lubricated until the oil is entirely exhausted or worn out, with no delays from over-heating, and with no loss of power by friction. The bearings are always cool and work perfectly. These mills are constructed with the under stone hung on a sensitive point or cockhead spindle, or they can be made with the under stone rigid and stiff on the spindle.

For further particulars address the manufacturers, Munson Brothers, Utica, N. Y.

THE ASWAIL.

The aswail, or sloth bear, is found in the mountainous parts of India, and is equally dreaded and admired by the natives of that country. Although a sufficiently harmless creature if permitted to roam unmolested among its congenial scenery of mountain and precipice, it is at the same time an extremely dangerous foe if its slumbering passions are aroused by wounds or bodily pain of any kind. As a general rule the aswail remains within its sheltered den during the hot hours of the day, as its feet seem to be extremely sensitive to heat, and suffer greatly from the bare rocks and stones which have been subjected to the burning rays of the glowing Indian sun. On one or two occasions, however, where the wounded bear had been successfully tracked and killed, the soles of the animal's feet were found to be horribly scorched and blistered by the effects of the heated rocks over which the creature had recklessly passed in its haste to escape from its enemies. On account of this extreme sensitiveness of the aswail's foot, it is very seldom seen by daylight, and is generally captured or killed by hunters who track it to its sleeping place, and then attack their drowsy prey.

The aswail is said never to eat vertebrate animals except on very rare occasions, when it is severely pressed by hunger. Its usual diet consists of various roots, bees' nests, together with their honey and young bees, grubs, snails, slugs, and ants, of which insects it is extremely fond, and which it eats in very great numbers.

Probably on account of its mode of feeding, its flesh is in much favor as an article of diet, and though rather coarse in texture, is said by those who have had practical experience of its qualities to be extremely good.

The hair which covers the body and limbs is of singular length, especially upon the back of the neck, and the head, imparting a strange and grotesque appearance to the animal. The color of the fur is of a deep black, interspersed here and there with hairs of a brownish hue. Upon the breast a forked patch of whitish hairs is distinctly visible. When it walks its fore feet cross over each other, like those of an accomplished skater when accomplishing the "cross roll," but when it remains in a standing attitude its feet are planted at some distance from each other.

These bears seem to be very liable to the loss of their incisor teeth, and even in the skulls of very young animals the teeth have been so long missing that their sockets have been filled up by nature as if no teeth had ever grown there. On account of this curious deficiency, the first specimen which was taken to England was thought to be a gigantic sloth, and was classed among those animals under the name of *Bradypus ursinus*, or ursine sloth. In one work it was candidly described as the "Anonymous Animal." Other names by which it is known are the jungle bear, and the labiated or lipped bear. This last mentioned title has been given to the animal in consequence of the extreme mobility of its long and flexible lips, which it can protrude or retract in a very singular manner, and with which it contorts its countenance into the strangest imaginable grimaces, especially when excited by the exhibition of a piece of bun, an apple, or other similar dainty. It is fond of sitting in a semi-erect position, and of twisting its nose and lips about in a peculiarly rapid manner in order to attract the attention of the bystanders, and ever and anon, when it fails to attract the eyes of its visitors, it slaps the lips smartly together in hopes to strike their sense of hearing.

When captured young it is easily tamed, and can be taught to perform many curious antics at the bid of its master. For this purpose it is often caught by the native mountebanks, who earn an easy subsistence by leading their shaggy pupil through the country, and demanding small sums of money for the exhibition of its qualities.

ASWAIL, OR SLOTH BEAR.—*Melursus Lybius.*

Lobsters for the Pacific Coast.

A large quantity of live black and striped bass, eels, and lobsters from the Atlantic coast have lately been distributed along the California coast. This is the first time that lobsters in good condition have reached the Pacific. Their successful transportation is attributed to the unremitting attention of Mr. Livingstone Stone and his assistants, in whose charge they were. The lobsters were taken at once to Point Bonito, and liberated. On the way to the Point they were placed in a fresh supply of water from the incoming tide, which greatly delighted them. They were all females, ripe for spawning, and were estimated to carry 1,000,000 eggs. The cost of the importation was borne by the California State Fish Commission.

Railway Risks from Defective Vision.

Railway risks from color blindness have attracted much attention of late, and a system of railway signals, using bars at different angles, has been proposed as a substitute for color-signals. Dr. Garretson, of Philadelphia, calls attention to a new source of danger from such signals, arising from the great frequency of the optical defect known as astigmatism.

