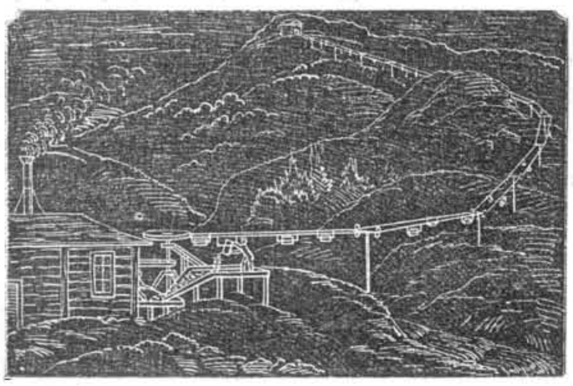
HALLIDIE'S WIRE ROPE WAY FOR TRANSPORTING ORES.

This invention is one of great importance, especially to the miners of the Pacific slope. Our illustration gives a general view of the whole apparatus in practical operation, conveying quartz from the top of a mountain in a rough mining region to the mill below. The *Scientific Press* thus describes it: "The wire rope passes over pulleys elevated upon posts of a suitable length, and, as shown in the engraving, the sacks of ore are suspended by the proper device to the rope. The sacks or cars are loaded on the dump at the mine on the mountain, and, the patent grip pulley being revolved by means of the engine, the sacks or cars pass down on one side, deliver their load, and pass up empty on the other side. Boxes may be used that are self dumping, or operated by hand, as desired. By this means, the expense of road building, teams, drivers, etc., is done away with, and a safe and very convenient method adopted by which the ore is delivered to the mill. Either sacks or cars may be used for carrying, as desired. The patent grip pulley is a very ingenious device, and accomplishes its purpose admirably.



"The rope way may be run by the same engine that runs the stamps at the mill; and when the descent is sufficient and the load comes down, no extra power is needed, the gravity of the descending loads being sufficient to keep it in motion; it being desirable, however, in all cases to connect with the steam engine or water wheel, in order to regulate the speed of the rope, which is usually about 200 feet per minute. The posts, of course, are arranged high enough so that the cars may be clear of all obstructions from the ground, but the undulations of the ground can be followed. There being a pulley over the rope as well as under it, the rope is kept between the pulleys and enabled to pass over any mountain at any angle. A brake is sometimes used to regulate the rapidity. One very great advantage, possessed by this system of conveying ores, is that the weather will not affect it, for it can be worked during heavy storms and freshets, and the depth of snow is of no consequence; moreover it will run as well by night as by day, and with no more care.

"The advantages of this apparatus will be obvious at a single glance to any one familiar with the general rugged character of the Pacific slope.

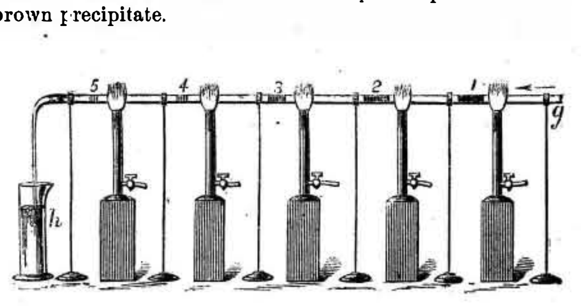
' This apparatus should not be confounded with the ropeway of Hodgson's patent, which is now in operation at the Eberhardt and Aurora Company's mines in White Pine, as it is totally different in its construction."

PRECIPITATION OF ARSENIC BY HEAT IN MARSH'S TEST.

BY JOHN C. DRAPER, M.D., PROFESSOR OF CHEMISTRY, UNIVERSITY MEDICAL COLLEGE, NEW YORK.

Among the methods for the detection of arsenic, there is not one which promises better quantitative results, for the purposes of medico-legal investigators, than that by the action of heat on the arsenide of hydrogen. I have, therefore, endeavored so to improve the ordinary method, of precipitation of arsenic from its gaseous compound with hydrogen, as to render this method both satisfactory and reliable.

In the text books on medico-legal chemistry, it is recommended that the arsenide of hydrogen, developed by the action of zinc, dilute sulphuric acid, and the arsenical solution, should be conducted through a hard glass tube of narrow caliber which should be heated at some part by a spirit or Bunsen flame. The compound gas is, under these circumstances, separated into its constituents, and a metallic mirror of arsenic deposited a short distance beyond the flame. After the gas has been exposed to the action of heat, it is to be passed into a dilute solution of nitrate of silver, where any portions that have not been decomposed produce a dark brown precipitate.



