and that which brings the fruit to perfection through the "lateral roots" now, where there is a vigorous growth of leaves and no fruit, it is evident that there is some defect in the furnishing quality of the lateral roots, the sap root giving a superabundance of sap. This can be obviated thus: Let the farmer dig a trench (commencing some six or eight feet from the tree in order that the lateral roots may receive no injuries) deep enough to enable him to strike the "tap root" some three or four inches from its junction with the main portion of the tree. Cut this with a saw or sharp knife, fill up the excavation and the good effects will be seen the following season. This should be done before the sap rises.

READER.

Richmond, Va.

Philosophy of Preserving Eggs.

MESSRS. EDITORS.—Cobbet says, "A preserved egg need be run from, than after." The thousand and one recipes given from time to time are in fact as worthless as the mermaid stories or those of the snake monster of the sea. Many who put forth these stories for the million do not know what a fresh egg is; many do it for notoriety, and some ignorantly. No egg is fresh that will shake; this is because it has lost some of its albumen. No egg has ever been preserved over a month that will not shake, except it be air-proofed, which is a term not generally understood, and is a new process. If they are put in solution, no matter what it is, the egg will absorb it; if put up in dry measures the albumen will escape by transpiration through the shell. The egg has been coated with every conceivable composition, even in solid stone, and galvanized, yet the watery material escapes. The philosophy of this is that there is air in the egg before it is treated, and this uniting its oxygen and carbon, produces decomposition by carbonic acid gas, the yellow of the egg first breaking, then follows the destruction. Eggs are naturally designed to last as long as the hen requires to get her brood, and the life germ can be preserved a few weeks—seven or eight—but no longer. The egg itself may be kept in a preserved state for two years by greasing with butter, oil, or lard, but from the time it is thus put up to the end of two years it will daily lose its albumen by transpiration, and while its carbonic acid escapes to a certain extent, the egg meat will be reduced fully two thirds, and will shake. For culinary purposes they will do very well. But we want a whole egg, not a half one, and we want them fresh. Butter and lard and suet have been used for half a century, still nothing has recommended itself over the old liming system in a commercial point of view. The theory always has been, and still is, that to keep an egg fresh the air must be excluded. It is the only philosophical treatment of it that can be made. Eggs are composed of more than half a dozen chemical ingredients, and these components are very volatile; hence the atmosphere with its powerful agencies works quickly upon it. Externally kept from the air, the latter is powerless to do it harm, but the air inside no mortal can prevent, and that alone in time will decompose the egg.

AN EGG STUDENT FOR FIFTEEN YEARS.

New York city.

To Make Castings Free from Scoriæ.

MESSRS. EDITORS.—Your correspondent, J. C. W., in No. 6 current series, page 87 speaks of his difficulty in getting sound castings. Has he ever tried a "stodge catcher," which is nothing more than a large sprue set in front of the pouring sprue and gated heavy from one to the other? It should be gated not quite so heavy from under the stodge catcher to the casting in the nowell. Then by pouring fast enough to keep the iron well up in the stodge catcher the scoriæ that goes into the pouring sprue will rise and stay in the catcher.

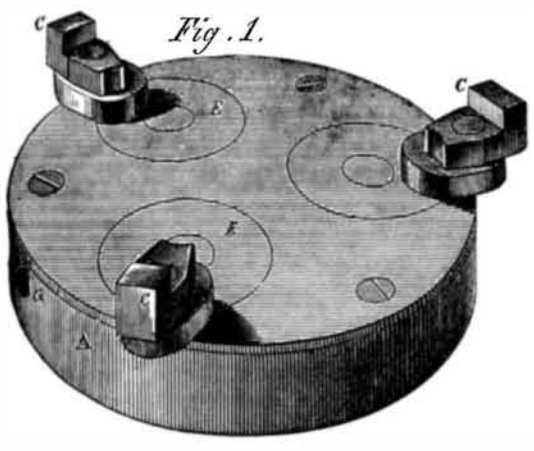
Iron should be poured hot, whether in dry or green sand molds; I consider it a great mistake to let iron cool in the ladle. If the mold is just right the iron can hardly be too hot. When the iron is poured hot the stodge rises, but if it is cooled down to the point many molders prefer, the scoriæ catches on the sides of the mold and make an unsound casting.

