trating the undoing of mountains and the making of cañons in California.

This has been the most difficult part of the road, and it may be of interest to note, in passing, some of the items of construction. The route was selected and the grade established after much difficulty, many problems presenting themselves, but the eleven miles already completed from Avalon to Eagle Camp was built in five months, with a gang of from thirty to fifty men and twenty-eight horses, at an expense of about $20,000. As stated, the grade is ten per cent, and about 140,000 yards of material were removed, in which eight tons of powder were employed in blasting the rock from the mountain side. In reaching the summit five cañons were crossed, or rather passed, without the aid of a bridge, all the curves and natural indentations being followed—a feature which adds much to the attractiveness of the drive.

From the summit the road extends for a long distance parallel with the front ridge of the island, affording the observer a constantly changing view of cañons which enter the sea north of Avalon and south of Long Point—a high cape. Not far from the natural base of one of the highest peaks is the widest portion of the island—about 8 miles. Here the longest cañon begins, winding down, first as a narrow gulch, gradually widening out into a flat level plain, encompassed by the peaks, Mount Banning, Orizaba, and Black Jack, and the ridges about them.

An interesting feature of this drive is that it passes several ancient town sites where the aborigines lived, the heaps of abalones at the mouths of the cañons telling the story. North of Black Jack is an ancient olla manufactory, where the natives made their stone mortars, which they sent to the mainland for exchange. On the fronting ridge the writer found evidences of an arrow manufactory—bits of broken arrows, flint, and heads in various stages of completion.

Once in Middle Ranch Cañon, the six-in-hand gallop along the fine level roadway, finally reaching Eagle Nest Camp beneath a group of sycamores, which constitutes the terminus of this section of the road at present. From this point the road has been surveyed to Little Harbor, and owing to the amount of rock to be blasted, it will be the most difficult portion to build. Little Harbor has its inn, and from here to the Isthmus, eight miles, the road is completed, rising to the divide, above the Isthmus, where there was a large Indian village, then pitching down suddenly, with many fine curves around various cañons, ending on the sandy beach, giving the traveler nineteen miles of staging and five of horseback riding, assuming that he has taken the entire trip.

There are several famous stage roads in California, but it is safe to say that none exceed this in novelty, by which the coacher is treated to a constantly changing panorama of mountains and ocean in a climate which will make this island one of the great sanitariums of the world.

Machinists' Nomenclature.

There are, perhaps, few except those who have had much translating of technical literature from English into foreign languages, who have any idea of how many absolutely meaningless names we have drawn from the animal kingdom, and which very seldom can be rendered in their technical sense by their actual equivalent.

Thus the machinist employs a *dog* on his lathe; he takes a *hog* cut, if the tool will stand it; the castings are made from *pigs* of iron, which in turn were fed from a *sow*. Work is set upon a *horse* or *buck*, and punched or bent by a convenient *bear;* screws are turned by a *monkey* wrench.* Hoisting is done by a *crab*, and a convenient *cat* is a part of the outfit of a shop *crane*, and a *kit* of tools is ever at hand. A *crow* helps to straighten work, a *jack* to lift it, a *mule* pulley aids in driving machinery that a *donkey* engine turns. A *fish* connects parts end to end, or strengthens a broken beam; *shells* are used all over; a *worm* does powerful but quiet work. A *cock* shuts off the water; one kind of a *ram* raises it and another does heavy work. A printing press has a *fly;* the first locomotives had a *grasshopper* valve motion and drive, and *butterfly* valves are common. *Herring-bone* gears are used by the best builders; *turtles* fit printing press cylinders, and *fly*-wheels are running all over the world. In drilling, even an *old man* is called into service, and *doctors* prevent faulty lathe work.

But from the human body itself we borrow the name of nearly every principal part, as head, neck, and chest; arm, leg, and toe; heel, sole, and foot; elbow, shoulder, wrist, and knee; knuckle and finger; rib and diaphragm; eye, ear, nose, and cheek; mouth, tongue, and tooth; throat and gullet; back, side, and belly.

From the minor animals also we get snout and horn, tail and claw, wing and feather, quill and spur, fin and scale.