From the above *resumé*, it will be seen that the arsenide of hydrogen is only partially decomposed by heat, since the silver solution is intended to arrest the portions that escape its action. I have, therefore, investigated the extent to which the precipitation by heat takes place, and for this purpose have passed the gas through a Marsh reduction tube, heated at five points by Bunsen flames, as shown in the adjoining figure, and which takes the place of the tube in the apparatus represented on page 179 of the last number of the SCIENTIFIC AMERICAN.

In the first experiment, the arsenious acid solution, introduced into the decomposition flask, was moderately strong, and a stain soon appeared at 1. This was followed by another at 2, then at 3, 4, 5. The passage of the mixed arsenide of hydrogen and hydrogen was continued about half an hour, at the close of which time there was a thick deposit of arsenic about two inches long at 1, another about the same length but not so thick at 2, one still weaker at 3, while 4 and 5 were of about the same appearance.

In a second experiment, a very dilute solution of arsenic was introduced, and the rate of evolution of the gas was very slow; in this nearly the whole of the arsenic was arrested at 1, very faint and unsatisfactory stains appearing at the other heated spots.

In a third trial, a strong solution of arsenious acid was introduced with a result similar to that obtained in the first experiment. We may therefore conclude that, in the separation of arsenic by heat from arsenide of hydrogen, though the greater part of the metal may be removed by a single application of heat when the current of gas is very slow and it is largely diluted with hydrogen, if the flow is at all rapid or if the gas is rich in arsenic a very large proportion of the metal may escape reduction, even though the passing gas is frequently heated; and the last portions of arsenic are only separated in this manner with the greatest difficulty.

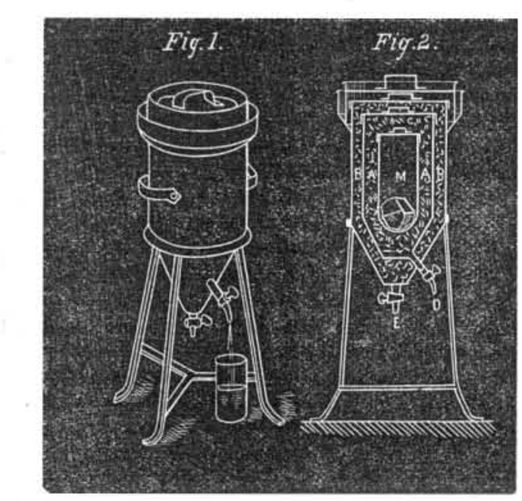
In an examination of the liver or other organ, in cases of arsenical poisoning, the solution generally obtained by the process of Fresenius and Babo is moderately strong when arsenic is present; it is therefore necessary to secure under these conditions the precipitation of the whole of the arsenic at the first heated spot, and obtain it in such a form that it may be weighed without loss, and then subjected to any other tests that may be desired. The possibility of accomplishing this problem in a satisfactory manner, we propose to discuss in a future paper.

DETERMINATION OF HIGH DEGREES OF HEAT BY THE MELTING OF ICE.

It was mentioned in our number for March 9 (page 168 of the present volume), that any substance, able to withstand the heat of a furnace, may be used to determine its temperature. We will now explain this method, which is one of the most interesting applications of our knowledge of the specific heat of bodies.

Suppose we take a lump of mica, asbestos, fire clay, or a large fire brick or a piece of graphite, and expose it so long to the heat of the furnace that we are satisfied that it has attained the same temperature; and then transfer the piece rapidly to the ice calorimeter of Lavoisier and Laplace, and notice how much ice it will melt.

As this most useful apparatus is not as universally known as it deserves to be, and as its description is totally omitted from most text books on natural philosophy, we will describe it here. Fig. 1 represents the exterior view, and Fig 2, a



section of the same. It is made of three vessels of sheet tin, of similar shape, and fitting concentrically one into the other. In the smallest central vessel, M, we place the body of which we wish to determine the number of heat units; the space, A, between this vessel and the one surrounding it is filled with pounded ice; the vessel has a lid and this is also covered with ice. This ice is intended to be melted alone by the heat of the body, M. In order to secure this, and to prevent the melting of this ice by the exterior heat of the room where the experiment is performed, the space, B B, between this second vessel and the third exterior one is also filled with ice. The latter will be melted only by this exterior heat, and the water proceeding from this melting runs off by the stop cock, E; while the water proceeding from the melting of the interior ice by the heat of the body, M, runs off by the stop cock, D, and is collected in a proper vessel (see Fig. 1), and carefully measured or, better, weighed.

