The English and French astronomers obtained a series of coronal negatives. Some of these extended to its outer limits, and some of those of the coronal spectrum contained several bright lines. The meteorological observations showed a rise in barometric pressure of 0·02 inch, the rise in humidity was five per cent., the temperature fell to that of night, the direction and velocity of the wind were uniform, and the observations on radiation showed that the reception of heat by the earth was almost entirely checked.

Even these barren items of information are of exceeding interest, and will furnish admirable material for thoughtful study until the official accounts are made public, and a wonderful story of personal experience, observation, and devotion to science will be related that will find admiring listeners all over the civilized world.

The astronomers enjoyed excellent health during their long trip. After the eclipse, the Hartford returned to Caroline Island and carried the American party to Honolulu, from whence they took passage to San Francisco and home.

HOW SCREWS ARE THREADED.

Screw threads are "originated" in the lathe usually. All lathe turning, with regular—constant—feed of the turning tool, is screw cutting, or threading; the tool cuts a spiral around a revolving cylinder.

It is evident, therefore, that by increasing the speed of the feed relative to that of the revolving cylinder, and having the point of the cutter properly shaped, a screw thread would result, instead of a paring off of the entire surface of the cylinder. All important actuating or working screws, as those for feeding on machine tools, are formed in this way, and large numbers, also, of ordinary machine screws, which when once seated are expected to remain *in situ* until the machine or implement of which they form a part is worn out.

Wood screws, as screws for fastening wood to wood, metal to wood, etc., are threaded in a similar manner, the thread being cut from the solid by a single cutter removing the material between the threads.

Large numbers of screws are threaded by dies, which may be called hollow screws, or nuts with cutting edges. These, by rotating, form the feed as well as the cutting device for threading the smooth cylindrical rod or bar. Some of these dies are worked by hand, others by power, but in either case the cut, by the modern and improved dies, is clean, and the thread is formed from the solid. The old fashioned dies were adjustable so as to be "set up," and could be made to cut several sizes of diameters. Much of their work was done by pressure, or squeezing, and a part of the thread was "raised" instead of being cut from the solid material. There are adjustable dies made now, but they are so formed as to do solid cutting.

There is another method of cutting threads direct from the solid, and that is by milling. It is the invention of the late Eli Horton, the chuck man of Windsor Locks, Conn. The machine is entirely automatic, the blank to be cut being rotated as in a lathe, and a rotary milling tool rotating against it at an angle adapted to the pitch of the thread desired. As the blank revolves slowly toward the cutter, the cutter revolving more rapidly forms the thread by being fed along over the blank as is the cutting tool in a lathe. The milling tool is so formed in cross section as to produce any shape of thread desired. This method is still in use by the successors of Mr. Horton to thread the steel screws of their chucks.

Threads on large cast iron screws are sometimes formed simply by being cast, and formerly there was much cheap small work of that sort in the market.

Threads may be raised by forging in dies, and some good work by this is produced. In both these cases, however, an after finish in the lathe is desirable.

For some peculiar purposes threads are formed by twisting a square or a flat bar; a common form of hand drill that has superseded the bow drill being a case in point. The stock of this drill is a bar, square in cross section, twisted, and which is rotated by sliding a loosely fitting nut rapidly back and forth over its length. A familiar instance of a screw thread of this description is the ordinary auger or bit, the cross section of which is a flattened parallelogram like a flat bar.

One peculiar method of forming screw threads remains to be mentioned. It is that of raising a thread by rolling between dies under pressure. There is a great deal of what is known as "bright wire goods" in the market, which are threaded. In many cases these threads are formed by simply rolling—one revolution, or a little more—the wire between two hardened steel plates that are corrugated spirally to form, when combined, a continuous thread. Sufficient pressure is applied during the rolling—which, however, is very rapid—to raise the metal from the annealed wire enough to make a thread. In this case the threaded portion is considerably larger than the stock or wire, at least half the depth of the thread on each side.

