicant that he had no other name; that his father had several sons, to each of whom was given the single Christian name *Mor;* and that the sons were distinguished by prefixing to their names the letters of the alphabet in regular order and that the applicant, being the tenth son, was known as *J Mor.* This statement was accompanied by a letter from the attorney in the case adding that this method of naming children was quite common in Hungary, the native country of the applicant. F. A. S.

PLUME-STICKS (KETHAWNS BAHOS) AMONG THE NORTHERN TRIBES.—The system of sacrifice by means of plume-sticks, which is such an important element in the worship of the tribes of the southwest, seems still to flourish also among the Indians of the Upper Missouri, to judge from the following paragraph appearing under the head of "Fort Berthold Items" in the *Word Carrier* (Santee Agency, Nebraska,) of October–November, 1888:

"Riding along the bluff our attention was attracted by what seemed to be children's play on the very edge of the bluff. Four or five sticks were stuck in the ground; from the top of each waved a white feather. I said, when I saw it, 'Some children have been playing there.' 'No, that is some charm.' This is about all it seems possible for us to find out about such things." W. M.