Exasperating to foreigners learning our technical terms.—R. Grimshaw.

* This, however, got its name from the inventor, Thomas Monkey, of Bordentown, N. J.

Science Notes.

Van Ermenglin states that the toxic ptomaines sometimes found in preserved meats, hams, game pies, etc., are due to the presence of a specific organism, Bacillus bolulinus. The soluble toxine it secretes, called boluline by the author, is stated to be so intensely toxic that one thousandth part of a milligramme killed a rabbit in twenty-four hours. Fortunately, this ptomaine is destroyed at a temperature of 60° to 70° C., and the bacillus which produces it at 85° C., so that thorough cooking will remove all dangers in the case of salted or smoked meats.—Journ. de Pharm. [6], ix., 88.

Prof. A. Gray has been devoting a considerable part of his time to determining the circumstances which affect the conductivity and specific conductive capacity of glass. From manufacturers in London and Jena various specimens of glass were obtained. These were all richer in lead and freer from soda than glasses formerly available. Specimens of glass used for thermometers, and a barium crown glass, were tested also. It was sought to ascertain whether by increasing the lead-oxide and diminishing the amount of soda, the conductivity would go on diminishing. The resistance was taken after five minutes' electrification. The "Jena glass" showed considerable effects of dielectric polarization. Powell's glass did the same. The barium glass showed hardly any, but it had a very high resistance, and behaved like lead and lime glasses. The Jena glass had low resistance, from its high percentage of soda and complex composition.

The medical officer of one of the leading deaf and dumb institutions of England states that he has obtained material aid from the seemingly improbable source of a loud-speaking telephone in the treatment of his patients, in the education of such deaf mutes as possess a fragment of hearing power, the telephone being found to possess many important advantages over the speaking tube usually employed. In the first place, in arranging for this purpose, the wires from several receivers can be coupled up to one transmitter, and thus a teacher can instruct a group of children at the same time; then again, it is not necessary for a teacher to apply his mouth close to the transmitter, so that pupils have a full view of the facial expressions and lip movement, which is not possible when having to direct his voice into the mouthpiece of a speaking tube or trumpet. While seeing the movement of the lips, the patient has the sound conveyed close to his ear drum—a most advantageous combination.

The idea of utilizing the threads of the spider on a larger scale than is, or was, done by telescope makers is very old, but attempts have never been persevered in. About ten years ago a Madagascar missionary, Camboué, experimented with two kinds of spiders of that country. He seemed to be successful, but nothing further has been heard of his researches. In the professional schools at Chalais-Meudon, we see from the Industrie Textile, spiders have now to spin for the benefit of the balloons which are used for scientific and military researches. The spiders are grouped in dozens before a reel, which withdraws the delicate threads. One spider can give a thread from 20 yards to 40 yards in length, after which performance it is released. The threads are of a pinkish hue, and are washed to remove the sticky surface layer. Eight threads have to be combined. The resulting texture is much lighter than ordinary silk of the same bulk, and strong cords for military balloons can no doubt be obtained in this way.

After numerous practical experiments, it has been found by Ferdinand Linneborn, of Hagen, Germany, that a fabric may be produced for garments which shall have properties adapted to keeping the skin cool and thus obviating excessive perspiration. Wool and cotton-wool have the property of absorbing moisture, but wool deprived of oil has it in a considerably greater degree; but in order to prevent clogging of the pores by the fluff, the new fabric is woven or knit with that surface which comes in direct contact with the skin with linen and wool fiber. The linen threads, which come in contact with the skin and are possessed of little power of absorption, are well dried at 100 degrees Celsius, then steeped in a solution of ten parts of paraffine and one hundred parts of benzine, remaining thus from four to five hours at a medium temperature, and when taken out are completely dried at 100 degrees Celsius, after dripping; the yarn so obtained does not absorb any perspiration. The wool remains in a bath of 40 degrees Celsius and consisting of one hundred liters of water, six of spirits of sal ammoniac, one and three-quarters pounds of soap, and two pounds of soda for four hours. It is then well stretched, rinsed in clear running water, and dried at 100 degrees Celsius; while still warm, the wool is now placed in a bath of 40 degrees Celsius and composed of five parts of spirits of sal ammoniac and three of benzine, each skein being now stretched under strong pressure for three minutes, again rinsed in running water, and dried. These threads are woven or knit into a fabric having one side entirely of linen threads or yarn and the other entirely of woolen.