The threads in nuts are produced either by the "originating" method, cutting them in a lathe, by being tapped, or sometimes by being cast of soft metal, as brass, on a threaded core of hard metal, as iron or steel. But nuts are mostly threaded by tapping, running one, two, or three successive taps through them either by hand or in a power machine. Nuts of very thin material, as sheet brass for lamp tops, jar covers, etc., are formed simply by rolling between spirally corrugated rolls, a work analogous to "beading" on tin ware.

D'ARREST'S COMET.

[Translated for the SCIENTIFIC AMERICAN from *Ciel et Terre* of the 15th of April.]

On the 27th of June, 1851, D'Arrest discovered at Leipzig a very faint comet. After following its course for a fortnight, D'Arrest and Yvon Villarceau announced, almost simultaneously, that the orbit of the new comet was elliptical, and that it must be ranked among periodical comets that return at regular intervals to perihelion, the only time when they are visible. The comet was observed for three months. Yvon Villarceau, from the computation of its positions, assigned to it a period of about six years and a half, and an orbit that at aphelion approached very near the orbit of the giant planet of our system, the mighty Jupiter, whose mass is nearly 340 times greater than that of the earth, and whose attraction must consequently exert a powerful influence upon the path traversed by the comet, and complicate the determination of the successive epochs of its return.

It is difficult to form an idea of the length and tediousness of the process required by these mathematical calculations. The task was, however, undertaken, and, on the 1st of June, 1857, Yvon Villarceau announced the return of the comet during the winter of 1857–58.

According to the ephemeris issued at the same time with the article in question, he also announced that the comet would not be visible in the northern hemisphere, and notified observers in the southern hemisphere of the results of his work, that they might be on the watch for the erratic visitor. On the 4th of December, 1857, Sir Thomas Maclear, of the Cape of Good Hope Observatory, detected a faint comet in the neighborhood of the position assigned to it.

In July, 1861, Yvon Villarceau published a new paper concerning the comet's orbit. He predicted its return to perihelion on the 26th of February, 1864, but declared that its faint luster and small angular distance from the sun would probably render it invisible. This prediction was fulfilled, and the return of 1864 was not observed.

The next appearance of the comet was announced for 1870. M. Leveau calculated the probable orbit for this epoch; following the plan of M. Yvon Villarceau, he introduced into his calculations an indeterminate quantity from which he selected three probable values that gave him three different ephemerides. In spite of the great perturbations caused by the attraction of Jupiter between the returns of 1858 and 1864, and the absence of observations in 1864, D'Arrest's comet was detected by Winnecke at Carlsruhe on the 31st of August, 1870.

Its position was in right ascension 16 h. 38 m. 3 s.; its declination was 10° 39·8' south. One of the ephemerides of M. Leveau had assigned to it for this epoch a probable position in right ascension of 16 h. 38 m. 18 s., and in declination of 10° 41·1' south. The agreement between calculation and observation is remarkable.

Finally, the return of 1877 was observed at Marseilles on the 8th and 9th of July. The return of the visitor is expected during the present year. It has even been already announced, but the news proved to be without foundation, and the celestial object mistaken for D'Arrest's comet is a faint new nebula.

The reader will, perhaps, ask what scientific interest there can be in announcing the return of periodic comets. After the brilliant confirmations of the law of universal attraction that have been furnished by phenomena of various kinds, of what use is it to build monuments of figures in order to predict the return of a comet? At first sight it would seem that such labor is unwarrantable, and without direct utility.

We must, however, discard such conclusions, for they are in contradiction to the essentially perfectible character of science. Certainly it is no longer necessary to seek in the movements of the planets of our solar system confirmation of the law of universal gravitation; but the utility of the labor in question is not bounded by this law!