As the substances used for this experiment may lose some of their weight by the intense heat to which they are exposed, it is unnecessary to weigh these before they are exposed to that heat; their weight is ascertained only after the practical portion of the experiment is finished, that is, after they have been exposed in the calorimeter, melted all the ice they could melt, and are cooled to the temperature of the melting ice, 32° Fah.

It is evident that precautions must be taken against loss of heat during the transfer, of the heated substance, from the furnace into the calorimeter; it is, of course, impossible to prevent this loss altogether, and all we can do is to bring this loss to a minimum by care in our manipulations. It is unnecessary to make any corrections for the specific heat of the vessel itself, as we commenced with having it at 32° Fah.; and the heat the interior lining absorbs from the body, M, is finally all given off again to the ice to be melted. The heated body is best laid in the space, M, on a non-conducting cushion of mica and asbestos, as otherwise the heat would be too rapidly communicated, and serious disturbances caused.

Suppose now we have taken a piece of fire brick, heated it, and introduced the same in the calorimeter. We find that the weight of the water proceeding from the ice melted is 7·62 lbs., while the weight of the piece of brick after cooling is found to be 3 lbs.; 7·62 lbs. of melted ice is equivalent to 142 × 7·62 or 1,082·04 units of heat, and as this number was carried out of the furnace by 3 lbs, of fire brick, of a capacity of 0·19 specific heat per pound, we have 3×0·19 or 0·57 as the divisor of 1082·04 units, which gives for the temperature of the furnace 1,898° Fah.

If there is any doubt as to the correctness of the result, by reason of the uncertainty in the specific heat at the high temperature to which we exposed the sample of fire brick used, one single determination with a substance like platinum, of which the specific heat is exactly known, gives us the correct temperature of the furnace; and this may then be applied to correct the specific heat of the fire brick. Suppose, for instance, the method with platinum and water, explained on page 168, gave us, in the same furnace at the same time, a temperature of 1,790° we should then reason as follows: 7·62 lb. melted ice is equivalent to 7·62×142 or 1,082·04 units of heat; and as 3 lbs brick carried this amount, each lb. of brick carried one third of 1,082·04, or 394 units, that is, one lb. of brick, when it had absorbed 394 units of heat, showed a temperature of 1,790° sensible heat; its capacity for heat or specific heat must then be 394÷1,790 or 0·22. As long, then, as we use this quality of fire brick and take its specific heat as equal to 0·22, we shall have more correct results than if we take it at 0·19, as it is found at ordinary temperatures and given in most of the tables of specific heat.

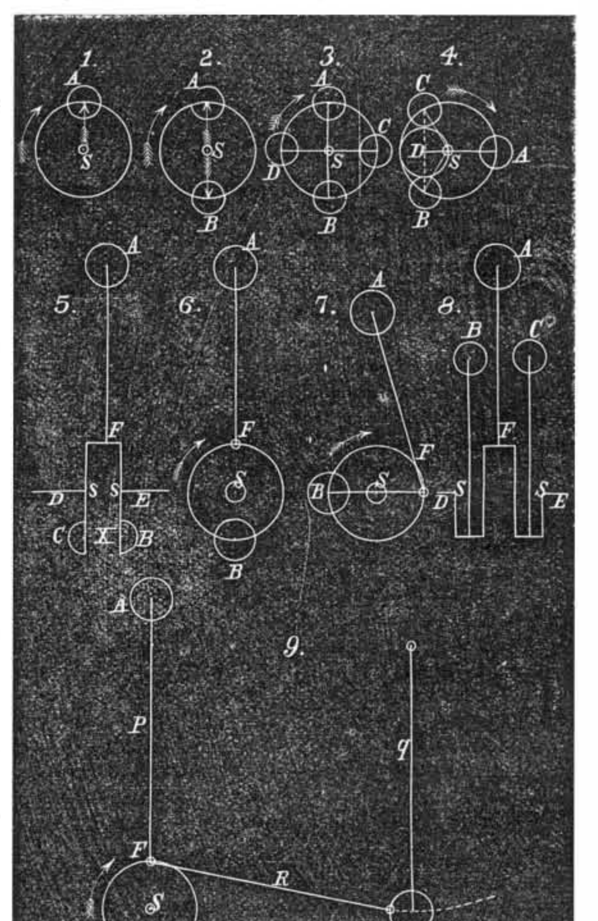
Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Counterbalancing Saws and other Machinery.