Correspondence.

Speed of the Bicycle.

To the Editor of the SCIENTIFIC AMERICAN:

On page 151 of the SCIENTIFIC AMERICAN for September 3, there is an interesting rule for determining the rate of speed of a bicycle. We think a still simpler one is the following, as it enables the rider after he has found the number of seconds for his own wheel, to ever afterward determine his rate of speed without any further calculations.

Rule.—Multiply the gear by 10 and divide by 56. Call the result seconds. The number of complete revolutions made by either pedal in that number of seconds shows the rate of miles per hour. Example.—If your gear is 84, then $84 \times 10 \div 56 = 15$; and if either pedal makes 20 revolutions in 15 seconds, you are riding at the rate of 20 miles to the hour. If the gear is 67·2, then $67{\cdot}2 \times 10 \div 56 = 12$, and 20 revolutions made in 12 seconds equals 20 miles to the hour.

JOSEPH DIXON CRUCIBLE COMPANY.

The Uranium Intensifier.

Uranium has long been known as a first-rate intensifier with many advantages over the poisonous mercury. It is so simple and gives such good results.

But the usual one solution intensifiers, generally used, have the serious drawback of rapidly deteriorating, and becoming useless, which has no doubt considerably restricted their employment.

The plan I have adopted, however, completely overcomes this difficulty, and the intensifier prepared on the following lines will keep well.

The method is to make up two separate stock solutions, which are mixed as directed, when required for use. The mixed intensifier is then of precisely similar strength, etc., as the "single solution" ones.

Stock Solution No. 1.

Potassium ferricyanide (red prussiate)	100 grains.
Boiled water	5 ounces.
Glacial acetic acid	5 "

Stock Solution No. 2.

Uranium nitrate	100 grains.
Boiled water	10 ounces.

To prepare the intensifier, take 1 ounce No. 1 and add 8 ounces water, then add 1 ounce No. 2, which quantity will intensify several half-plates, and is best thrown away after use.

The negative may be immersed either dry or wet, but it must be free from hypo, also it is essential to keep the dish rocking.

When sufficiently intensified, wash until greasy appearance of plate disappears, which is about twenty minutes; too long washing is injurious.

If from any cause the intensification is unsatisfactory, it can be entirely removed in a few minutes by soaking in a solution of soda carbide 2 ounces, water 1 pint, and well washing.

This property also easily admits of local reduction. It has also the advantage of being capable of being used as a reducer. Intensify first, then immerse in hypo 1 ounce, water 6 ounces, ammonia 1 drachm. This acts rapidly, and the greater the original intensification, the greater will be the eventual reduction.—J. R. R. in Photo. News.

Comparative Census of European Countries.

According to figures given by the latest number of La Revue Française de l'Etranger, the total population of Europe, by calculations made on the latest census, is 380,000,000, which is a gain of 37,000,000 over that computed January, 1888. Here is a table showing the figures given in the Revue Française de l'Etranger:

Europe and Russia and Finland	106,200,000
Germany	52,300,000
Austria-Hungary	43,500,000
The United Kingdom	39,800,000
France	38.500,000
Italy	31,300,000
Spain	18,000,000
Belgium	6,500,000
Turkey in Europe	5,800,000
Roumania	5,600,000
Portugal	5,000,000
Sweden	5,000,000
Holland	4,000,000
Bulgaria	3,000,000
Switzerland	3,000,000
Greece	2,400,000
Denmark	2,300,000
Servia	2,300,000
Norway	2,000,000

The density of the population according to each square kilometer (about 0·386 square mile) is thus reckoned: In Belgium, 220; Italy, 169; Holland, 149; England, 126; Germany, 97; Switzerland, 73; France, 72; Austria, 69; Spain, 36; Russia, 20. While the annual increase of the population of Russia has been 1·45 for every 100 in the last ten years, that of Germany has been 1·15, of Austria-Hungary 0·96, of England 0·35, of Italy 0·45, of France 0·08. At this rate of augmentation, in 100 years, Russia would have 228,000,000 inhabitants, Germany 106,000,000, Austria 79,000,000, England 65,000,000, Italy 44,000,000, and France only 40,000,000.