A multitude of secondary causes play a part in the economy of the material universe, and the effect of these multiple causes can only be revealed by the constant observation of all the phenomena offered for examination. Each observation constitutes, in some measure, a function of the constant quantities that enter into the great law of universal attraction, combined with the effects of these causes in detail. The accumulation of a great number of these functions will alone allow us in the future to suspect the existence of these causes and to discern the part that belongs to each one of them in the production of phenomena as we observe them. The constant study of facts constitutes the experience of science; this is not lost, like personal experience, but it can be transmitted to our successors to throw light upon their researches in ages to come.

Each comet therefore presents, as it were, a special interest in our studies of the universe. Encke's comet seems to feel the effect of the resisting medium through which it passes. The great comet of 1882 grazed the sun's atmosphere and furnished appreciable elements of the small resistant power of this atmosphere. D'Arrest's comet offers in the same way at every reappearance the possibility of measuring the extent of the perturbations to which it has been subjected, and as it passes exceptionally near to Jupiter it is eminently adapted for furnishing the data of observation relative to the mass—not yet absolutely determined—of this immense planet, which exerts so powerful an influence upon the solar system.

Snakes in Australia.

"Although the bushman has nothing to fear out here from the attacks of any wild animals," says a writer whose knowledge of Australian country life is not to be excelled, "he has still his secret enemies, which in many cases are as dangerous as the open foe; and what he has most to dread in the Australian bush are the snakes." Such is certainly the case. "I do not believe," he continues, "any part of the world can be more infested with these reptiles in the summer season. Let him walk where he will—in the depths of the forest, in the thick heather, on the open swamps and plains, by the creek or water holes—the shooter is sure to meet with his enemy, the black snake. It enters his very tent or hut, and coils itself in his blankets. In fact, nowhere is he safe; and if he did not banish the thought of them altogether from his mind, he would not have a moment's peace.

"It does, indeed, appear as if the eye of a watchful Providence peculiarly guarded the traveler in these wilds; for at any moment he is liable to tread upon a deadly snake, coiled up in his very path, which does not always get out of the way, but lies watching him with his basilisk eye, ready in a moment to make the fatal spring if touched, and very often the snake is not seen until the danger is past." Bushmen soon become accustomed, like the black fellows, to the indications of the presence of a snake, and can see it before reaching it, unless coiled up very snugly. The bush fires destroy thousands of snakes, but seem to make no impression on their numbers. Curiously enough, snakes are not found in New Zealand, although there is no record of St. Patrick having ever visited that part of the world.

A Bolivian Saurian.

"The Brazilian Minister at La Paz, Bolivia, has remitted to the Minister of Foreign Affairs in Rio photographs of drawings of an extraordinary saurian killed on the Beni after receiving thirty-six balls. By order of the President of Bolivia the dried body, which had been preserved in Asuncion, was sent to La Paz. It is twelve meters long from snout to point of the tail, which latter is flattened. Besides the anterior head, it has, four meters behind, two small but completely formed heads (?) rising from the back. All three have much resemblance to the head of a dog. The legs are short, and end in formidable claws. The legs, belly, and lower part of the throat appear defended by a kind of scale armor, and all the back is protected by a still thicker and double cuirass, starting from behind the ears of the anterior head, and continuing to the tail. The neck is long, and the belly large and almost dragging on the ground. Professor Gilveti, who examined the beast, thinks it is not a monster, but a member of a rare or almost lost species, as the Indians in some parts of Bolivia use small earthen vases of identical shape, and probably copied from nature."

Mr. William E. A. Axon, in a note giving the above to the *Journal of Science*, says: "If this account should prove to be accurate, it would form a counterpart to the etching of the mammoth, which forms so interesting a memorial of prehistoric art."

New Explosive.