JOHN K. RICHARDS.

New York.

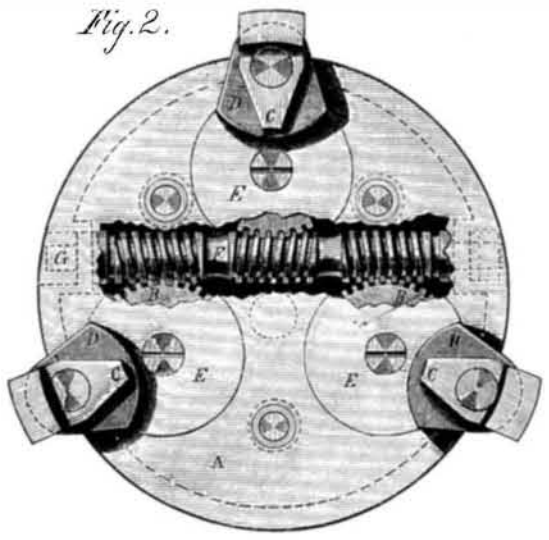
JOHNSON'S UNIVERSAL LATHE CHUCK.

A good universal lathe chuck, one strong, durable, not easily got out of repair, or so choked up with chips and dirt as to



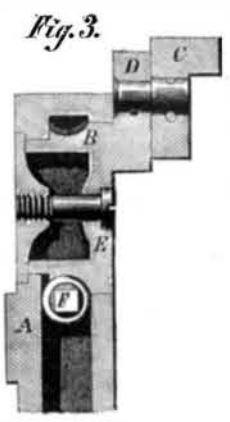
be impossible to use without consuming more time than would take to do the job, would be, as every machinist knows, an invaluable tool in the machine shop; but, as most machinists have experienced, one very difficult to obtain. This has confined the use of universal chucks to small work which could not well be done otherwise, and has lead to the use of a less economical class of chucks as a substitute for holding larger work. The chuck here illustrated is upon a new principle. has been most thoroughly and severely tested, and the patentee says, has proved itself perfect to do the work for which it is designed.

A socket wrench applied to the end of the worm shaft revolves the arms carrying the jaws, to and from the center grasping the work with the utmost precision and holding it firmly as in a vise.



The superiority of this chuck consists, briefly, 1st, in its entire freedom from dirt, and impossibility of chips or dirt getting to the working parts of the chuck; 2d, the simplicity of its construction renders it less liable to get out of repair than other; 3d, its accuracy strength and durability; 4th, the jaws, being simple in form, extra jaws for holding odd jobs of peculiar form or shape can be quickly made at a trifling expense.

A brief description and reference to the parts may aid in an understanding of its construction and operation: Fig. 1 is a perspective view of the chuck as ready for use; Fig. 2 is a view with a portion of the face broken away, exposing the right and left hand screw or worm and the worm segments; and Fig. 3 is a cross section through worm segment, chuck, and jaw. A is the body of the chuck; B, segments of worm gears having teeth around about six tenths of their circumferences; C are steel jaws pivoted to the projections, D, on the plates, E, which are rigidly a portion of the worm wheel segments and rotate with them; F is the worm shaft which engages with the gears and is turned by a socket wrench inserted at G, Figs. 1 and 2.



As the worm shaft is rotated by the wrench, it revolves the gears so as to bring the jaws either to or from the center. These jaws can be easily adjusted to receive objects of an irregular form, or they can be used as are those on the scroll chuck for the reception of regular shapes.

Patented by William Johnson, and manufactured by Cowin and Johnson, Lambertville, N. J., to whom all orders should be addressed. Responsible agents are wanted in all the principal towns in the United States.

The Central American States.

