

THE AMERICAN TOAD.

The common American toad of the eastern United States is scientifically named *bufo lentiginosus*, Shaw; sub-species *Americanus*, LeConte (Professor Cope, and the Smithsonian Institution).

In Pennsylvania and New Jersey, from the latter part of March to the first week in April, according to the season, the toad quits its winter quarters. A week or so later it seeks a mate, when, most commonly at twilight, the buzz-whistling cry of the male may often be heard. The female deposits her spawn in the water, and the ova are fecundated by the male while they are being laid. They soon hatch, when myriads of larvæ, or little black toad tadpoles, may be seen in clusters in the shallow water of ponds and creeks, near the banks. The hind legs of the tadpole are the first to appear; the fore legs later, the tail disappears, and in a few weeks the young toads quit the water with the form they are to retain throughout life. In September the toad creeps into the mud of ponds and ditches, or digs a hole in a loose or sandy soil, and there hibernates.

This, like other batrachians, is insectivorous, devouring almost any kind of insect with which it meets, not excepting bees and wasps, although some have supposed differently. I have in several instances induced it to seize and devour pieces of raw beef, by impaling the meat upon the point of a piece of thin wire, and passing it in a swinging manner before the toad.

The toad has often proved itself to be a good collector of entomological specimens, for many rare and interesting insects have been found by extracting the stomach and examining its contents. By this means insects, not supposed to be found in a certain locality, have, on dissection, been found within a toad taken in that same locality. The prevalent supposition that, by handling a toad, excrescences will be produced upon the hands is entirely fabulous.

I have attempted to represent a toad creeping towards a beetle. This habit of creeping slowly upon its prey instead of always springing, I have also observed in various frogs (*rana*). Insects are sometimes frightened off by a sudden spring of a frog or toad before they can be captured, hence this habit of creeping.

Fig. 1 represents the internal organs of this *bufo*. Fig. 2 is the skull, viewed from above. Fig. 3 is the larva or tadpole.

C. FEW SEISS.

THE VAPART DISINTEGRATOR.

We annex an illustration, from *Engineering*, of a disintegrating machine largely used in France. It consists of a cast iron case provided with two doors, which can be opened, as shown, for inspection or renewal of the various parts. Through the middle of the case runs a vertical shaft, with bearings at top and bottom, and carrying at the upper extremity a pulley by which the shaft is driven. Within the case, three disks are mounted on the shaft at equal intervals. On these disks are bolted a series of radial ribs, as shown. Around the inner side of the case, as well as on the doors, are placed strong cast iron toothed segments, and beneath each segment is placed an inclined and curved plate. The operation of the machine is as follows: The material to be disintegrated is fed in from the top and falls upon the upper disk, and the quick rotation of the latter drives the material forcibly against the corresponding toothed segments. From here it falls down the inclined plates, and is delivered on the middle portion of the second disk, where the same operation is repeated on it, as well as on the bottom disk, whence it is delivered into a hopper below. The disintegration can be carried to any desired extent

Cheap Coal and Water Supply.

Our manufacturers on the east branch of the Hoosac have been congratulating themselves on the abundant supply of water which they are now enjoying. This is like old times, when an equal and sufficient flow could be depended upon. The reason of this former affluence of water was that the native forests, as yet undestroyed, retained the water in the vast range of country over which they stretched, and rendered it gradually forth throughout the summer season. These growths of wood, when firewood was at so high a price, became, however, a rich source of income to our farm-

our factories to the former, and farmers, finding it of so little profit to hew wood on the mountain sides, have left off doing so. Consequently our young forests are springing up vigorously on every side, and the old localities are again being covered with a thick screen of verdure, which both attracts and retains moisture—hence the natural supply of water over which our manufacturers are now rejoicing.—*North Adams (Mass.) Transcript.*

Ruins of New Mexico.