Herr Koppel has devised a new explosive substance, which he expects to be less costly than any other, to give out no injurious fumes, and not to be liable to explosion by shock or friction. The following is the composition of two kinds, No. 1 being suitable for hard rocks, such as basalt, and No. 2 for softer, such as sandstone:

	No. 1.	No. 2.
Saltpeter	35	42
Soda	19	22
Sulphur	11	12·50
Sawdust	9·50	10
Chlorate of potash	9·50	—
Charcoal	6	7
Sulphate of soda	4·25	5
Prussiate of potash	2·25	—
Refined sugar	2·25	—
Picric acid	1·25	1·50
	100	100

The New Nickels not a Standard Weight for Measure.

The new V nickels are now coming into general use, the word "cents" having been added to prevent their being mistaken, when gilded, for half-eagles. The following, which was true of the old nickel, although it does not apply to the new, is now going the rounds of our exchanges:

"*Five Cent Nickels as Measures.*—A fact probably but little known is that the United States nickel five cent pieces furnish a key to metric measures and weights. This coin is two centimeters in diameter, and its weight is five grammes. Five of them placed in a row will give the length of a decimeter, and two of them will weigh a decagramme. As a kiloliter is a cubic meter, the key of the measure is also a key to a measure of capacity."

Although the new nickel pieces are larger in diameter than the old, they weigh less.

The average weight of those which we have tested is 4·9 grammes, or 75½ grains, while the diameter is 21 millimeters. Both old and new are so nearly two millimeters in thickness that the eye cannot distinguish the difference, hence a very correct idea of a millimeter can be had by taking half the thickness of a five cent nickel.

To give an idea of larger metric measures we may add that the column rules of the SCIENTIFIC AMERICAN are 0·36 meter, or 36 cm., in length, while the editorial columns are 8 cm. wide. The columns of the New York *Sun* and *Times* are nearly 54 cm. long and 6 cm. wide.

Ergotinine (Tanret's).

Upon request of the Pharmacological Institute of Strassburg, Gebe & Company have made many attemps to prepare this alkaloid, to which the oxytoxic effects of ergot are ascribed, and have at last succeeded. It is a substance which is very readily decomposed, being quickly altered by alkaline reagents, or even by a moderately elevated temperature. It soon assumes a red-brown color. Dr. Kober, of Strassburg, writes to Gebe & Company in respect to it as follows:

"You can scarcely realize how you have delighted my pharmacological heart by your ergotinine, for its action is most extraordinarily strong, and such as I never have attained in my own experiments. Frogs are placed by one-twentieth milligramme into a deep toxic condition, which is remarkable by its close resemblance to that produced by veratrine, inasmuch as the muscles—although promptly contracting—require from four to six hours for again relaxing. This peculiar condition lasts many days. A few milligrammes administered to Guinea pigs produce a condition resembling strychnine poisoning, inasmuch as they exhibit convulsive twitchings of the legs and dyspnœa, and finally die from paralysis. The intoxication may be very nicely studied in rabbits, which are affected already by injections of one-tenth milligramme into the circulation. At first the cardiac plexus is excited, then follows a stage in which the blood pressure is increased. This discovery is of the *greatest importance*, since it has been suspected, for the last twenty years, that ergot increases the blood pressure and thereby acts upon the uterus. Larger doses diminish the blood pressure in rabbits permanently, produce cramps lasting for hours, and cause death by asphyxia. It is remarkable that the alkaloid has no effect upon chickens, although the latter are very easily affected by ergot, and may be killed by feeding three times with ten grammes of the crude drug."

The hypodermic dose of the substance is ten to twenty drops of a solution containing one milligramme in one cubic centimeter.

This preparation, says *New Remedies*, is the *most expensive* drug so far quoted, since at lowest rate it must be put at 200 marks (50 dollars) per gramme (or 3¼ dollars per grain, over $1,300 per ounce). Yet even this price is seven and one-half times *lower* than that charged by the French manufacturer, namely, 1·50 marks (36 cents) for one milligramme in solution.

CHEMICAL VAPORIZER AND DEODORIZER.

