THE OLD RIVER BEDS OF CALIFORNIA.

In the current number of the *American Journal of Science and Arts*, Professor Joseph Le Conte discusses the subject of the old river beds of California, which, in several respects, present features that are entirely unique. In most countries, as, for example, in Europe and the Eastern United States, the new or present river beds occupy the same position as the old; while in Middle California the rivers have been *displaced* by lava flows from their former position and compelled to cut entirely new channels.

Again, in certain portions of Europe and the Eastern United States, the old river beds are broad, deep troughs, filled sometimes several hundred feet deep with detritus, into the upper parts of which the present much-shrunken streams are cutting their narrower channels on a *higher* level; while in California the displaced rivers have cut their new channels 2,000 to 3,000 feet deep in solid slate, leaving the old detritus-filled channels far up on the dividing ridges. In the Northeastern United States the drainage system has remained substantially unchanged since early tertiary, or even earlier times; while in Middle California the tertiary drainage system seems to have been obliterated, and the streams have been compelled to carve out new and independent drainage systems, to a much deeper level and having the same general direction, but often cutting across the former. Furthermore, in California, the detritus which fills the old river beds is nearly always capped with lava, clearly indicating the cause of the displacement. Finally, the contrast is further marked in the fact that the detritus filling of the old California river beds usually consists of large pebbles and bowlders; while the old channels of the Eastern coast are filled with fine silt.

This peculiar relation of the old to the new river beds does not characterize the whole Pacific slope, but only the auriferous slate belt of Middle California. It is not found in the coast range, nor in the region of the granite axis of the Sierra range. Neither is it found in any marked degree in extreme Northern California, nor in Oregon, nor in Southern California. It seems to be confined mainly to the slate belt of the western slope of the Sierra from Plumas county on the north to Tuolumne county on the south, inclusive, a distance of about 250 miles, and from the San Joaquin and Sacramento plains on the west to about 4,000 feet elevation on the Sierra slope on the east, a breadth of about 35 miles.

There are many difficult and important questions suggested by these phenomena. How were the old river beds filled with detritus? How were the streams displaced? Why have the new channels been cut so much deeper than the old? When did these events occur?

In answer to the first question, Professor Le Conte first points out the fact that rivers either erode or build up by deposit. Every current has a certain amount of energy, and can do a certain amount of work, increasing with the velocity. This energy is divided between the work of transport ation and that of erosion. If the load of transported matter be moderate, a large amount of energy is left for erosion; but if it be very great, the whole energy may be expended in transportation and none left for erosion—the limit is reached at which erosion ceases and deposit begins. All that is necessary, therefore, to cause any stream to deposit, is to increase its load beyond the limits of its energy. If rivers build, they almost always do so very rapidly. Now, the phenomena of the old river gravels are precisely those of deposits made by the turbulent action of very swift, shifting, overloaded currents, which must have been far swifter and more heavily loaded than any existing ones. Therefore the process of filling must have been exceptionally rapid. It may have occupied years, or even centuries; but, geologically, it must have been a very speedy process. And these conditions must have been fulfilled by the rapid melting of extensive fields of ice or snow. The reason the detritus was not carried away again was because immediately after the filling the detritus was protected and the rivers displaced by the lava flood. This brings us to the cause of the displacement of the rivers.

Middle California lies on the southern skirt of the great lava flood of the Northwest. The center of the great outflow (which came from fissures and not from craters) was the Cascade and the Blue Mountains. In Oregon the lava is 3,000 feet thick; in extreme Northern California it is still several hundred feet thick, and the old river beds are hopelessly concealed. In Middle California it is reduced by erosion to ridges and patches. Immediately after the obliteration of the previous drainage system, the rivers began cutting a new system having the same general trend (determined, of course, by the mountain slope), but independent of, and therefore often cutting across the older system. From all the facts of the case the conclusion seems inevitable, that the subterranean heat of the impending lava flow was the cause of the rapid melting of the snow and ice, and the consequent rush of the overloaded waters, which filled the channels with detritus. Before the melting was completed the ash eruptions had already commenced, and mud streams, followed by lava streams, completed the work of obliteration.