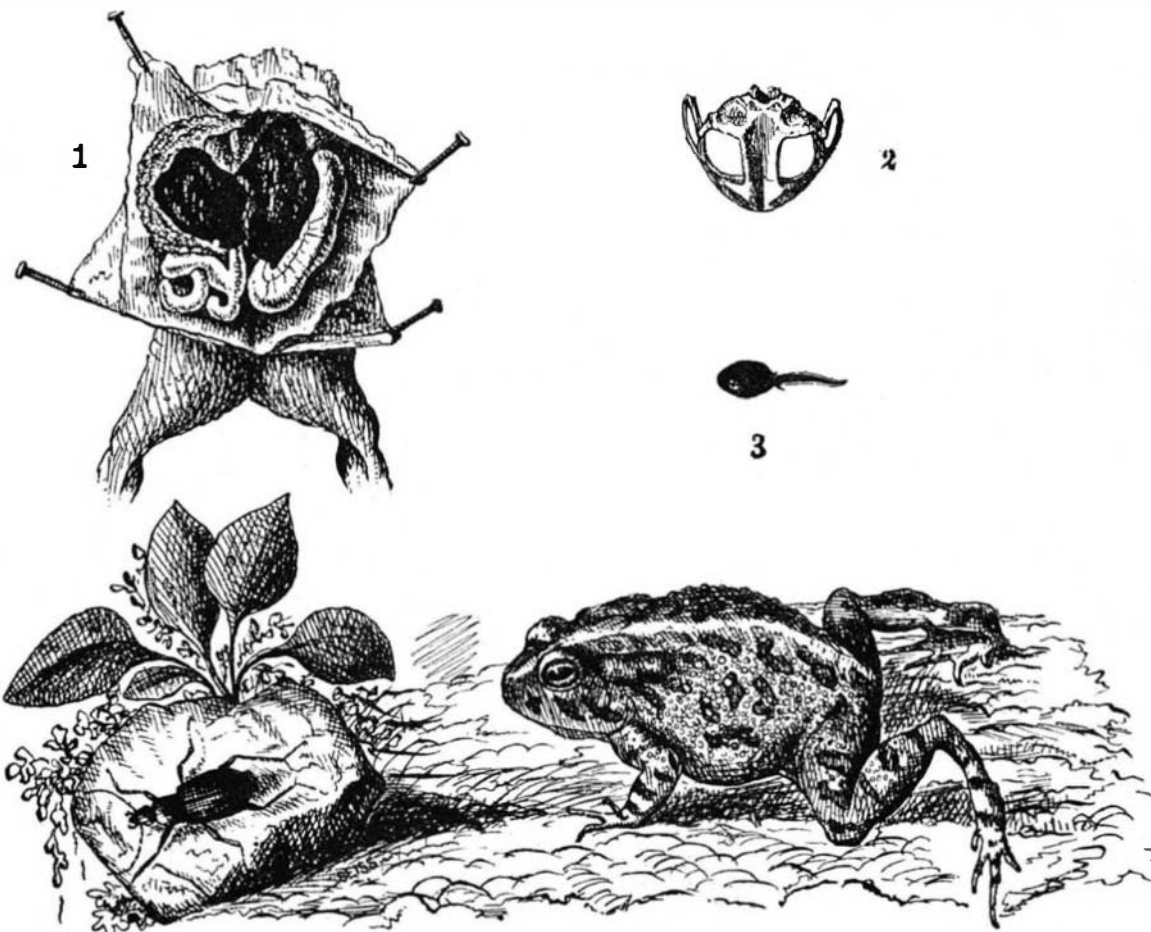
The following notes, by William H. Jackson, of Professor Hayden's survey, on the ancient ruins of New Mexico, and concerning a people about whom nothing is known, will be of interest to all readers:

Commencing with the first ruin, of the Pueblo Contado, as it is called, there are ten others along the cañon of the Chaos, two of them upon the bluff overlooking the cañon, and the others in the valley, all of similar workmanship, and manifestly the work of one people. They are remarkable in being dissimilar and immeasurably superior to any of the ruins yet discovered in America, or to any of the habitation of the present buildings. The large ruin in the Cañon-de-Chelly is of the same class, and is probably contemporaneous with them. The largest of the ten is the sixth, as we go down the cañon, called the Pueblo Bonits by Simpson, which is 540 by 310 feet in its diameter. The smallest is the ninth, and which is a regular parallelogram 78 by 62 feet. With but two exceptions all are built around three sides of a rectangle, with open court facing south and inclosed by a semicircular wall. One of the exceptions to this regular rectangular plan was the last one down the cañon, the

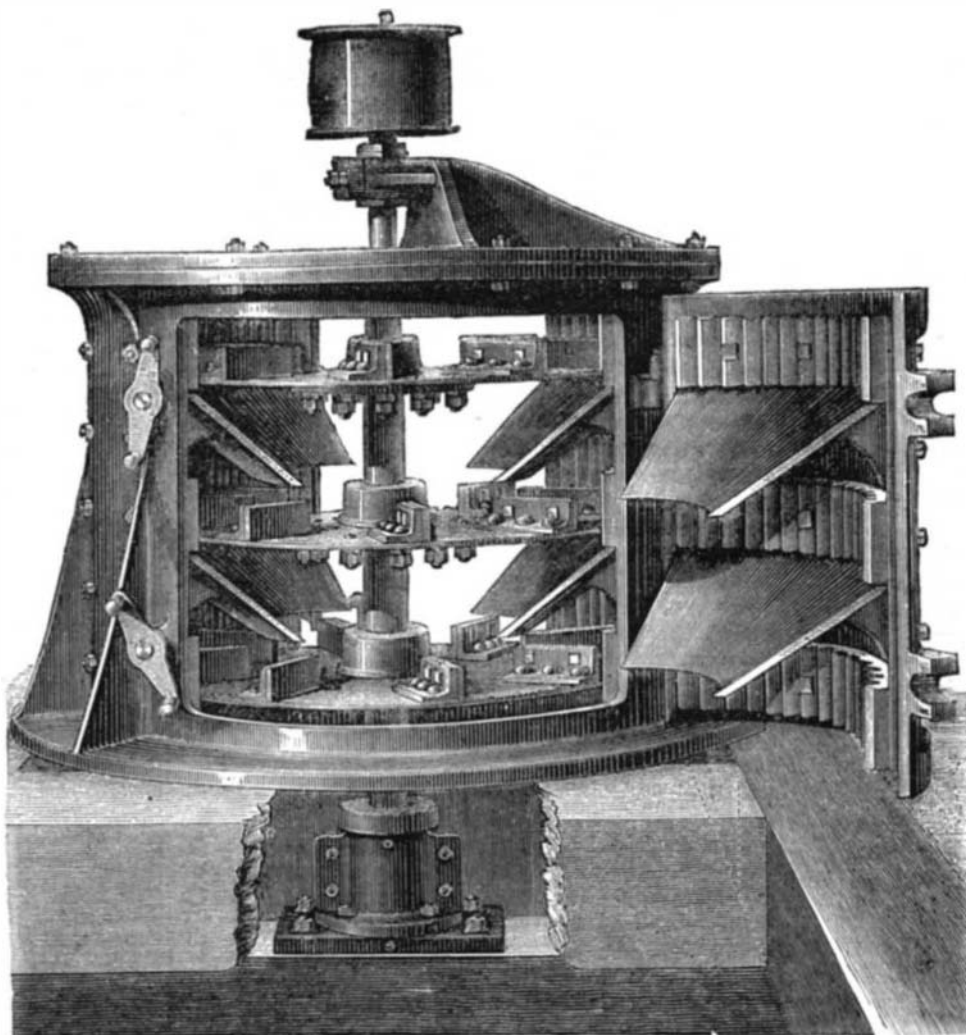
Pueblo Penasco Blanca, of perfect elliptical shape, 496 by 363 feet in its diameter, and the other, Pueblo Bonits, was a perfect half oval or of an egg-shape divided along its greatest diameter. In all, the ground plan of each could be made out with perfect instructions, and in nearly all an elevation through three or four of their stories.