This condition exists in irregularities of the refracting media of the eye, and is a defect so common as to be met with very much more frequently than color-blindness, the evils of which are sought to be remedied. The eye affected with astigmatism sees bars or lines with clearness only when these are at certain planes with the horizon; lines or bars at other planes it sees dimly or not at all. An astigmatic pair of eyes, having the bar signals alone for a guide, would certainly wreck the train under their direction.

If the new system be adopted, railway officials will owe it to the community, and for the protection of the companies against damages from accidents, to submit every employé for examination by competent surgeons. Accidents arising out of such neglect would assuredly be without excuse.

NATURAL HISTORY NOTES.

A New Theory in Regard to Galls.—Insect galls, which are usually held to be excrescences, a diseased condition of vegetable tissue, resulting from the injection of some fluid or secretion by certain insects, are regarded by Mr. A. S. Wilson, of Aberdeen, in altogether a different light. He says, in a communication to *Nature*, that "all insect galls are in reality leaf buds, or fruit buds, and not mere amorphous excrescences. The vascular lines which would form leaves can easily be followed up the structure of the oak leaf galls. And in cases where the egg has been deposited in the tissue of a young branch, the cap of the gall is sometimes surmounted by a leaf two or three inches long. But in the large blue Turkish galls many lacunæ occur where the fleshified leaves have not filled up the spaces between them. If a dissection be made of one of the weevil galls on the bulb of the turnip, the second or third slice will show the outer foliations, exactly similar to those of the root buds. When the center has been reached, where the maggot will be found, there will also be found a vascular pencil running up from a medullary ray in the bulb, and bearing on its top a bud of the same description as that produced by a ray running out from a root. The insertion of the ovipositor brings a medullary ray into action, producing a tuberculated bud, and it is only the bud which the larva feeds upon. The growth of a bud is an intelligible cause of the growth of a gall, but we can infer nothing from the injection of a fluid. The analogy to leaves is further shown by the fact that various microscopic fungi are matured in the interior of imperforate galls.

Red Canary Birds.—Among the varieties of the canary bird that have recently come into fashion among amateurs is one with red plumage. These birds, according to Mr. Vander Suickt, a Belgian fancier, appeared for the first time at the London Exhibition in 1872. They were exhibited by Mr. Bembrose, of Derby. The birds received no prizes, however, as the jury had doubts as to the origin of their color, and believed them to be dyed. The following year, at the Exhibition held at Whitby, the red canaries were recognized as a new variety, and they became all the rage. In numerous controversies Mr. Bembrose had given his word of honor that the color of his bird was not due to any fraudulent processes, but had been really obtained through a special mode of feeding. But as a friend to whom he had communicated his secret abused his confidence and sold it, the author has believed it his duty to make known to the public the process which he used to obtain his results. It appears, according to him, that the birds are fed upon hard boiled eggs crushed up with the crumbs of common white bread and dusted over with Cayenne pepper. Dr. Dusch, a Belgian amateur, adds the following:

Purchase at the druggist's some of the very best quality of Cayenne pepper, ground very finely; for each meal mix some of it with stale bread macerated in well water, and press it together so that it will crumble, but not form a paste. Instead of bread the white of an egg may be used, if preferred. This kind of food should be given to the bird only before and after moulting. It is well to add that it would be a waste of time to experiment on any other canaries than those of the Norwich breed, or on birds that are not of a very dark yellow strain. This statement is made on the authority of *Les Mondes*.

Insects Destroyed by Flowers.—Mr. J. W. Slater, in a communication to the Entomological Society of London, says: Whilst it is generally admitted that the gay coloration of flowers is mainly subservient to the purpose of attracting bees and other winged insects, whose visits play so important a part in the process of fertilization, it seems to me that one important fact has scarcely received due attention. Certain gayly-colored, or at least conspicuous, flowers are avoided by bees, or if visited have an injurious and even fatal effect upon the insects. Among them are the dahlia, the passion flower, the crown imperial, and especially the oleander. That the flowers of the dahlia have a narcotic action both upon humble bees and hive bees was first pointed out, I believe,

by the Rev L. Jenyns, in his "Observations in Natural History." He mentions that bees which visit these flowers are soon seized with a sort of torpor, and often die unless speedily removed. He quotes also a writer in the *Gardener's Chronicle*, who pronounces the cultivation of the dahlia incompatible with the success of the beekeeper. I find it also recorded that the passion flower stupefies humble bees; that bees of all kinds avoid the crown imperial and the oleander, and that the honey of the latter is fatal to flies. I cannot call to mind that I ever saw a butterfly or a moth settled upon the flowers of this shrub in Hungary and Dalmatia, where it is very abundant. It seems not unimportant to ascertain whether the above mentioned phenomena have been verified by other observers; whether any other insects in such cases undertake the functions generally exercised by bees, and whether other flowers have a similarly noxious or deadly action upon insects.