It is almost certain that, coincident with the outflow of lava in California, there was an increase in the elevation of the Sierra range. The inevitable effect of this would be the cutting of new channels below the level of the old, and thus, finally, the singular relation between the old and the new channels which now exist. Professor Le Conte believes that these general phenomena of the gravels and their accumulation are wholly those of the Quaternary period. They can hardly be explained except by the existence of glacial conditions. Also the gentle movement of elevation which he supposes to have preceded and attended the lava flow is characteristic of the Quaternary everywhere. On the other hand, it is certain that the Pliocene passed insensibly into the glacial epoch, and therefore that glacial conditions commenced in the Pliocene. Furthermore, it is certain that here in California, glacial conditions continued and reached their acme *after the lava flow;* for glaciers occupied all the present cañons, and *swept away all the lavas* from the granite axial region, exposing their roots in the form of dikes. In conclusion, therefore, it seems best to make both the accumulation of the gravels and the lava flow which protected them the dividing line between the Pliocene and Quaternary, although it is probable that glacial conditions had already commenced when these events occurred.

ARIZONA SHELLAC.

At a recent meeting of the California Academy of Sciences Professor Stillman read a paper on the gum and coloring matter found on the *Acacia Greggii* and the *Larrea Mexicana* or creosote plant. The gum which exudes from these plants is very abundant, and is the product known to commerce as shellac. The same plants produce lac dye. Professor Stillman suggested that California might compete with British India in supplying this valuable product. Mr. B. B. Redding said that these lac-yielding plants were as plentiful as sage-brush from Southern Utah to New Mexico, and from the Colorado Desert to Western Texas.

The lac is most abundant around stations on the Mojave and Colorado deserts, and exudes as the result of an insect's sting. Calcutta exports a million pounds sterling in value annually of shellac, selling at 25 to 35 cents a pound, and almost as much more of lac dye, selling at 30 to 40 cents a pound. In 1876 the United States imported 700,000 pounds of shellac alone. To collect this is simple work for boys, and will prove an important industry. It will require little or no capital. The twigs are boiled in hot water, and the gum rises to the top, is skimmed off, strained and dried on smooth stones, and hand pressed into flakes, ready to make sealing wax or varnish. The residue, when allowed to settle, makes lac dye. The plants live on a rainfall of three inches a year.

In vol. vi. (Botany) of the Reports of the U. S. Geographical Surveys west of the 100th meridian we find the following information relative to these two plants, which would seem to be worthy the attention of commercial men and manufacturers:

P. 108—ACACIA GREGGII, Gray.—A small tree, 10 to 20 feet high, pubescent or glabrous, unarmed or with scattered stout recurved prickles; pinnæ 2 or 3 pairs, on a slender petiole; leaflets 4 or 5 pairs, oblong or oblong-ovate, 2 or 3 lines long, rounded or truncate above, narrower at base, rather thick, and with 2 or 3 straight nerves; flowers in cylindrical spikes an inch or two long, the peduncles equaling or exceeding the leaves; pods thin, coriaceous, flat, 3 or or 4 inches long by 5 to 7 lines broad, shortly stipulate, acute, curved, glabrous, and reticulated, more or less constricted between the seeds; seeds half an inch long.—From Western Texas to Southern California; collected in Western Arizona, 1872.

P. 41—LARREA MEXICANA, Moricand, *Creosote bush.*—Common from Western Texas to Kern County, California, and southward to Mexico. Dr. Loew's examination proves that the reddish-brown exudate on the branches, caused by an insect, will yield a red coloring matter showing all the reactions of cochineal. "The alcoholic extract of the leaves, on evaporation, yields a greenish-brown residue of a specific and somewhat disagreeable odor, more strongly perceptible on boiling the extract with water. This residue is only to a small extent soluble in water, and the solution has an acid reaction. It yields a light yellow precipitate with acetate of lead. The part of the alcoholic extract that is insoluble in water is easily soluble in alkalies. It also dissolves in nitric acid at a moderate heat, whereby oxidation takes place. On addition of water a yellow brittle mass is precipitated." The Mexicans are said to use an infusion of the leaves for bathing in with good effect in rheumatic affections. (Also vol. iii., Wheeler's Reports.)