A marked feature was the large size of the rooms. On the second flooring, in the Pueblo Pintado, the rooms averaged 12 by 20 feet, some being as large as 14 by 25 feet square and 12 feet in height. In the Pueblo Penasco Blanca the average length of the rooms on the second floor was 20 feet, some being as large as 18 feet. In the other Pueblos the average height between floors was 10 feet. This does not apply to the first or ground floor, which had a similar height and was divided into much smaller apartments. These were evidently for storage purposes, as is the practice with the Pueblos at the present time.

In five of the ruins we found entire and perfect rooms, preserved from the destruction by the strength of the regas or rafters supporting the floor above them. These we examined with much care and interest, and regretted that we had not the means of digging into others, which are intact beneath the débris of fallen walls. In all the rooms there was a notable neatness of finish, particularly of the ceiling, which, in the case of Penasco Blanca, were covered with thin boards of pine somewhat larger, but of the thickness of an ordinary shingle. All the larger beams, ten to fourteen inches through, were cut off square and smooth. Some of the rooms were plastered perfectly white, probably with the same *yeso* the Pueblos and Mexicans now use. On the walls of one of the small rooms of the Pueblo Bonits were scratched the names of Lieutenant Simpson and R. H. Kern, dated August 1849, and looking as fresh as if but a day old. There were at least two doors or windows in every apartment, of an average size of 26



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THE VAPART DISINTEGRATOR.

by 42 inches. These were plumb to square, of equal width top and bottom, and in forming them the builders seem to have given their greatest care and attention.

A prominent feature in all these ruins were the circular rooms or *estufas*—their council halls or secret places for the practice of their ancient religion. The number of these from each Pueblo varied from but a single one up to as many as twenty-two; their average size was 25 feet in diameter, the largest being a trifle over 60 feet, and the smallest 15 feet in diameter. In two Pueblos these *estufas* had been divided into two or more floors, the beams still protruding from the walls. The interior walls were of the most perfect masonry and perfectly circular.

In all the ruined Pueblos the most remarkable feature was the skill with which the stone walls were built and which has enabled them to withstand for hundreds of years the ravages of human hands and the slower work of the elements. Commencing at the foundation with a width of 32 inches, each succeeding story was built a little less in thickness until the walls of the fourth floor are but 18 inches through, giving them a pyramidal shape and of such solidity that in some cases, although the floors have been crushed down and the crosswalks fallen, yet they remain firm and plumb nearly forty feet in height. They had their methods of laying the stone—big regular sandstone blocks of the size of two bricks, cut and ground to a uniformity—by alternate layers of these blocks with layers of very small and thin pieces of sandstone, generally three courses of the thin to one of the thick, and last by laying the entire wall of these excessively small pieces of thin sandstone. As an example of this last kind I measured off a square yard on the northern wall of the Pueblo of Chetto-Kethe, and counted the number of stones forming the surface. There were 450, each laid so close together that a knife blade could not be pushed between them, and not a particle of mortar of any kind appearing at the surface. This entire wall was 490 feet long, and originally fully 40 feet high and averaged 24 inches thick. Imagine the industry and patience of such builders. The interior of these walls were laid in with rougher stone, and with abundant clay mortar. Binding courses of pine sticks were laid in the wall, both transversely and longitudinally. Every doorway and window was framed with scrupulous exactness, and it would appear as if the plumb and square had been faithfully used in all their work.

Communications.

The Seventeen Year Locust.