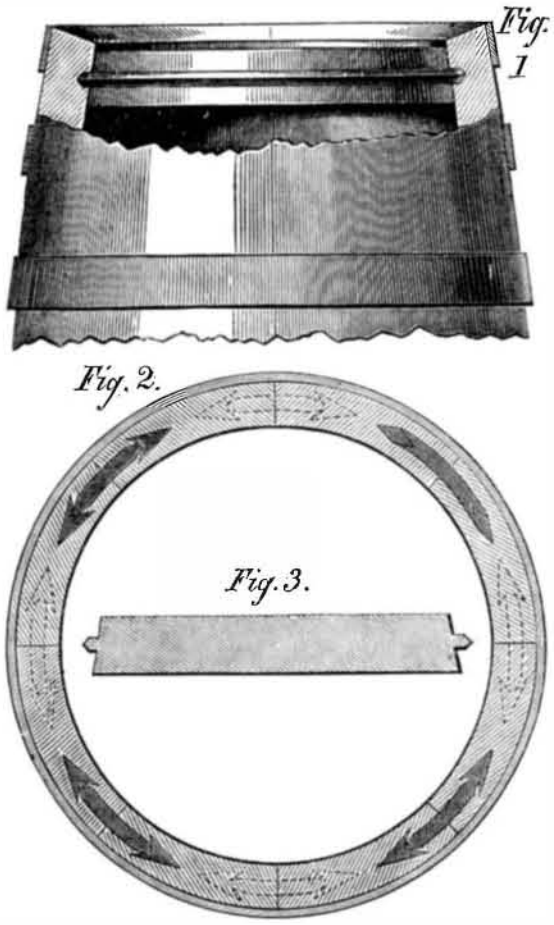
That portion of the continent lying between North and South America proper, known as Central America is becoming of political and commercial interest to the people of this country, and, because of its presenting the most favorable routes between the two oceans, to the nations of Europe. The following from the Hartford *Courant* will be read with interest:—

The large profits of the Panama railroad revive every now and then certain old projects for the construction of another railroad or the canalization of Central America. There can be no doubt that had the people of the region which lies between Mexico and South America been possessed of ordinary commercial activity, two or three well traveled routes would ere this have been opened from ocean to ocean. But like the inhabitants of other portions of Spanish America, they have been too busy with revolutions and political squabbles to find any time or energy to devote to industry or trade. The five Central American republics all achieved their independence about 1821, and in 1823 formed themselves into a confederation, which lasted until 1839, when it fell to pieces and all the members set themselves up as independent powers. The largest one is Nicaragua, which is about the same size as Georgia; its capital is Managua, with ten thousand inhabitants; its total population is about four hundred thousand, of whom thirty thousand are whites, ten thousand negroes, and the remainder Indians and half-breeds. The next in size is Honduras, having about the same area as Mississippi; its capital, Comayagua, has eighteen thousand inhabitants; its total population is about three hundred and fifty thousand souls. Guatemala is the third of the Central American republics, being a little larger than Ohio; the name of its capital is also Guatemala, with forty thousand inhabitants; the total population is estimated at one million and one hundred thousand, or greater than that of all the isthmian powers together. Costa Rica is the next in size, its area being somewhat more extended than that of West Virginia; its capital, San Jose, contains thirty thousand souls; its total population is one hundred and twenty thousand. The smallest of these powers is San Salvador, which does not cover quite as much ground as Massachusetts; its capital is also styled San Salvador, and its inhabitants number perhaps fifteen thousand; the whole population is believed to reach six hundred thousand. The existing constitution of Nicaragua was adopted in 1858, of Honduras in 1865, and of Guatemala in 1847. The presidents of all the republics serve four years—unless they are overthrown by a revolution—except the executive of Costa Rica, whose term of service is three years. The term Central America is generally considered to include, besides the five republics, the state of Yucatan, in Mexico, and the state of Panama in Colombia.

SHEA'S PATENT BARREL AND TANK.