P. 80—LARREA MEXICANA, Moric (*L. glutinosa*, Engelmann), Valley of the Gila, Arizona.—This shrub is especially common on the hills bordering the Gila, also on the sandy wastes adjacent to Tucson and Camp Lowell, in Arizona, even imparting its strong odor to the air.

In the third volume of these reports this plant is also called stinkweed and etiontio.

The Non-examination of Engineers in Chicago.

Chicago is waking up to the necessity of regulating the employment of engineers and the establishment of a system of official boiler inspection. The *Inter-Ocean* says:

"There seems to be an impression that any one, after a few hours' instruction, can run a stationary engine and boiler, or boilers, and the result is that the man or boy who will work cheapest gets the place. Most of the engines in the business and office blocks in the city are in charge of old feeble men or mere boys, and there are actually cases where women do the work. Many of the large factories, rolling mills, blast furnaces, foundries, grain elevators, implement and machine shops have men in charge of the engines, but how competent these men are as engineers there is no means of learning, and boy engineers are to be found even in some of these great establishments. In some places, too, the engineer does not put in his whole time about the engine and boiler, but is called out by the foreman every now and then to do other work, and engine and boiler have to take care of themselves for long periods."

The natural consequence of this sort of carelessness is a frequency of explosions, with loss of life and limb, that is positively alarming. Chicago has no city inspectors of boilers, the only inspections being by the insurance companies where they have risks.

ANOTHER SIX WEEKS OF SUSPENSE.

Five drops of water for the sawing of ten cords of wood is a liberal allowance compared with the originally promised propulsion of steamships across the Atlantic with a pint or so; still it will be an achievement worth recording when it comes off "about six weeks from now." That is the way with Mr. Keely; his marvelous motor is always on the point of being completed, but the finishing touch is always delayed. It is gratifying, however, to know just how the matter stands, and for this information the world is indebted to a correspondent of the New York *Times* who has lately been favored with a "private exhibition" at Mr. Keely's workshop in Philadelphia. The correspondent says of the new engine:

"All the machinery is contained in a cylinder which resembles an ordinary drum. Through this runs a double shaft, one revolving in a sleeve. It is upon this shaft that the difficulty at present exists. The negative and positive motions are nearly equal, and Mr. Keely is engaged in the graduation of these so as to cause them to harmonize. When he accomplishes this, which he says is a tedious operation, then the Keeley motor will be completed."

The *Times* correspondent has seen the machine turn an 18-inch wheel with force enough to break a rope, but he does not say what fraction of a drop of water sufficed to generate the exhibited power. The new generator is pronounced a curiosity. It occupies a space about six feet by ten feet, with a height of five feet.

"There are numerous small pipes, of mysterious appearance, of the thickness of telegraph wire, bored to the fineness of a cambric needle. One of these leads from the generator to the engine, and it is claimed that all the power is secured through this medium, and the regularity of motion secured by the vibratory apparatus contained inside the drum cylinder. People who expect to learn all about the engine, generator, and the secrets of the thing, will probably be discouraged when they take into their mind what Mr. Keely says. "After I have secured my letters patent, it will require at least a year of lecturing to demonstrate the secret of this generator and engine," remarked Mr. Keely. "The apparatus will be in use some twenty years before the thing is fully understood."

The public exhibition of wood-sawing is promised "somewhere about July 1," year not stated. The *Times* correspondent does not say whether he or his friends have any stock to dispose of, or what ground there is for believing that the tedious harmonizing process above mentioned will ever be accomplished. Mr. Keely's facility in the invention of plausible excuses and catch phrases for the gulling of the simple is scarcely less remarkable than the capacity of some people to be gulled.

The East River Bridge.