To the Editor of the Scientific American:

H. J. Loomis, of Chesterfield, Ill., says, in the SCIENTIFIC AMERICAN of July 7, that what is termed the seventeen year locust appears every thirteen years. In 1829, 1842, 1855, and 1864 they appeared in that region. In Grundy county, Ill., they were numerous in 1854, and also in 1871. I read a few weeks ago that these locusts were appearing in great numbers, if I remember right, somewhere in Pennsylvania, and this is 1877. It does not correspond with either of the periodic appearances as noted above. Is it possible that Nature's operations are so widely variant in the same insect, in about the same latitude? One would think that a seventeen year locust, reasoning from analogy, would remain such in its habits, in obedience to the fixed laws of life; but if it be true that these three appearances of locusts (which by the way are not locusts at all, but cicadas) are one and the same species, can science reconcile or account for these wonderful discrepancies of their appearances, varying four years or more in different localities, and in latitudes not very widely apart? We think they must be different and distinct species. We regret we have not an entomological description of our seventeen year locust. One thing we distinctly remember, he had red eyes, which no other species of our acquaintance has. A specific description of a specimen of each of their appearances would determine the identity, or otherwise would show three species. Cannot the scientific readers of the SCIENTIFIC AMERICAN settle the question of identity?

Verona, Ill.

R. K. SLOSSON.

Pumping with Tight Connections.

To the Editor of the Scientific American:

In response to your wish for some experimental data in proof of my assertion as to the advantage of a tight connection, I relate the following. In 1874 I was employed by the Boston and Providence Railroad, to go to Mansfield, Mass., to make some soundings for water, which was wanted in large quantities. I drove two 3 inch wells 100 feet apart. They were 21 and 23 feet in depth driven through 3 feet of iron ore, which was very close and solid, effectually excluding air. In testing the wells as to supply, I used a Knowles steam pump, 2 inch suction, 1½ discharge.

When ready to make connection I found I had no reducing coupling suitable, and I inserted the suction pipe inside of the well tube in the same manner, but could not run my pump more than 15 minutes without drawing air, the pump running 34 strokes per minute.

Next day I made a tight connection and set my pump in operation. I was astonished at the result. I cannot give you any data on the first trial, for I kept none except the number of strokes per minute and the length of time of the run. On the second trial the pump was in operation one week constantly, from Monday morning at 8:45 until Satur-

day night at 5:30, pumping 165,000 gallons per day of 24 hours. I have tried the same thing many times and the result has always been the same.

Waltham, Mass.

J. R. SMYTH.

Raw Taste of Tobacco.

To the Editor of the Scientific American:

I have been a slave of tobacco for so long that I have given up the idea of ever stopping the use of it. There is so much of the plug tobacco that causes the mouth to become raw, besides containing hair, feathers, and other little dainties too numerous to mention, that I have determined to use none but leaf tobacco hereafter. Will you be kind enough to tell me, through your valuable paper, how to remove the raw taste from the natural leaf, and oblige a subscriber who fully appreciates the value of the SCIENTIFIC AMERICAN?

New Cumberland, Pa.

J. W. F.

[ANSWER—We believe that the common method of removing the raw taste, that our correspondent complains of, is to soak the tobacco in urine. Tobacco thus treated and then sweetened with molasses dirt, is considered "lovely," the "solace" of mankind, "honey dew," etc.]

Eruption of a South American Volcano.

The eruption of a volcano, probably Cotopaxi, has caused serious damage in Ecuador. The *Comercio* of Guayaquil, of June 29, gives the following particulars:

"A volcanic eruption occurred in the interior at from 9:30 to 11 o'clock A.M., on the 26th instant. We do not know which of the volcanoes is in action, but suppose it to be Cotopaxi, which for a century past has had an eruption every ten years. On the day mentioned, from Babahoyo to Tumbuz, detonations resembling the discharge of cannon were heard. At Yaguachi it was said the reports came from the north. At 6 o'clock P.M. of that day a heavy shower of ashes commenced to fall, and continued until this morning. A calculation has been made of the quantity of ashes which has fallen in thirty hours, and it is estimated that on each square kilometer of space 318 kilogrammes of ashes had fallen. A mineralogical analysis of the ashes is made with the following result: Volcanic ashes composed of exceedingly fine particles of lodestone, vitreous felspar, hornblende, and an amorphous substance. On account of the absence of acids in the ashes they are not likely to be injurious to the crops or cattle, as on previous occasions.