The demand for kegs, barrels, pipes, and tanks is constantly increasing. They are the most convenient vehicles for the conveyance of liquids and many solid materials from place to place, and upon their proper construction depends largely the amount and the condition of the material they hold upon their arrival at the place of destination. The engravings exhibit a new method of constructing barrels, tanks, etc., patented January 29, 1867. Fig. 1 presents a view of a barrel partly in section; Fig. 2 is an end view of the staves of the barrel, and Fig. 3 is a cross section of the improved head. This improvement consists in forming a V-shaped encircling projection, A, upon the edge of the head, leaving a shoulder above and below. It will be seen that when the head is seated in the barrel it forms shoulders above and below the croze, bearing against the chimes and preventing them from being broken. The incline of the edge of the head also gives additional security, as the greater the internal pressure the closer will be the fit of the head to the staves.

Fig. 2 shows a new method of securing the staves one to the other. B represents metallic dowels, slightly curved, to correspond to the curvature of the cask, and feathered at each



end. These are driven into suitable recesses in the ends of the staves, thus firmly binding them together. Fewer hoops are required for barrels thus built than for others.

The use of this dowel is particularly applicable to heavy work. The inventor says that, casks made in this way will cost no more than others, require less labor, and will overcome all the disadvantages of the present style of construction. A factory is now being built in New York for the manufacture of casks under this patent, having already very large orders ahead from brewers, distillers, oil merchants, and sugar refiners, who, through their patronage have given substantial evidence of their appreciation of the improvement.

The patentee will sell manufacturing and territorial rights and will furnish the necessary machinery for the manufacture of these improvements, or will alter any now in use at a moderate cost. Address Samuel Shea, Corry, Erie county, Pa., or at Jersey City, N. J., or H. W. Quitzow, 24 South William street, New York city.

SETH GREEN, Holyoke, Mass., writes to the New York Farmer's Club that he is hatching shad by the million, artificially, and he wants to say to everybody that he will give them all the young shad and impregnated ovas that they will come and take away. The day before writing he hatched 5,000,000.

PARISIAN TASTE is rather an indefinable sense. The Chinese have never been accused of over fastidiousness in the selection of their food, but what with horse flesh, frogs, snails, and so on to the end of the chapter, the same may soon be said of this more favored Western nation. The latest delicacy introduced in Paris is whale's flesh, and shark and dolphin steaks.

Adjustable Heads for Gear-Cutting and Slotting on Lathes.

In small shops it is often required that a gear should be cut for some specific purpose where the demand for this sort of work is not sufficient to warrant the purchase of a gear-cutting engine; and if a milling machine or planer cannot be at liberty to be used for fluting reamers, taps, etc., then some convenient attachment to the lathe might be advisable and handy. To fill both these requirements is the object of the inventor of the devices shown in the engravings.

Fig. 1 shows Parker's gear-cutting attachment for engine lathes. It is a standard to be secured to the lathe carriage by a bolt passing through the curved slot in the projection, A, which carries a spindle in the box, B, that supports the bearing, C, and the index wheel and finger, D. Under the platform is a plate secured to the upper part of the lathe carriage by a bolt similar to that used in fastening the ordinary tool post, so that the appendage can be swung around in such a position as to meet all exigencies. The blank to be cut is secured to the arbor, E—shown in blank—in the usual way. The screw, F, elevates or lowers the index wheel and its parts and the set-screw, G, secures them in place. The segmental slot in A allows the attachment to be turned at an angle to the ways of the lathe in order to accommodate itself to the cutting of "slashed" or spiral teeth, and the means of elevation or depression by the screw, F, adjusts the arrangement for different sized gears or ratchets. Every machinist will see how readily it may be adapted to the cutting of the straight, bevel, miter, or spiral gears, from the smallest up to those of ten or twelve inches diameter, with any desired number of teeth. For cutting bevel gears it is only necessary to set the arbor, E, with its connections by means of the nut on the end of the box, B, to give the proper incline to the arbor, and its appurtenances. The arm of the finger, D, has a scale of figures marked on it to designate the number of the holes in each concentric circle on the index. It appears to be a very neat and complete device for the purpose intended.