The New York approach to the East River Bridge is finished with the exception of about four blocks, and the property through to Chatham street has been appraised by the bridge authorities. Should this not be accepted by the owners, a commission, acting under the railroad law, will be appointed to value the land. Upon this portion of the work 90,000 bricks are being laid daily. But one block of the Brooklyn approach remains unfinished. The cities still hold about $1,000,000 of interest accruing from the sale of bonds. The first one hundred tons of the recently awarded contract for steel have been sent from the Cambria Iron Company at Midvale to be rolled; from there they will be taken to the Edgemoor Iron Company, who do the drilling, fitting, etc. The bill for the final appropriation—$2,250,000—now pending in the Legislature, has passed the Senate, with an amendment, and is in the House, where it is favorably received.—*Engineering News.*

International Exhibition of Steam Thrashing Machines.

The Italian Minister of Agriculture, Industry, and Commerce has arranged to hold an international exhibition of steam thrashing machinery at Perugia, in Umbria, Italy, to begin July 1, 1880. Only machines from one to four-horse power will be admitted. Four prizes of gold, silver, and bronze will be bestowed by the government. Public tests of the competing machines will be made under the direction of a commission. Applications must be made before May 31st next, to Signor Alessandro Raspi, Secretary of the Agrarian Committee, Perugia, who will furnish any desired information with reference to the competition.

THE enormous advance in the cost of paper may be in part attributed to its extensive use in the various arts and manufactures not connected with printing. The last application of paper is the construction of an astronomical tower twenty-nine feet in diameter at the Polytechnic Institute, Troy, N. Y.

A Prevalent Popular Error.

By the burning of a Chinese wash house in San Francisco a short time since, eleven of the occupants who were asleep in bed lost their lives. The account published in the newspapers described them as exhibiting, by the positions in which their bodies were found, the agony they suffered from the fire. As editors and reporters are considered to possess more than an average amount of intelligence and information, it appears singular that they should propagate or perpetuate such an error. It may be safely asserted as a general rule that persons who lose their lives while sleeping in burning buildings, are suffocated and die painlessly without waking, and before the flames had reached their bodies. The merest tyro knows what would be the effect of going to bed with a pan of burning charcoal in the room, or the effect of blowing out the gas instead of turning it off. An individual going to sleep under such circumstances inhales the impure air, which acts as an anæsthetic and rapidly converts the natural sleep into stupor and coma, from which there is no waking. Persons sleeping in a house which takes fire are smothered in this way by the carboniferous gas long before the fire reaches them. Their bodies or remains are found—not in the halls or stairways where they would have been had they awakened and attempted to escape—but in bed, or in the spot which the bed had occupied, and in the very position in which they had been lying asleep. The exceptions are mostly noticeable, as when persons are seen to make attempts to escape. There is something so horrible in the idea of being burned to death that it were well for the community not to suffer needlessly from sympathy for the victims. To the relatives of persons who lose their lives in burning houses, particularly to parents whose children may die in this way, it may save a lifetime of grief to know that death entered the chamber quietly and performed his task without so much as disturbing the slumbers of his victim.—*Pacific Med. and Surg. Journal.*

NEW USES FOR OLD TIN CANS.

BY A. W. ROBERTS.

I give below the result of an extended experience in the utilization of tin cans, such as are used by the million by

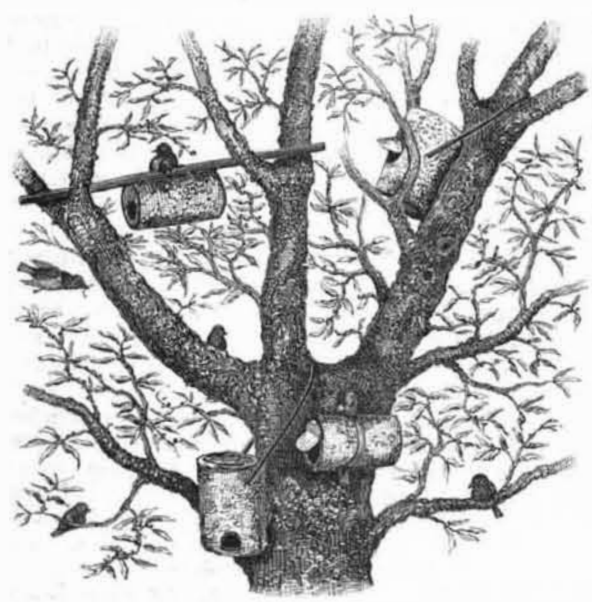

Fig. 1.—Bird-houses made from Old Cans.

packers of fruits and other articles. These cans, after serving their original purpose, are usually thrown into obscure corners, battered and rusty, a nuisance to every one.