To the Editor of the Scientific American:

E. F. J., writing in your issue of March 2, wishes to know how to counterbalance his gang saws so as to prevent vibration, and states that the saw gate weighs some 5,500 lbs. As the theory of counterbalancing seems to be but little understood among millers, I propose to occupy some of your space in explaining it in a practical way.



Let the circle, Fig. 1, represent a disk or wheel revolving upon a horizontal axis, S; it is evident to any mechanic that, if the disk be perfectly true and of uniform density, there will be no vibration; but if we attach the weight, A, to one side, throwing the disk out of balance, a vibrating action will be produced, which increases with the weight, distance from the center, S, and number of revolutions in a given time. To make our disk run smoothly, we apply an equal weight, B, equidistant from S, Fig. 2.

Before leaving Fig. 1, we must inquire what are the natures and directions of the vibrations produced by the weight, A. If we whirl a plummet in the air, we find a force developed called the centrifugal force, which keeps the string taut and draws the hand constantly towards the bob. So also with our disk; the centrifugal force of the unbalanced weight

A, causes a tension in the direction, S A, which wears away the side of the axle next to A, and causes it to vibrate in the direction in which it is poorly supported. If it be supported upon a poor foundation, the vibration may be in the vertical direction; or if the axis or shaft be supported by the overhead sleepers of a weak framed building, then the vibration will be in the horizontal direction. These evils may be prevented, as shown in Fig.2.

Fig. 3 shows four equal weights, A opposite B, and C opposite D, all at equal distances from the center, S; therefore Fig. 3 rotates without causing vibration. Fig. 4 shows three equal weights, A, B, and C, at equal distances from S and their centers, dividing the circumference into three equal parts; then this disk also revolves without vibration. The practical way of determining when pulleys, disks, etc., intended for rapid revolutions, are balanced is to lay the shaft or axis across two beveled straight edges, as the sills of a lathe, which allow it to revolve without friction, and the heavy side speedily turns down, and pieces may be applied to the top until the pulley remains in any position.

Referring again to Fig. 4, draw the dotted line, B C, and extend the line, A S, to D; we will have S D equal to half A S; at the point, D, we will apply a weight equal to G+B, or double of A; and removing B and C, our disk will still be balanced when tested on the straight edges, and will revolve without vibration. The principle of the lever applies here as to all mechanical constructions; and weight, A, multiplied by distance, AS, equals D multiplied by D S.

Although we do not practically calculate, the method of balancing on the straight edges accomplishes the calculation, and we come to an important point usually overlooked, which is that the attraction of the earth, or gravitation, has nothing to do with the vibration of unbalanced mechanism.

Gravitation supplies a convenient method, of measuring the mass of matter in any body by weighing, which is tolerably correct, and also their moment or leverage; for we have found, when disk No. 4 balances perfectly, that A×AS= D×DS.

In Figs. 5, 6, and 7, let F represent the position of a crank pin to which is connected the pitman represented by the line, FA. To the upper end is connected the saw gate which, for our purpose, may be represented by the weight, A. Now we may counterbalance by adding the weight, B, equal to A, on the opposite side of the axis, and equally distant from it with the crank pin, F; and this will be balanced, that is, the crank will stand in any position. Now run the mill at a rapid rate without B, there will be a strong vertical vibration only, because A, the unbalanced part, moves only in that direction, but attach B, and the vertical vibration is counterbalanced and removed; but there is introduced a vibration equally severe in the horizontal direction. Therefore it appears that we cannot counterbalance a reciprocating weight by a revolving one so that it will run without vibration; but we can use another weight moving in directly the opposite direction, as in Fig. 8, where B and C represent two weights, each one half of A, connected to the pins, G and H, directly opposite to the pin, F. Two cranks are used, one on each side of F, because a single weight at B or G, equal to A, would tend to produce a tilting motion in the crank shaft.