Our engraving shows a compact and portable apparatus for the radical destruction of sewer gas, foul air, and fungous germs in the atmosphere. This device practically applies the latest scientific discoveries of Prof. Robert Koch, and others, on treating by inhalation diseases caused by germs of sewer fungoid, for continuously charging the air with chemicals which produce artificially any desired atmosphere considered essential by physicians, for the prevention or treatment of diseases.

This apparatus enables practitioners to administer by inhalation active volatile drugs during the night, bringing within the range of curable complaints several fatal diseases which have heretofore resisted scientific treatment.

The apparatus consists of a small case containing the vaporizing cylinders and a spring acted fan which draws in air and forces it through the cylinders containing the remedial or disinfecting agent.

The air thus charged is poured into the apartment in a continuous stream.

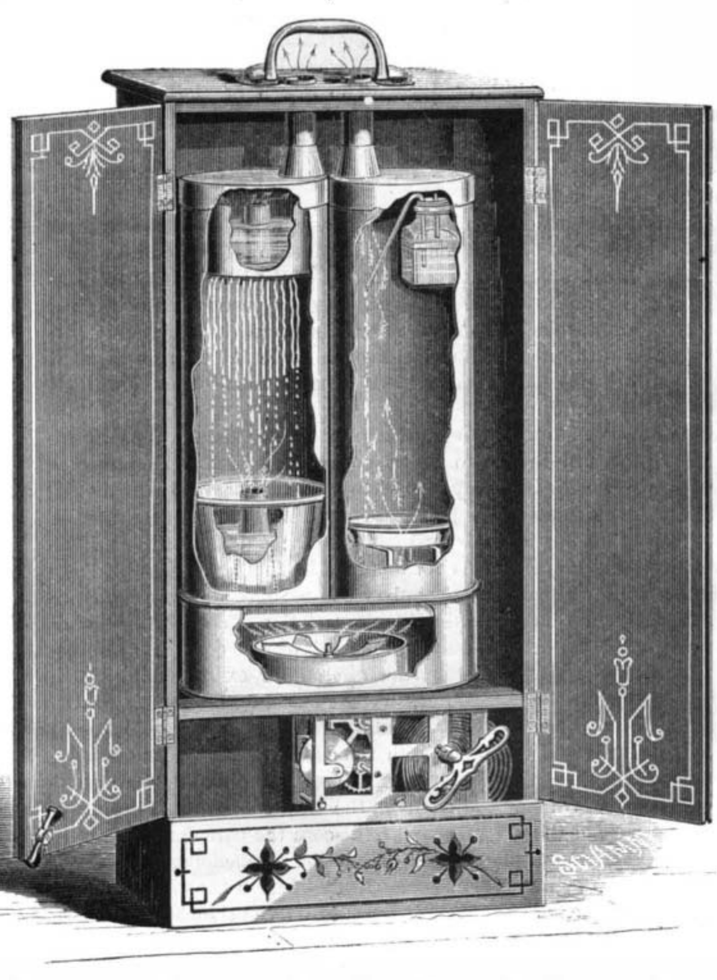
The vaporizer demands but little attention, and the chemicals used are inexpensive. All of the formulas or drugs recommended for use with the apparatus are furnished prepared for immediate use.

As the vaporizer makes no noise it can be put in the sleeping room, or it may be placed on a bracket in the hall on the floor occupied as sleeping apartments.

For the use of hotels and office buildings, a large chemical vaporizer, capable of supplying the entire building, is placed in the basement. Connecting pipes leading from the generator carry the vapor to the ice boxes, supply rooms, water closets, halls, sleeping rooms, and other locations.

This apparatus may be employed in diffusing grateful and invigorating perfumes, as well as the remedial and disinfecting agents. If desired, a double effect may be secured by charging the cylinders with different agents. The apparatus seems well adapted for the rational treatment and prevention of zymotic diseases.

Further information may be obtained by addressing the Chemical Vaporizing and Deodorizer Co., 94 Greene Street, New York city.