Fig. 1

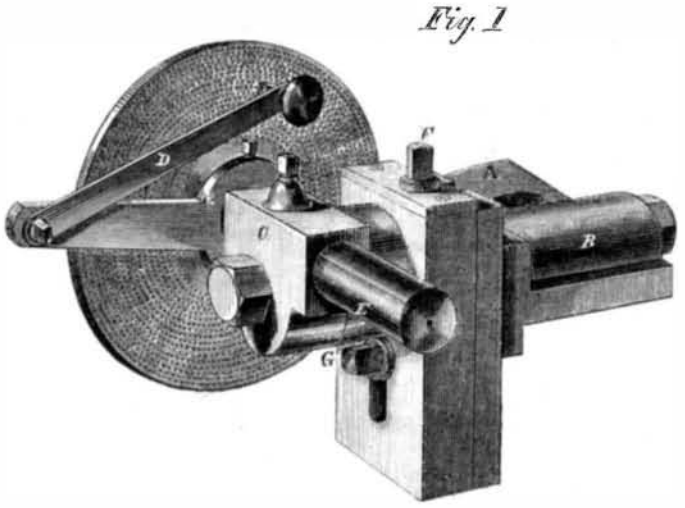
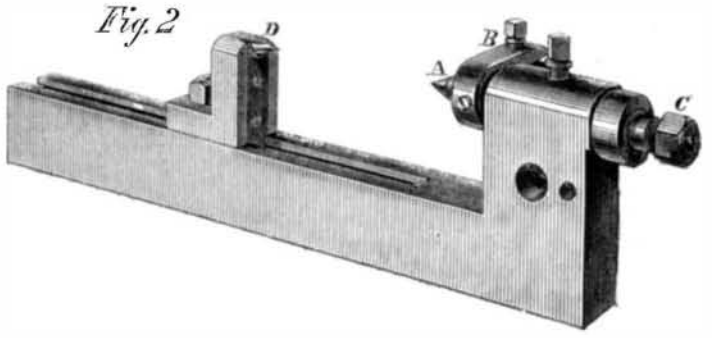


Fig. 2



PARKER'S GEAR-CUTTING ATTACHMENT FOR LATHES.

Fig. 2 is a handy attachment to be affixed to the carriage of a lathe for fluting reamers and taps and splining studs and short shafts. The stationary center, A is furnished with a radial clutch, B, to receive the tail of a dog or any other device for holding the shaft or taps, having a set-screw to prevent "back-lash." On the end of this center, at C, the index plate of the other device can readily be affixed. The other center, D, can be moved from point to point and secured by the set-bolt. The center of this movable part is dressed down to allow the action of a milling tool or cutter to the lowest point. No further explanation is required by the practical workman.

These appliances are the subjects of patents, one issued July 3d, 1866, and have been tested for more than a year and proved to be valuable aids to the machinist. All additional information desired can be obtained by addressing the manufacturers, Warwick Tool Co., Middletown, Conn.

Science Familiarly Illustrated.

STARCH, ARROWROOT, SAGO, AND TAPIOCA.

All the above are only synonyms for one and the same substance, that of starch, the difference between them being mainly those occasioned by the differing proportions of the constituents and the presence of more or less foreign matters. Starch is a component of many articles of food, all the farinaceous vegetables containing a large proportion. That manufactured variety known as corn starch is prepared from the maize called the "white flint." Before being ground, the corn is soaked in vats, and then is run through the stones with water. The mass is then filtered and the residue is dried in a kiln until all, or most of the water is evaporated, when it is again ground to a dry powder.

Arrowroot is a term loosely applied to the starch extracted from a number of roots and cereal products, as the maranta, mandioc, tacca, arum, potato, etc. That from the maranta of the East and West Indies is the true arrowroot, but much of that in commerce is from other substances. It is a simple food, very nutritious, containing no nitrogen, and well adapted for producing adipose matter or fat.