I hope that I have now shown clearly that a simple reciprocating motion cannot be balanced by a rotating motion, but can be by another reciprocating motion, equal and opposite.

To apply the results of our investigations to the case submitted by E. F. J. He can first apply a counterbalance of half the weight of his saw gate, which would reduce the vibration in the vertical direction but one half, and would introduce a horizontal vibration of equal amount. To this may be added a heavy fly wheel, which will reduce the vibration in proportion as its weight exceeds the weight of the gate; these excessive we gnts, however, produce heating and wearing of the journals. They must, moreover, be placed very close to the plane in which the center of the length of the crank pin rotates, or else form d on a pair of disks each side of the pin, as in Fig. 5. Fig. 9 shows a method which will prevent vibration both in the vertical and horizontal directions. The weight, A, being counterbalanced by B, of equal amount, another weight, C, equal to A or B, is introduced, suspended by the rod, q, made as long as can be and connected to the same crank, F, by the pitman, R; the weight, C, counterbalances the horizontal action of B. The best way, however, is a modification of Fig. 8, in which a forged crank is used, having three pins or wrists, two down and one up. If the pitman, AF, has a good length, the weights, B and C, may slide vertically each side below the gate, or they may be suspended in a pit under the crank. It will not be found necessary to counterbalance within 500 or 1,000 lbs., as some allowance must be made for the power required to force the saws down through the timber. W. H. HARRISON.

Philadelphia, March 4, 1872.

[The remarks of our correspondent, relative to balancing cylinders or pulleys on straight edges, will be demurred to by some of our readers who have had experience in balancing cylinders destined to run with high velocities. It is a fact, not as universally known as it should be, that cylinders that are in standing balance when tried on the straight edges will often shake heavily when set to running at high speeds, owing to the distortion produced by unequal centrifugal force, the inequality in this force being due to nonhomogeneity of the cylinders, etc. This subject was discussed at length in Vol. XXIII. of the SCIENTIFIC AMERICAN. The diagrams above given, relative to balancing saws, will, however, prove valuable hints to many readers.

CALIFORNIA boasts the largest orchard in the world. It contains 426 acres, and over 75,000 fruit trees.

Small Pox Remedies.

To the Editor of the Scientific American:

I was interested in the perusal of an article in the number of your excellent periodical for February 24, on "A Remedy for Small Pox, by one who has tried it," and also in a notice of the same in your editorial columns. I have long since learned to "go slow" in recommending and using medicines that gain some reputation in the treatment of this disease; and your correspondent, I think, presumes too much upon his observations in a single case.

One or two points which this case brings to my mind may be of interest to your readers, and help your correspondent to account in another way for the results following the administration of the sulphite of soda in the care of his patient.

Whatever authorities may say in a general way, in relation to the correspondence between the severity of the premonitory symptoms and the subsequent stages of the disease, a large experience has taught me that even if this be the rule, it is not without numerous exceptions. There is a class of nervous, impressible, neuralgic persons, in whom the febrile stage of small pox produces severe back ache, headache, nausea, and even delirium from the general febrile excitement, etc., and in whom the later stages of the disease are of the mildest type. I think I have seen as severe symptoms at the onset of an attack of varioloid as frequently occur in unmodified small pox. I have now in my mind the case of a professional brother, who suffered so intensely throughout the first stage of the disease that the most serious apprehensions were aroused, among his friends, as to the result; but the later stages were of the mildest kind.

Again, there is a variety of the disease which is designated as "dry pox" or "horn pox," which, I think, is frequently the cause of too hasty conclusions in regard to the potency of medicines in this disease. In this variety, the premonitory symptoms may be very severe, and the eruption on its first appearance be so profuse as to denote a case of confluent small pox; but when the eruption has reached the vesicular stage, that is, when the contents are transparent, instead of passing on to suppuration (formation of yellow matter), it becomes dry and hard, and desquamation takes place rapidly. No pitting occurs usually in these cases, and these are the cases that give reputation to certain medicines and methods employed to prevent pitting. Now it will be seen how easy it is to mistake these cases, in which nature seems able to bring about this abortive action, and attribute it to the wonderful specific properties of a medicine which the patient was taking, but which had no agency in the matter whatever; for this is the result in scores of cases that are treated on a purely expectant plan.