Propagation of Oysters.—Prof. Brooks, of the Johns Hopkins University, has, according to the *Science News*, been recently engaged in experiments with the object of securing the artificial propagation of oysters, and on the 20th of May his efforts culminated in success. Before these experiments naturalists were not fully conversant with the early history of this mollusk's development. A correspondent of the Baltimore *Sun*, who witnessed the process of making embryonic oysters, says in his account of it: Half a dozen on the half shell served on a plate, a few watch crystals, a small glass jar, a little water, and the microscope, constituted the laboratory. The oysters had been taken fresh from their beds and opened carefully. In this way they will live for a day or two if kept in a cool place, and all the while the heart may be seen to pulsate in its cleft next to the muscles. Close to the heart lay what is usually called the "fat," but which is really the reproductive organs. These are wrapped all around the stomach, liver, and digestive organs, the latter being the "belly" or dark part of the oyster. The flaps extending around the whole of one side of the shell are its gills, through which it breathes and separates its food. The mouth is at the butt end of the shells where the hinge connects them. Male and female oysters on the half shell cannot be told apart, and indeed one in fifty is believed to be hermaphrodite. It is claimed that oysters are females when young, and males when they become older and larger. But the facts have not been established with certainty, nor is it of importance. To produce free swimming ciliated embryos the operator pinched away with tweezers a particle of the generative part, put it into a watch crystal, and stirred it until the eggs were well shaken out. The water was now milky from the great number of eggs. The microscope determined the sex, which in the present experiment proved to be male. Under the microscope these male cells appeared to be minute dots perpetually in active motion, and each one of them being sufficient for impregnation when properly lodged. The female eggs are 100,000 larger than the male cells, but are invisible to the naked eye.

Having been washed out into separate watch crystals, the eggs are mixed with the male cells. Then viewed under the microscope the male cells are seen to attach themselves vigorously to the egg in eager crowds, but only one of the many is supposed to impregnate. The first change apparent is the disappearance of the germinal vesicle, and this is accomplished in a very few minutes. The egg then becomes spherical and remains quiet for one or two hours, when a kneading process becomes visible. A globule appears on its surface, and this is the beginning of segmentation. Then by degrees the egg becomes divided into smaller and smaller granules. This process of subdivision occupies two hours, and at the end of this time a small, transparent swimming embryo is found, which is the oyster in its infantile state. The whole process occupies from four to six hours, according to the temperature, although in the present instance it was brought to a successful issue in four hours. Prof. Brooks in his previous experiments had raised oysters till they possessed the cilia which serve to propel the microscopic animal, but they died without further revelation of the mystery of life. In the present experiment he had the satisfaction of developing the embryos until he could clearly trace their digestive organs, and he is inspired with the hope that continued watchfulness will enable him soon to see the infants begin to assume their armor of shells. It is believed that there is no specific time for the spawning season of the oyster, and that it continues throughout the summer months, though this is a point not yet definitely settled.

Correspondence.

How to Hear Lightning in Advance of the Thunder.

To the Editor of the Scientific American:

During a recent thunderstorm at this place I tried, with much success, the interesting telephone experiment suggested in your last week's paper by Mr. G. M. Hopkins. I connected one pole of the telephone with the water faucet in my room, and the other pole with the gas pipe. On applying the telephone to my ear I heard, at every flash of the lightning, a crackling or bubbling sound in the instrument, the intensity of the sound varying with that of the flash. There were also, throughout the storm, frequent minor sounds, indicating lesser electrical action in the telephone; but these minor sounds were unaccompanied by a visible flash.

The thunder sounds were heard from 5 to 30 seconds after the flashes were seen; showing that the center of electrical action was at a distance of one to six miles from my instrument. The water pipe simply connected with a cistern in the ground near my house. The gas pipe connected with the street main, ramifying through the village over perhaps a square mile, but not in the direction of the storm I have mentioned.

A. E. B.

Mont Clair, N. J., July 11, 1879.

Large vs. Small Vehicle Wheels.