By the method given below these troublesome articles are made useful and even ornamental, such articles as flower-pots, hanging baskets, bird-houses, etc., being produced from them with little trouble or expense.

The cans were prepared in the following manner: Procuring a large dishpan, as much asphalt was melted in it as it would hold with safety. Into the boiling asphalt the cans were dipped; as each can was taken out it was rolled in dry sand, to give it a natural ground color; without the sand the effect of the black asphalt coating would be somber and out of keeping with the color of the surroundings. To give some of these bird-houses a still more picturesque effect they were rolled in the ordinary dry packing moss used by florists and wood mosses; also short dry twigs, small cones, and burrs were fastened on the cans. In this way very nice effects of color were produced. It is a well known fact that birds avoid brilliant or artificial colors; for this reason greens, grays, browns, and neutral tints are best for bird-houses. Where cans had been opened so that the top piece was still attached by a small piece of metal, it was bent down so as to form a rest for the birds when feeding their young, or a porch or rain screen over the entrance. All these little points when carried out gave character, variety of form, and completeness. The different ways of fastening and suspending the bird-houses are shown in Fig. 1. I sometimes fastened branches of vines over the birdhouses to more thoroughly obscure them.

A glue-pot, a grater, a fruit gatherer, and a bailer, shown respectively in Figs. 2, 3, 4, and 5. The glue-pot, Fig. 2, was made in the following manner: Selecting an empty two pound can, enough tin was cut away to admit of an empty one pound can. This inner can projected one inch above the top of the one pound can, and was held in position by four wooden pegs, which were slightly tapering, so as to bind. Holes were made in the shoulders of the cans, through which wire bails were fastened.

Fig. 3, a bread grater, is so simple that it hardly needs

Fig. 2.—Glue Pot.

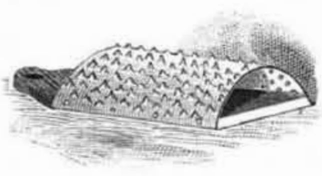

Fig. 3.—Bread Grater.

Fig 4.—Fruit Gatherer.

describing. Out of a piece of one inch board a holder was shaped on which a perforated piece of tin was fastened. This piece of tin consists of a side of a fruit can flattened out. Tines were then drawn diagonally over it for guides when punching in the holes. The tin was laid on a piece of wood, in which a hole had been made of the exact depth required for the uniform projection of the burred cutters of the grater. The tin was then nailed to one side of the holder and bent over in as perfect a curve as possible to the other side, when it was again fastened.

Fig. 4, a peach gatherer, was made by attaching a circular piece of board to the end of a long pole and fastening to this a can. Inside of the can there was a bag to receive the fruit without bruising. The bag was sewn inside of the can through a circle of small perforations. The rim of the tin was sharpened, so that when pressed against the stem of the fruit it would cut through it.

Fig. 5 shows a liquid measure or a water bailer. A hole is made in a can two inches below the edge; through this hole a handle is inserted which presses against the opposite side and is secured with a nail or screw.

Fig. 6 represents a fruit can converted into a respectable looking flower-pot. The can to be operated on was first dipped in the hot asphalt. A piece of well-seasoned white birch bark was cut out of the same height as the can and sufficiently long to reach around it. This piece of bark was so shaped that it flared out from the bottom of the can, leaving considerable space between the can and the bark. This space was filled in with hot asphalt. For ornamentation of the pots burrs of the liquid amber, black alder, and acorns were used. A hole must always be made in the bottom of the pots for the drainage of surplus water.

Fig. 7 is a hanging pot, planted with ferns. This was also covered with white birch bark, fastened on the straight sides of the can with asphalt. Three wires, by which it was suspended, were fastened to the rim of the can. In using cans for flower-pots or hanging baskets care should be taken to thoroughly coat the insides and outsides with the asphalt; this secures the tin from rusting.