Oceanic Phosphorescences.

Nature dazzles the eye of man with many wonderful phenomena, but perhaps never more so than when she turns the gloomy night waters of the sea into a sheet of silvery fire. At these times every movement of the wave, every cleavage of the water by oar or prow, reveals in its dark depths a hidden fire which scintillates and sparkles with weird and mysterious light. The spectacle is one of absolute fascination, for the Spirit of Enchantment rests upon the waters and reality becomes fairyland. The ancients, keenly alive to a sense of the supernatural, saw in this luminosity a manifestation of some unknown power, and wondered; the ignorant read in it a portent of judgment and terror; while in all ages the curious and the searchers after knowledge have speculated as to its cause. But just as nature has invested its appearance with a halo of mystery, so she has also wrapt in much obscurity its immediate cause; and thus, though in the course of centuries varying suggestions have been put forward, nothing with any finality about it has been arrived at. It was asserted truly that certain fishes were luminous; sharks have glowed and shone, shoals of herrings, pilchards, or mackerel have been moving masses of light, and the fish drawn out of the water have lain in great shining heaps, the glow of which vanished as they dried and died. Many writers have described the passages of ships through such shoals—the sheet of moving flames—the beautiful pale greenish elf light that the fish exhibited; while poets have apostrophized the "mimic fires of ocean" and the "lightnings of the wave," and scientists and naturalists have in turn tried to account for their power of luminosity. Some have attributed it to the presence of certain substances of a fatty nature excreted by the fish and adhering to the surface of their bodies; others have declared that it is due to a subtle power of the fish itself—a form in which the energy of life shows itself under certain conditions, just as this energy may be exhibited in heat, or motion, or electricity; others, again, have ascribed it to direct absorption and transmission of the light of the sun, and so on. Many theories have been elaborated, but none convincingly. But now, it is asserted, the secret is laid bare. It is wonderful how many secrets the searching light of the nineteenth century is claiming to reveal. It is, perhaps, a matter for still more wonder whether in the far future our descendants will indorse all our solutions, or whether they will not smile at some of them just as we, half contemptuously, discredit those of our ancestors. However that may be, we have, in this case, a solution offered to us that apparently approaches nearer the heart of truth than any yet put forward, in that it satisfies the various phases of the phenomenon and gives a unity and coherence to its manifestations. It is only lately that any very serious effort has been made to study this phenomenon, but the research has been abundantly rewarded, for it is now pretty certain that the luminosity is due to the presence in the water of various kinds of bacteria.

Now, bacteria are the very smallest living organisms of which we have cognizance. Millions of them can lie on a penny; therefore, to produce the gleaming appearance recognized by us as phosphorescence, they must be present in numbers too enormous even to contemplate with our finite minds. It would be immeasurably easier to reckon with the stars for multitude than with these phosphorescent bacteria. They are colorless, rodlike bodies, only known to us in the land revealed by the highest powers of the microscope, and careful comparison shows minor differences among them. For instance, some of them are capable of independent motion—we can hardly call it swimming—others are non-motile, some are inclosed in a jelly-like covering. Others are without this sheath. Their power of motion is probably due to excessively fine hairs at their extremities, which, moving to and fro in the water, act the part of oars. These cilia have not been found in all forms of bacteria which move, but their presence is inferred, since every advance in the study of motile forms increases the number of bacteria which are seen to possess them. These light-producing bacteria are known as photo-bacteria, and so far some half-dozen varieties have been distinguished and named. That they lie at the bottom of the matter—that phosphorescence is due to their presence—has been and can be proved in several rather pretty ways. It is not sufficient, of course, that we should always detect them in any examination of luminous sea water; to prove that they are the cause of light, we must be able to procure luminosity by introducing them into water that did not previously show this quality, and this can be done thus: Place a few of these tiny organisms into sea-water or broth prepared from fish, and keep at a suitable temperature; they can then be cultivated without much difficulty, and as they spread and develop phosphorescence appears, so that a removal of the vessel into another room shows unmistakably the glow of the familiar light. It only appears, however, at the surface of the liquid, where the oxygen of the air has free access to the bacteria; if, for experiment's sake, the supply of fresh air be cut off—that is, if no oxygen be allowed to come near them—then the little colony of bacteria loses its fascinating power and remains dull and shorn of its glory. But restore the air, and the microbes again recover their normal condition and luminosity seems a natural corollary. There is a tale told that a lady, whose husband made bacteria his study, took a leaf out of his book, and cultivated these bacteria on gelatine in such a way that as they developed they shone out the message, "Hommage à M. Pasteur." The shining letters were then photographed and the picture sent to the great bacteriologist, thus conveying in graceful form the warm appreciation in which he was held by those following in his steps.—Knowledge.