To the Editor of the Scientific American:

In a late number of the SCIENTIFIC AMERICAN appeared the question whether a large or small wheel ran the easier. The answer was given in favor of the larger wheel. The principle involved is well known to the carriage builder as being based upon the law in mechanics that regulates the workings of the lever. A wheel is a perpetual lever, the weight, although it is placed upon the hub or axle, is carried to the ground by the law of gravitation in a perpendicular line with the suspension. The obstacles to be overcome in propelling a vehicle create a continuous fulcrum, being a greater or less distance from the weight in accordance with the obstacle surmounted.

To illustrate this principle we have prepared two illustrations. In Fig. 1 is shown an incomplete wheel, the spokes have been driven into the hub, but the fellies have not yet been placed in position. The wheel stands upon two of its spokes. From the hub is suspended a weight of 190 lb; this weight, although placed upon the hub, actually rests

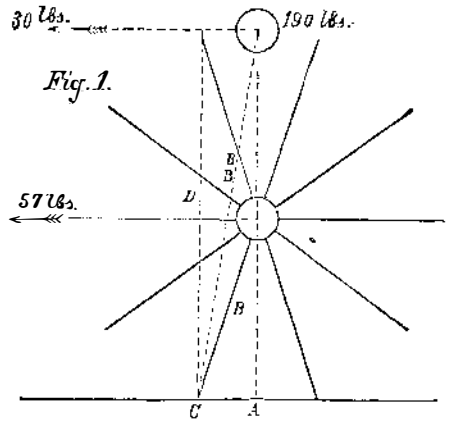
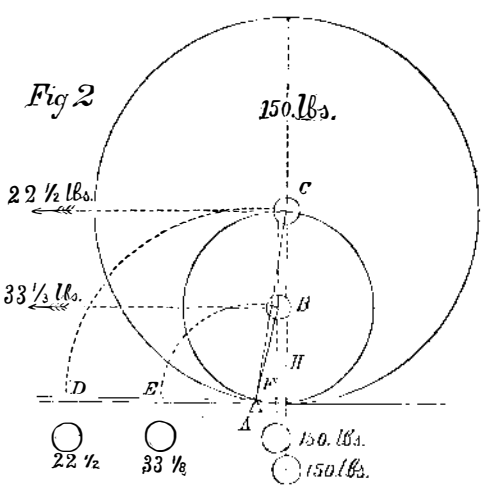


Fig. 1.

upon the ground at A; the end of the spoke, B, forms a fulcrum at C. We wish to raise the spoke, B, to a perpendicular position, shown by the dotted line, D, and in order to do so a force of sufficient amount is applied at E, or the hub, pulling in the direction of the arrow. Now as the distance, A C, is to the distance from the center of the wheel to the fulcrum, C, so is the force applied at E, or the hub, to the weight, 190 lb. We, therefore, find that a force of 57 lb. will move the 190 lb. Now, suppose that the wheel is just twice as large, and that the dotted line, B B, represents the spoke of the larger wheel corresponding with B in the smaller wheel. Applying the force at F in the direction of the arrow, we find that 30 lb. will move the weight of 190 lb.

In Fig. 2, two wheels are represented, the smaller two



feet, the larger four feet in diameter. We will suppose an obstacle is placed upon the track at A; a weight of 150 lb. is placed upon the axle of the smaller wheel, and a force applied at B in the direction of the arrow. This force will be equivalent to 33⅓ lb., while a force of 22½ lb., applied at C, the center of the large wheel, under the same conditions, would accomplish the same object. In order to illustrate the principle more fully, let D A represent the long arm of a lever, corresponding with the spoke of the larger wheel, and A H the short arm. Suspend a weight of 150 lb. at H, and another of 22½ lb. at D, and the lesser weight will balance the heavier. The same with E A F; here, however, a larger weight is required to balance the 150 lb. than with the longer arm, thus fully demonstrating the advantage of a large wheel over a smaller.

GEORGE A. HUBBARD.

New Haven, Conn.

The Old Telegraph Mine.