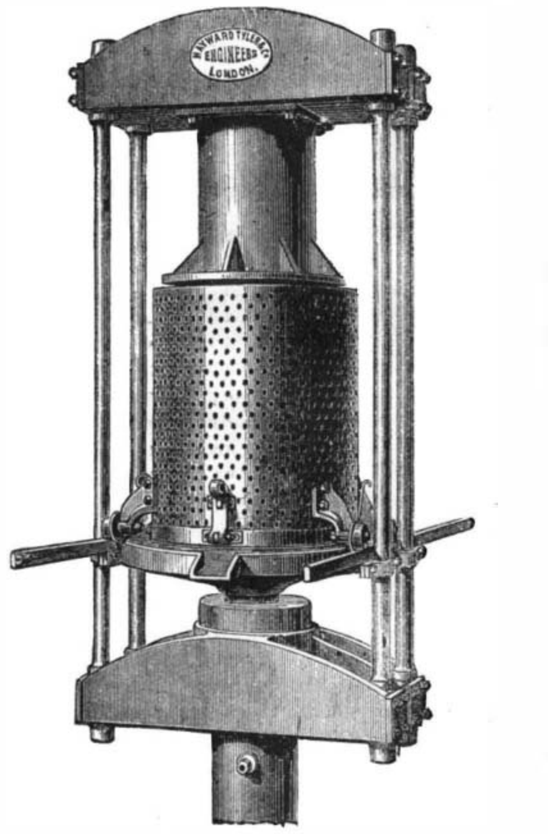
DR. HUBBARD'S CHEMICAL VAPORIZER AND DEODORIZER.

MORITZ GROSSMAN, in his Year Book for 1883, gives the following recipe for cementing rubber or gutta-percha to metal: Pulverized shellac, dissolved in ten times its weight of pure ammonia. In three days the mixture will be of the required consistency. The ammonia penetrates the rubber, and enables the shellac to take a firm hold, but as it all evaporates in time, the rubber is immovably fastened to the metal, and neither gas nor water will remove it.

IMPROVED HOP PRESS.

Various presses have been contrived at different times for extracting the wort from spent hops, but as a rule the objections to them have been their very complicated character and consequent expense.

The press here illustrated is fitted with two circular wrought-iron boxes, holding about six bushels each, which are filled and pressed alternately, and are arranged to run in and out of the presses on wheels and rails. The pressed hops are discharged from the bottom of the press, which opens



IMPROVED HOP PRESS.

downward like a door, and can be run into any suitable receptacle, or through a chute into the yard. One of these new hop presses has just been constructed for and fitted at Messrs. H. & G. Simonds' Brewery at Reading, and has proved highly successful. The pump which works the hydraulic press is driven by a strap from the main shafting, so that the attendant has nothing to do but open and close the valve; but the pump can also be made to work by hand.

Destruction of Steam Boilers.

The Dusseldorf Society for the Supervision of Steam Boilers consider the following to be the chief causes of the destruction of steam boilers:

The corrosion of steam boilers on the outside is principally due to the action of the beating gases and of the moist masonry. The products of combustion very frequently contain sulphurous acid, which in contact with moisture is gradually converted into sulphuric acid, and as such corrodes the iron. The moisture of the brick work causes direct rusting. With regard to interior corrosion, the following points are to be noted:

When an upper and a lower boiler are used, the feed water is let into the latter, which the fire gases reach last, and therefore is not so hot as the other. It is often noticed that the separate plates of this boiler are pock-marked with little grooves. When fresh water containing air is warmed, little bubbles of air containing much oxygen form, and as there is very little motion in this part of the boiler, they adhere to any rough spots on the iron and are destructive to it. It is easy to see that rough iron is attacked more readily than smooth; and of course, the action is most powerful in the grooves themselves. If steam bubbles attach themselves to any spot whatever in a steam boiler, where the temperature is not very high from its being heated with hot gases only, rusting will take place. Here too the atmospheric air in the feed water would be the destructive agent.