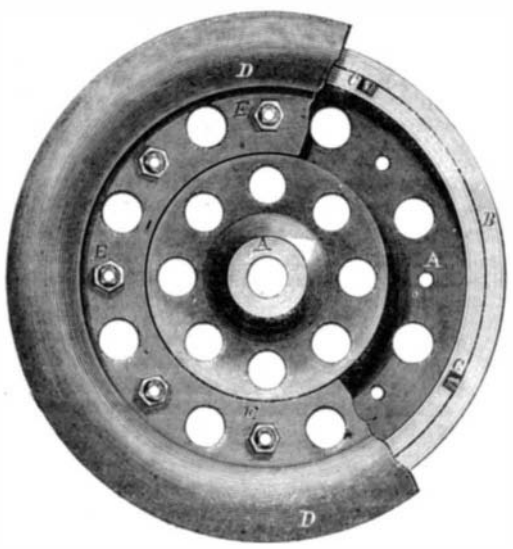
Sago is a farinaceous substance prepared from the pith of a species of palm growing on the islands and main land of the Indian Archipelago. To obtain it the tree is felled and the trunk split. The pith is then removed, macerated with water, and beat with paddles, when the woody fibers separate and float. These being removed, the grains settle and the flour or grain, after being dried, is sifted and then generally bleached with chloride of lime. Pearl sago is prepared from the ordinary sago by being heated on an iron surface. In cold water neither forms of the sago are solvent, but only in hot water, when they form a thick starch-like solution, and make an excellent and very nutritious food.

Tapioca is prepared from the root of the mandioca or cassava, grown in the West Indies, South America, and some parts of Africa. The root grows sometimes to the weight of thirty pounds. It contains, with the starch, a large proportion of a poisonous, milky juice, containing hydrocyanic acid and an acrid bitter substance. The poisonous principle is used by the inhabitants of northern South America to poison thorn arrows thrown from their *pucunas*, or blow guns, for the killing of game. The root is brought from the mandioc patch and then washed and peeled. The peeling is usually performed by the teeth; after that the root is grated, the grater being a wooden slab about three feet long, a foot wide, slightly hollowed, and set in diamond-shaped patterns with sharp pieces of quartz. The grated pulp is then partially dried on a sieve and placed in a long cylindrical basket of elastic fibers. One end of this basket is affixed to the limb of a tree or a stout peg in the wall and a pole passed through a loop on the lower end. One end of the pole is rested under some projection and the Indian woman seats herself on the other end as the power. Her weight draws the sides of the basket together until it assumes the shape of an inverted cone. The milky juice drops into a vessel placed to receive it. The pulp is then removed and dried in a kiln or oven. This pulp is known as *semonilla* and used for a bread. The poisonous liquid deposits the starch known as the tapioca of commerce. This deposit is dried either in the sun or by rude, kilns and granulates, as is seen in that so extensively used for puddings. Sometimes it is denominated Brazilian arrowroot, but under whatever name, it is the product of a root which in its natural state is one of the most virulent of poisons.

It is almost impossible to believe that one of the most nutritious and palatable of the elements of our *cuisine* should be derived from one of the most fatal poisons known in the vegetable kingdom, yet such is the case.

FORREST'S COMBINATION CAR WHEEL.

The engraving presents a double view of a car wheel intended to overcome the objections to the common cast wheel and the wrought wheel used on European roads. It is composed



of three distinct parts, secured together by screw bolts. The hub and body, A, of the wheel is either cast from suitable iron or forged from good wrought iron—which is preferable—to prevent breaking. The tire, B, is a separate piece of chilled iron, or cast steel. It has projections, C, on its inner surface which fit into corresponding recesses in the rim of the body, A, which reach partially across its face. The disk-flange, D, is either of chilled iron or steel, and is made to fit over the central projection of the body, A, and confine the tire in place. The three parts are secured by square shanked bolts, seen at E, which may be of any convenient number. To procure lightness, the webbing of the wheel may have a number of holes of any form made through the parts. The flange of the wheel and the webbing of the wheel outside of the hub is in one piece and when bolted to the mass of the wheel secures the tire place. The tire or tread may be of the hardest metal, as steel or chilled iron, as its position on the wheel rim does not depend upon shrinkage. The advantages of wrought over cast car wheels have never been acknowledged in this country, where chilled cast car wheels have been used to the exclusion of wrought wheels, ever since the first successful running of railroad cars. But in Europe, except Russia, the rule is that car wheels should be of wrought iron or steel tired.