Sulphite of soda is no new remedy for this class of diseases. It was heralded forth a few years ago as the antidote to blood poisoning, and tuns of it have been used in the treatment of zymotic diseases. But I am of the opinion that the observing, intelligent portion of the profession have lost confidence in it.

After a quite extensive observation in the treatment of small pox and employing all the reputed remedies and abortives for the disease, I am convinced that *the* remedy is not yet discovered.

But why search for the pound of cure while we hold in our hands the ounce of prevention, in the form of true Jennerian vaccination?

Chicago, Ill. R. M. LACKEY, M. D.

Elastic Backing for Armor Plating.

To the Editor of the Scientific American:

A correspondent in the number of your valuable journal for February 24 says: "The fostering of erroneous opinions or other causes have left us without an efficient navy," etc.; and he proceeds to demonstrate the practicability of elastic backing for armor, as though it were the only thing essentially necessary to produce an efficient navy. Permit one of long experience in naval affairs, and a close observer of all matters appertaining thereto, to suggest a few objections to elastic backed armor, and to offer a few general remarks about our navy.

It has been found by experiments at the Washington navy yard that the difficulty, in securing the plates having elastic backing, more than counteracts any advantage gained by diffusing the impact of percussive force. The more unyielding the backing, the better the condition in which the fastenings were found after impact of the projectile. A fifteen inch shot seldom failed to destroy some of the fastenings of armor having elastic backing. Properly securing the plates is quite as important as the plates themselves. The experience of the *Essex* and others is not sufficient evidence of its efficiency, having only to oppose comparative pellets, as scarcely any gun of the rebels, on the Mississippi away from Vicksburg, was above a 64 pounder. I am quite sure, at close quarters, before a fifteen or twenty inch gun, the *Essex* would not only have had her armor stripped from her, but the St. Louis ferry boat would have been knocked to pieces in a short time.

To produce a good and efficient navy, it is neither essentially necessary to expend "untold millions" on plate vessels with elastic backed armor, nor to plate a cruising vessel at all. The writer of the article alluded to is evidently not informed of the improvements made for conducting a naval war, and the important part the torpedo is destined to play in future naval engagements. We have at present in our navy three vessels of about three hundred tuns each, capable of steaming ten knots an hour, fitted with torpedo engines. Alongside of either in an engagement, the heaviest ironclad extant would not float twenty minutes. Much credit for the adoption of this plan is due to Chief Engineer Shock and Superintendent Wilson.

For an efficient navy, two types of vessels are necessary, one for cruising purposes and the other for coastwise purposes. For the latter, the *Monitor* class are especially adapted, their low freeboard, sheer deck, and rounded turret presenting very obtuse angles to the line of fire, and presenting a target very difficult to penetrate. But such a vessel, while well adapted for attacking or defending ports, is not fitted for a cruiser.

For a cruising vessel, a different type is needed. She should be a swift vessel, provided with a fifteen or twenty inch pivot gun forward and aft, arranged to train to all quarters, to carry fewer men and still fewer officers, and occupy their places with coal, etc.; and she should be fitted with a torpedo engine above referred to. In the event of an engagement between such a vessel and an ironclad, there would be no sailing in circles with the former, but she would go for her antagonist at once, striking her at the bottom. Unless the ironclad should cripple her before reaching her, a matter highly improbable when going bows on, her fate would be decided in a few minutes.

To impute old fogyism to the late administration of the navy is unjust, and is not sustained by facts. Never was there so much ability and energy displayed in that department. It was then the great advance was made of reducing the number and increasing the caliber of the guns (it would have been better, however, had the practice extended to the *personnel* also), thus requiring a less number of men, leaving more room for stores, and rendering the vessel more efficient.

The fault of the present condition of the navy is not to be attributed (as some persons, having hobbies to ride or axes to grind, suggest) to "old fogyism and fossil-like plans, expedients, and devices," but to Congress in not providing the means wherewith to make it more efficient. TORPEDO.

Baltimore, Md.

The Models in the Patent Office.