AN OPENING AND CLOSING DEVICE FOR FIRE-BOXES.

Considerable difficulty is often experienced in starting fires in locomotive and other furnaces, owing to the reduction in temperature produced by the entrance of cold air to the fire-box. An invention recently patented by M. J. Griffin, general yard master, and P. W. Hogan, car foreman of the Grand Trunk Railway at Island Pond, Vt., is designed to overcome this obstacle.

The invention as illustrated in the engraving consists in providing the fire-box with two doors sliding on guideways secured to the front of the fire-box. Projecting pins on the doors engage the slotted ends of levers fulcrumed on the lower guideway and connected pivotally at their lower ends by links, with the upper end of a bar sliding in a guideway secured to the front of the fire-box. This bar extends below the platform in front of the fire-box and is rigidly connected, as shown, with the lower end of a spring-pressed foot-piece extending above the platform in convenient reach of the fireman's foot.

Normally the spring of the foot-piece, acting through the medium of the bar, keeps the doors of the fire-box

GRIFFIN AND HOGAN'S OPENING AND CLOSING DEVICE FOR FIRE-BOXES.

tightly closed. When the fireman desires to shovel coal into the fire-box, he presses down the foot-piece in the manner shown, and moves the bar downwardly, thus causing the links to act on their respective levers to slide the doors outwardly in the guideways. After having thrown in his coal, the fireman removes his foot, this causing the doors to close automatically. It is evident that the doors during this process are open but a short time, so that cold air is prevented as much as possible from passing into the fire-box and reducing the temperature while firing up.

Protection of a Closet Trap.

F. P. Dunnington writes us from the University of Virginia as follows:

In cold weather, not unfrequently there is necessity for leaving the trap of a closet unused in a location where it cannot be warmed, when, if the water standing in it is frozen, the trap might be destroyed, or, if the water be removed, sewer-gas would escape. This difficulty may be overcome by putting into the trap about one pound of common salt. This salt will saturate three pints of water, which is approximately the volume required to fill a closet trap, and this solution will not be frozen at any temperature above zero. Repeated stirring will be required to get the salt dissolved.

In hot weather, in an unoccupied house there is danger of water evaporating from a closet trap, so as to "break the seal" and allow the escape of sewer-gas. This result may be prevented by putting into the trap about one-half pound of dried commercial calcium chloride (costing a few cents). This salt has so great an affinity for water that it will hold on to it even through the greatest heat of the summer, and it is not corrosive or poisonous.

In some degree calcium chloride acts like common salt in preventing freezing, but for this purpose common salt is most efficient.

Miscellaneous Notes and Receipts.

Uninflammable Celluloid.—According to Asselot, dissolve 25 parts ordinary celluloidine in 250 parts acetone and add a solution of 50 grammes of magnesium chloride in 150 grammes of alcohol until a paste results, which occurs with a proportion of about 100 parts of the former solution to 20 parts of the latter solution. This paste is carefully mixed and worked through, then dried, and gives an absolutely incombustible material.—Chemische Industrie.