Fig. 5.—Bailer.

Fig. 8, a hanging log, was made by partially telescoping two cans together, after the opened end had been entirely removed. A section of the side of each can was cut out, to leave an opening for the reception of the soil and plants. The cans were then heavily coated with asphalt, particularly where the cans joined, so as to strengthen the joint. Barks of chestnut and oak trees were used for covering the cans.

Fig. 6.—Flower-pot.

Fig. 9 is a standard for plants and flowering bulbs. Having secured an old center-table, two cheese-boxes of different sizes were placed one on top of the other, the smaller one on top. Around the side of the lower box fruit can flower-pots were ranged, above these ranged another circle of pots, which stood on top of the largest cheese-box and against the side of the smaller one. On top of the smallest box more pots were placed, so that but little of the cheese boxes could be seen. All the pots were ornamented with burrs, cones, lichens, or barks. The spaces left between the boxes were filled in with wood mosses. Around the rim of the table was nailed hooping from a flower barrel. The inner angle formed by the hooping and the top of the table was patched with putty. Over the entire top of the table, the hooping, and the putty, hot asphalt was applied with a brush. This rendered the top of the table watertight, so that when watering the plants water could not run on to the floor. A hole bored through the top of the table afforded an escape for surplus water. The cheese boxes were coated inside and outside with asphalt, to prevent them from warping. The open space between the first circle of pots and the rim of the table was filled in with earth, on top of which moss was built up to the first circle of pots. The plants used were tradescantia, German ivy, English ivy, vincas, saxifraga, hyacinths, and calla lily.

Fig. 10 shows the complete plant standard. In hanging baskets, pots, and standards, where the plants are planted closely together and in a comparatively small bulk of soil, they require frequent watering and occasional applications of liquid manure. Our fowls provide us with a very fair article of "domestic guano," from which we make good liquid manure of sufficient strength by mixing one shovelful to a barrel of water. Still there is danger in a too generous use of liquid manure; if too strong or too frequently used the tender roots of the plants are injured and the leaves begin to fall.

Fig. 11 is a fern rockery for table or Wardian case. For the rockwork the most picturesque of rocks in form and color were selected. The rocks were fastened together with plaster of Paris, which was mixed with dry colors, grays and browns predominating. As fast as the plaster was applied sand was thrown on it. The effect of the coloring and sanding of the plaster was to destroy its whity glaring look, and to harmonize it with the general colors of the rock work. The cans used for the flower-pots were first wrapped in wet paper, to increase them in size, before applying the

Fig. 7.—Hanging Flower-pot.

plaster against them when building up the rock work. In a few hours the paper wrappings had so dried that the pots were easily withdrawn, after which the paper was removed and the pots put back in their places.

Fig. 12 is a vase for dried grasses and autumn leaves, which was constructed as follows: To the top of a broken-off lamp standard of glass was fastened a fruit can that had been previously dipped in asphalt. The outside of the can was then carefully covered with selected lichens and tufts of "sealing wax moss." Shells and parts of pine cones were used for ornamentation.

Weighing an Elephant without Scales.

An Indian writer relates an interesting anecdote concerning Shajee, the father of the first ruling prince of the Mahrattas of Hindostan, who lived at about the beginning of the seventeenth century. On one occasion a certain high official made a vow that he would distribute to the poor the weight of his own elephant in silver money; but the great difficulty that at first presented itself was the mode of ascertaining what this weight really was; and all the learned and clever men of the court seem to have endeavored in vain to construct a machine of sufficient power to weigh the elephant. At length, continues *Little Folks*, it is said that Shajee came forward, and suggested a plan, which was simple, and yet ingenious in the highest degree. He caused the unwieldy animal to be conducted along a stage, specially made for the purpose by the water-side, into a flat-bottomed boat; and then, having marked on the boat the height to which the water reached after the elephant had weighed it down, the latter was taken out, and stones substituted in sufficient quantity to load the boat to the same line. The stones were then taken to the scales, and thus, to the amazement of the court, was ascertained the true weight of the elephant.