Hence, if care is taken to keep the water in motion circulating around in the boiler, the chief cause of internal corrosion will be for the greater part neutralized.—*Polyt. Notiz.*

Detection and Estimation of Lactic Acid.

R. Palm says that when lactic acid is added to a clear or slightly opalescent solution of basic acetate of lead, *i. e.*, acetate of lead mixed with five or six parts of alcoholic ammonia, a white amorphous precipitate of plumbic lactate will be immediately formed.

The same precipitate is produced when acetate of lead is added to a mixture of lactic acid and alcoholic ammonia. The precipitate is soluble in a large quantity of water, in acetic acid, lactic acid, and caustic alkali, but insoluble in alcohol, and must therefore be washed with alcohol. It dries to translucent scales like dextrine. After heating with fuming sulphuric acid and igniting, it left behind 79⅛ to 77½ per cent of oxide of lead, so that its composition corresponds to a basic salt having the composition

$$3PbO,2C_3H_6O_3,$$

which requires 78·8 per cent of oxide of lead.

Lead for the Examination of Drying Oils.

The lead is obtained by precipitating with slips of zinc a 10 per cent solution of lead nitrate acidulated with a few drops of nitric acid. The precipitate obtained is agitated for a few moments with distilled water, washed by decantation two or three times; thrown into a funnel plugged with glass wool, washed quickly, first with alcohol and then with ether, and dried in a vacuum over sulphuric acid. To expel traces of ether, it is lastly exposed to the air in thin layers for about two hours.

For the examination of an oil, one gramme of the lead is spread out in a rather large watch-glass, and the oil in question is allowed to fall drop by drop from a pipette drawn out to a point, placing the drops in such a manner that a space may remain between them. The lead gradually sucks up the oil, so that every fragment is coated with an excessively thin film of oil. If the oil has been added in too great quantity it forms a thick coating, which dries at the surface, and forms a solid pellicle, which protects the lower part.

About 2 parts of oil at most should be used for 3 parts of lead. The watch glass should have been first tared; the lead is then weighed, and afterward the oil added. The watch glass is then exposed to a mean temperature and to full light, which materially aids oxidation. With drying oils the increase of weight sets in after about eighteen hours, and is generally at an end after three days, when it remains constant.

With non-drying oils the weight generally does not begin to vary until after four or five days. Numerous series of experiments have shown the following numbers as the limits of the increase of weight of oils in presence of finely divided lead: Linseed, 14 to 15·5 per cent; nut, 7·5 to 8·5; cotton, 5 to 6; beech nut, 4 to 5 per cent. The non-drying oils give an increase of weight from 1 to 3 per cent, and it is only after the lapse of some months that we find an increase of 4 to 5 per cent.—*A. Livache.*

The Petroleum Fields of the World.

The relative importance of the oil fields of the world are succinctly stated as follows, in the July *Century*, by E. V. Smalley, in his graphic and fully illustrated article on "Striking Oil:" "Nearly all the petroleum that goes into the world's commerce is produced in a district of country about a hundred and fifty miles long, with a varying breadth of from one to twenty miles, lying mainly in the State of Pennsylvania, but lapping over a little on its northern edge into the State of New York. This region yielded, in 1881, 26,950,813 barrels, and in 1882, 31,398,750 barrels. A little petroleum is obtained in West Virginia, a little at various isolated points in Ohio, and a little in the Canadian province of Ontario. There is also a small field in Germany, a larger one, scantily developed, in Southern Russia, and one still larger, perhaps, in India. The total production of all the fields, outside of the region here described, is but a small fraction in the general account, however. Furthermore, the oil of these minor fields, whether in America or the Old World, is of an inferior quality, and so long as, the great Pennsylvania reservoir holds out, can only supply a local demand in the vicinity of the wells."