Petroleum as Fuel.—To the endless number of recipes for the production of petroleum briquettes may be added the following: Petroleum, 10 liters; resin, 1 liter (?); soap powder, 1·5 kilos.; caustic soda, 3·3 kilos.; sawdust, 3 liters; and sand are heated with constant stirring. After ten minutes the mass begins to solidify. If liquid is still present, add soda. The mass thus obtained is formed into briquettes and cooled. Their heating value is said to be three times as great as that of coal briquettes.—Kraft und Licht.

Production of Stamping Ink for Linen.—Moisten 10 grammes of powdered dragon's blood resin and 10 grammes of powdered silver nitrate -lapis infernalis—throughout with a few drops of distilled water and increase the mixture by 10 grammes of white dextrine and enough glycerine so as to give the mass the consistency of a good printing ink. The rubber stamps employed should be rubbed before use with a few drops of sweet almond oil. Spread the ink on pieces of velvet for transferring purposes.—Färben Zeitung.

Antacid Shoe Polish.—A shoe polish which is free from acid is offered for sale under the name of "Antacid Glanzlack." The recipe for its production is as follows: Filter 50 grammes of powdered gall nuts, 30 grammes of logwood and 200 grammes of water; after boiling for two hours, dissolve in the hot liquid 200 grammes of sirup and 30 grammes of green vitriol. The fluid is boiled until it commences to thicken, then add a solution of 10 grammes of ruby shellac in 200 grammes of alcohol, stir the whole well together and fill the finished dressing in bottles.—Fundgrube.

Easy Removal of Boiler Scale.—In the Bull. de la Société d'Encour. the interesting observation is reported that boiler scale is rendered quite loose and is for the most part washed away on emptying out the water, if the latter is allowed to cool off slowly after taking the boiler out of use, which requires a varying length of time according to the size of the boiler, but generally eight to ten days. The remainder adhering to the walls can be removed by a strong jet of water. Where boilers can be kept idle for so long a time, this method is of great convenience, especially for boilers with narrow pipes or parts of difficult accessibility.—Der Seifenfabrikant.

Gum Arabic.—The gluing agents which are found in commerce under the name of gum arabic consist only for the smallest part of genuine Arabian gum, and we mostly receive in their stead substitutes containing dextrine; partly also gum resins resembling gum arabic; for instance, the gum exuding profusely from the Flinderria maculosa, indigenous in Australia. The fact that the powdered gum is frequently adulterated with entirely worthless substances, such as pulverized cherry pits, also deserves mention. Rock sugar mixed with milk and soda waterglass is likewise sold, in lumps and powder form, as gum arabic. Such a surrogate anybody may prepare at home by very finely powdering 3 parts (by weight) of rock candy and dissolving by boiling in one part (by weight) of fresh cow's milk, which must not be skimmed. To the boiling solution add 7 parts (by weight) of soda waterglass of 33° to 36° Be. Cause a thorough mixture by stirring, allow the whole to cool off to 36° to 38° Reaumur (=115° to 118° F.), pour out on a tin plate with upturned edges, allow to harden and knock with a hammer on the back of the tin, whereby the gluing material separates in grains.—Maler Zeitung.

Preservative Composition for Furniture, Wooden Ware, etc.—A composition for the preservation of furniture and woodwork, etc., has been patented in France by the Société Allegre and Goillot, says a Continental exchange (Maler Zeitung). This composition is said to possess the peculiarity of imparting to the articles upon which it is used not only the desired gloss, but also the appearance and the brilliant color of perfectly new articles. This distinguishes it from other preparations used for like purposes. The coating leaves no visible layer after the application. The mass is composed of: 10 parts pale rosin, 82 parts benzine, 5 parts palm oil, ½ part mirbane essence, and 1½ parts essence of peppermint. The mixture is prepared by the cold process and the application is as follows: Apply a little of the composition on the furniture, floors, etc., by rubbing with an old soft silk rag and finish wiping at once with a dry silk rag, pressing down well, whereby an incomparable luster is said to be produced. The objects remain in this glossy condition one to two months, according to the amount of dust developing in the respective rooms, and are then again treated with the composition. The product must be kept hermetically closed up. If used in summer, it is well to add a few drops of oil.