"The steamer Islay, on her way from Panama to Guayaquil, first noticed the fall of ashes at Manta, and continued to receive them till arriving at Guayaquil, from which it is inferred that the winds from the higher latitudes have carried them to a great distance. No doubt, as on other occasions, the ashes have been transported to a distance of two hundred leagues from the volcano which threw them out."

The authorities between Ambato and Guayaquil report that, at 10 o'clock on the morning of June 26th, a frightful noise was heard in Latacunga, which was followed immediately by a tremendous flood, which, taking the course of the rivers Cutuchi, San Felipe, and Yanayaco, and passing, washed the city to the chapel known as El Salto. The volume of mud and water was so great as to completely cover the hacienda Valle, including the distillery in front of Latacunga. The flood in its course carried with it many cattle, and, what is more sad, many human bodies. The bridge of Latacunga, the handsome bridge of Bolivar in Pansalco, those of wood of Culapachan and Patate, and that of masonry of Agoyan, were all destroyed. All of the haciendas situated on both sides of the river have suffered enormously, and the desolation is terrible and complete.

Renovating Grass Lawns.

It is astonishing how long a lawn will retain its verdure without assistance in the way of manure. No doubt a lawn gets impoverished in time by being continually cut; but still it seems to sustain little or no injury. The roots of grass appeared to be endowed with an extraordinary vitality, and the rains to which they are exposed recuperate them for the close cropping to which they are subjected, and perhaps the fact of the grass never being allowed to seed has also something to do with maintaining fertility. The vitality of grass roots is best exhibited in dry seasons. In the dry summer of 1868, I knew large trees to die through drought at the root, and many to be seriously injured; but though the lawn was as brown and dead-looking as if it had been scorched by fire, the grass was not killed. I thought it was in many places, for to all appearance the roots appeared shriveled up, as well they might be, being close to the surface, and the grass having been kept as closely shaven as a carpet till the drought came; but when the rains came in October it began to grow, and by next summer all traces of the drought had disappeared. It must not be supposed, however, that I approve of lawns being allowed to become exhausted; by no means. A starved sward is never a very green one, and greenness and freshness are everything in a lawn; and upon the whole it is not difficult to keep it in that condition, for, however neglected it may have been, it quickly responds to stimulating treatment. The best and most convenient plan is to apply artificial manure of some kind in the form of a top-dressing. Guano is good, but it does not produce the greenest verdure; soot surpasses it in that respect, and it is cheaper. It is not needful to top-dress the lawn annually, and when necessary most gardens should provide the materials. If all combustible rubbish in the way of prunings of trees, rakings of shrubberies, etc., be collected into a heap, they will serve not only to consume themselves, if set fire

to, and produce a good quantity of wood ashes, but will reduce to ashes all the short grass that has come off the lawn, weeds, roots, and other rubbish, and at the same time burn a considerable quantity of soil, which may with advantage be mixed with the ashes and the whole applied to the lawn as a top-dressing. There is hardly anything better than this for grass, and its effects are more lasting than guano or soot alone, and it may be applied without fear of injury. Should the lawn be mossy, it should be well harrowed with a rake first, and then cleaned and dressed.—*Correspondent in the Garden.*

The New Metals Ilmenium and Neptunium.