To the Editor of the Scientific American:

About twenty-five miles by rail, south of Salt Lake City, in the Bingham Cañon, one of the most reliable mines of Utah is located. I refer to the Old Telegraph, which has for many years been well and favorably known in this country as a producer of lead bullion. The mine is reached via the Utah Southern and the Bingham Cañon Railways, the latter road connecting with the former at Junction, a distance of twelve miles from Salt Lake City, and thence it runs to Bingham, thirteen miles distant, up a grade 200 feet to the mile. From Bingham there is a tramway running up the sides of the mountains to the mouth of the mine, more than two miles away. The ore is run down this tramway in small cars, and dumped from their elevated track into the larger cars of the railroad. The accessibility of the Old Telegraph is all that could be reasonably desired. Bingham Cañon is more in the nature of a valley than of an abrupt cañon. The slope is admirably utilized by the tramway and railroad already described, so that the attraction of gravity performs without cost what otherwise would require expensive machinery to accomplish. This Bingham Cañon Railroad was built to meet the necessities of ore shipments from the Old Telegraph, and it has paid for itself more than three times over.

Bingham City is also an outgrowth of this mine, and it is one of the most considerable mining towns in the Salt Lake valley. The property of the mine is about 3,500 feet in length, and the strike of the vein is nearly east and west. The average altitude of the whole mountain in which the mine is located is 6,800 feet. This is divided by deep gulches which offer convenient egress in various places for the ore.

The vein is tapped horizontally by five different levels. The first is the 460 foot level; the second is the 420 foot level, the third, the 360 foot level; the fourth, the 310 foot level, and fifth the 60 foot level. The width of the seam at the 460 foot level is 72 feet, and at the 60 foot level 60 feet. The entire length already opened is 1,710 feet, and about 1,790 feet more is virgin ground yet unopened.

The geology of the whole Bingham Cañon is of the Devonian formation, consisting of quartzite, marble, clay, and limestone. These have been rifted and twisted, by the volcanic action which reared these mountains, into multitudinous forms. The vein of ore is a true vein, of great strength, and practically inexhaustible. The upper part contains less lead than the lower, but is rich in silver. The whole vein averages from 25 to 50 oz. in silver, though in some places the yield is upwards of 200 oz. The average yield of lead is from 40 to 60 per cent. The lead ore consists of carbonate, which, when pure, contains 77 per cent. of lead, and galena, which contains 87 per cent.

The primitive vein material was galena, which was changed into sulphate, carbonate, and chloride by the action of concentrated sea water. Silver is found in the form of sulphate and chloride of silver. Ores containing much chloride of silver are seldom rich in lead, and are, therefore, not smelted, but leached out. The Old Telegraph has a leaching establishment immediately adjacent to the mine, and another one on a larger scale at West Jordan. This leaching process produces sulphate of silver, by the way of solution of hyposulphate of sodium, and precipitation by sulphite of calcium. Under the administration of Mr. L. A. Haldin, the former superintendent and manager of the Old Telegraph, the mine produced in one year $700,000. The average daily output was about 100 tons, or something over $20 per ton net profit. In the year 1876, the mine produced the sixth part of all the lead in the United States, or 10,000 tons in bullion. In 1877 it produced the eighth part, or 11,000 tons in bullion, the general yield being greater throughout the country in 1877. In 1876, 1,000 tons of the ore were analyzed at Pittsburg, by Othon Wuth, with the following result:

Carbonate of lead	50·43
Galena	15·02
Oxide of iron	3·78
Sulphate of copper	0·69
Sulphate of iron	7·37
Quartz	12·47
Clay	3·01
Carbonate of lime	3·64
Sulphate of lime	3·04
Carbonate of manganese	0·26
Water	0·19
	99·88

More recent analyses have been made with practically the same result. The Old Telegraph bullion is esteemed highly throughout the East, and is worth $5 more per ton than any other Utah bullion, because it does not contain antimony, arsenic, or zinc metals, which are noxious to the refining process; and consequently the bullion and ore of the Old Telegraph is sought by refineries and all smelting works in the neighborhood.

About the first of the present year a wealthy French company purchased this valuable mine, and since the 8th of May have been in possession of the property. The management is now taking out over 100 tons of rich ore per day. This operates the tramway to its full capacity and keeps four out of the five furnaces of the smelting works in blast. One hundred men are constantly employed, and preparations are making to increase this number, with additional facilities for a much larger output of ore. It is proposed, at no distant day, to put up three new furnaces, and when this is done the owners of the Old Telegraph will be able largely to command the whole silver smelting of Utah; for there is no good lead in the territory to smelt the silver with except that of the Old Telegraph; consequently, rather than sell their ore to smelt that of other neighboring mines with, they will buy all other ores and smelt them in their own furnaces. This is the true policy of the present company, which they undoubtedly appreciate. The company being one of large resources, the shareholders will not press the management for immediate large dividends, but will be content to wait for more permanent and equally beneficial results.