The inventor of this combination wheel believes that its value for durability is far in advance of those generally in use, and that it is cheaply made and easily kept in repair, as the tire can be removed at any time when worn and replaced by a new one; or any other part can be similarly replaced.

This plan was patented through the Scientific American Patent Agency July 23, 1867, by David Forrest assignor to himself and James Eldridge, Jr. For further information address Forrest and Eldridge Eastport, Me.

Railway Bridge Excitement in Hamburg.

Hamburg is in a state of alarm and excitement, as there is some reason to believe that Prussia is seriously contemplating the expediency of constructing the much talked-of railway bridge across the Elbe, at a spot that has hitherto never entered the wildest dreams of the most speculative engineer—namely, below Altona, near the terminus of the Kiel and Altona Railway. There can be no doubt that, as the two banks of the river belong to Prussia, that power has as much right to build a bridge there as over the Rhine at Cologne and Coblentz, where both banks are also Prussian; but should the plan be really executed, Hamburg will be cut off from all direct communication with the sea, and then good-bye to its commercial prosperity. From being fully as much of a sea port as London, at present, it will become as much an inland city as Dresden or Berlin. The trade of Altona will also be totally ruined by the bridge, but as that town is now Prussian, the government has the right to do what it likes with it. As far as regards Hamburg, however, the case is different; and in an international point of view, it is very doubtful whether Prussia has the right to cut off the traffic of an independent state and preclude it from direct commercial intercourse with the rest of the world.

Editorial Summary.

METEORITES.—M. Daubrée, who has been investigating the specimens of meteorites in the Paris collection, divides all meteorites into two primary groups—Siderites and Asiderites—the former being characterized by the presence of metallic iron, and the latter by its absence. The Asiderites contains one group only, which is termed Asideres. The Siderites are divided into two sections: in the first the specimens do not enclose stony particles, and in this we find the group of Holosideres; in the second both iron and stony matter are present. This, then, induces two groups: Syssideres, in which the iron is seen as a continuous mass; and Sporadosideres, in which the iron is present in the form of scattered grains.

SURGERY AMONG THE INCAS.—M. Broca, says the *British Medical Journal*, has presented to the Academy a skull found in the tomb of the Incas four miles from the city of Cuzco, which is chiefly remarkable from bearing marks of having had a surgical operation performed upon it. The skull gives evidence that it underwent a fracture and denudation of the frontal bone, and traces prove that trepanning was performed. A circular white spot is visible which shows an inflammation of a portion of the bone, terminating in death, as is believed, in about fifteen days after the operation. M. Broca thinks that the trepanning was performed with a gouge.

FOSSIL IVORY.—About forty thousand pounds of fossil ivory, that is to say, the tusks of at least one hundred mammoths, are bartered for every year in New Siberia, so that in a period of two hundred years of trade with that country, the tusks of twenty thousand mammoths must have been disposed of—perhaps even twice that number, since only two hundred pounds of ivory is calculated as the average weight produced by a pair of tusks.

IT is said the Indians have an ingenious way of setting fire to houses with their arrows. They wrap with a rag some powder on the heads of their arrows, and on the tip of the arrow head place a percussion cap. When the arrow strikes the object to be fired, the cap is exploded and the powder and rag ignited. The rag burns long enough to set combustibles with which it may come in contact on fire.

THE FRENCH SCIENTIFIC ASSOCIATION promises to take the lead of all the Continental organizations in promoting the cause of science. It has this year appropriated 78,000 francs for investigations and experiments. In future, its *Bulletin* is to be published every week instead of monthly, as heretofore.

SUBSTITUTE FOR COFFEE.—In Germany the seeds of grapes are frequently used in place of the coffee berry. When pressed, they yield a quantity of oil, and afterward when boiled, furnish a very economical, and it is said, a very delicious substitute for the genuine Mocha.