About thirty years ago R. Hermann announced the discovery of a new metal, ilmenium, accompanying tantalum and niobium in various minerals, and closely allied to them in its general characters. Several years later he relinquished his claims to the discovery, in consequence of researches by Marignac in the same field leading to entirely different results. Later investigations have, however, strengthened his belief in the existence of ilmenium, and in the February number of Kolbe's *Journal für praktische Chemie* he not only brings forward results tending to establish the individual character of ilmenium, but describes a new metal neptunium, belonging to the same group, and occurring in tantalite from Hadam, Connecticut. As the quantities obtained are small, the characteristic reactions limited, and as the spectral properties cannot be made use of, chemists will naturally reserve their opinion till confirmatory observations have been made by some other well known investigator. The following are the essential results obtained by Hermann. The mineral was found to consist of equal portions of columbite (ROMe_2O_6) and ferro-ilmenite (ROMeO_2). By fusion with potassium bisulphate the hydrates of the metallic oxides were separated out in the following proportions: Ta_2O_5 , 32.39; Nb_2O_5 , 36.79; Il_2O_3 , 24.52; Np_2O_7 , 6.30; total 100.

The hydrates can be changed into double fluorides, and from the greater solubility of potassium-neptunium fluoride, it may be obtained free from tantalum and ilmenium salts but retaining a small quantity of the niobium salt; these, however, on being changed into niobate and neptunate of sodium, may be separated on account of the greater solubility of the latter. By fusion of the neptunate of sodium with potassium bisulphate and treatment with water, the hydrate of neptunic acid was obtained in a pure condition. Neptunium may be distinguished from niobium and ilmenium by its having, along with tantalum, the property of forming an amorphous insoluble precipitate on the addition of caustic soda to the boiling solution of the fluoride; the other two form crystalline and easily soluble compounds. The very soluble character of neptunium potassium fluoride as compared with the corresponding tantalum salt serves to distinguish it from that metal. The reactions with phosphorus salts in the inner part of the Bunsen flame are the following: tantalalic acid, colorless; niobic acid, blue; ilmenic acid, brown; neptunic acid, wine yellow. Addition of tincture of galls to solutions of the sodium salts give characteristically colored precipitates. The atomic weight of neptunium, determined from the double salt $4\text{KFl} + \text{Np}_2\text{Fl}_2 \cdot 2\text{H}_2\text{O}$, was found to be 118. Hermann has also obtained ilmenium in the form of a black powder by heating potassium ilmenium fluoride with potassium chloride and potassium.—*Nature.*

The Hayden Survey.

The area to be surveyed includes something over 30,000 square miles, divided into three districts, lying mainly in Wyoming Territory, but trenching on Utah and Idaho on the west. Two of these districts, the Green River and Sweetwater, have as their southern line the parallel 41° 45' (or about the northern boundary of Clarence King's survey of the fortieth parallel), and the parallel 43° as their northern line. They extend from longitude 107° to longitude 112°, and are separated by meridian 109° 30', the Sweetwater Division taking the eastern portion and the Green River Division the western. The Snake River Division works an area extending as far north as 44° 15', and having the same meridians at east and west boundaries. The organization of the Green River Division is typical of all. It is composed of the following persons: Henry Gannett, Topographer in charge; Dr. A. C. Peale, Geologist; J. E. Mushback, Assistant Topographer; F. M. Eastman, Geological Assistant; two packers and a cook. Mules are used both for riding and for the conveyance of the outfit; i.e., tents, baggage, bedding, instruments, and rations. By using pack-mules we are rendered entirely independent of roads, and can move our camp to within a short distance of the mountain summit, and also feel sure that they will be able to endure a campaign where horses and ponies would be sure to fail us. All our mules have been in service since 1873, and after the first few days out fall into line like old veterans. It is amusing to watch them the first day. While the *aparejos* or pack saddles are being put on, they puff themselves out and hold their breath as long as the packers pull on the circingle. When the load is on and the mule allowed to go, the circus commences; and if any animal in the world knows all the inside mysteries of "bucking," it is a Western mule. Our packers, however, are tried men, and put the load on to stay, which fact the mule is not long in finding out, and after one or two mornings he travels along so demurely after the bell-mare that you can scarcely believe him the same animal. Packing is an art, and the head packer is an important person in the camp. He has charge of the constantly diminishing cargo which each morning has to be made up into "loads" of equal weights.