To the Editor of the Scientific American:

D., in your issue of March 2, defends the antiquated notion of illustrating by model at Washington every invention for which a patent is solicited, and asserts that the inventor's labor in comparing notes on inventions would be increased a hundred fold in the absence of models. While I differ from him on this point, and claim instead that it would be much reduced were good and generous illustration by well executed drawings the rule, to the exclusion of models, necessarily more or less inaccessible internally, I will not argue this point, but will suggest to him to inquire what proportion of the inventors of our widely extended country ever visit the Patent Office, or can possibly avail themselves of the facilities there afforded to examine models? Perhaps he would reply one in one hundred, though I think even this a large estimate. Is it wise to maintain an institution so necessarily expensive (both to the inventor directly in the first instance and indirectly through increased office expenses), and unwieldy a branch as the models require, simply to accommodate the few inventors who are favored with the pecuniary ability and time to make it possible to visit Washington? How much better for them to be at (as they would have to only about) one per cent of the cost in most cases, and receive the excellent drawings and specifications—provided for by the wise system lately inaugurated—at their homes where they can examine them during the fragments of leisure time they may be able to command! Let no hindrance be placed in the pathway of inventors, but let them understand and unite upon that which is for their true interest.

The writer believes the expense may be much better bestowed, upon developing and further improving the present excellent facilities for furnishing inventors with good copies of drawings and specifications relating to the classes of invention they are severally interested in, than by accumulating and caring for, at the inventors expense, the immense aggregation of models to which but few can ever make the necessary journeys to gain access.

INVENTOR NO. 2.

Buckskin Leather and Glove Making.

To the Editor of the Scientific American:

To a stranger passing over the Fonda, Johnston and Gloversville railroad, large and frequent fields, filled with skins hung on poles to dry, form the most noticeable feature of the country. A desire to trace the deerskin as it comes from the hunter's hand through all the processes by which it is converted, first into leather and then into mittens and gloves, led me; and the courtesy of the proprietor, Mr. D. B. Judson of Kingsboro, gave me an opportunity to visit the, as I suppose, largest mill and factory in the country. Mr. John Filmer, who leases the mill, conducted me through it and explained the several processes by which about 200,000 hides, which are brought from distant parts of the continent, the Rocky Mountains, South America, and some from Europe and Asia, are here annually converted into leather. The deerskins come in bales, dry and with the hair on. They are at first soaked for some time in vats, some in clear water, others in lime water, after which the flesh is removed from one side and the hair and grain from the other with large, straight, two handled knives, the skins being stretched over zinc covered beams, and the workmen taking the position of a person rubbing clothes upon a wash board. The skins are then worked for hours in oil, in a kind of fulling mill; the oil is taken out with soda ash, which converts it into soap, which is in turn removed by washing. After drying, the skins are made fast and stretched and softened by means of the stake, an instrument resembling that with which the blacksmith trims a horse's hoof. The coloring is done with ocher. Last of all, the face is smoothed by grinding on wheels covered with emery and pumicestone. From the mill, the leather is taken to the factory, where it is cut with steel dies, and made up into gloves and mittens on machines. The finished gloves are dampened, stretched upon a hand shaped board, dried and packed in paper boxes, ready for market. Besides deerskin, American sheepskin and lambskin German and French kid, and chinchilla, velvet, cassimere, and Petersham cloth are used. Cloth gloves with kid and deerskin palms are a novelty of the past season, and have had an extensive sale.

Mr. Judson's leather mill employs some fifty men, and his factory, about the same number in the factory and from there to four hundred at their homes. Some twenty thousand dozen pair of gloves and mittens, worth about $250,000, are made yearly. This business, commenced twenty-one years ago on a small scale, affords an instance of what a thorough knowledge of business, persevering industry and integrity, with the favor of Divine Providence, may accomplish. The town contains many other mills and factories, some nearly as extensive as this; but one may serve as a type of the whole. The annual sales in Gloversville amount, I am told, to about about $4,000,000.

Gloversville is a flourishing village, with a population of 5,000, on the Cayadutta creek, eight miles from its junction with the Mohawk. It is the northern terminus of the Fonda, Johnstown, and Gloversville railroad, but a company has been formed for the purpose of extending it to Northville, fifteen miles farther north, the gate to Hamilton county and the north woods, the Paradise of sportsmen. Kingsboro', though older than Gloversville, is really a suburb of the latter place. C. H. D.

Kingsboro', Fulton Co., N. Y.

Borax.

To the Editor of the Scientific American :

Your Nevada correspondent requests a description of the borax lagoons and marshes of Tuscany in Italy. I was there many years ago; and if no better account is given, the following may perhaps be worth perusal:

The borax region covers about thirty miles square, the water therein being weakly impregnated with boracic acid. In some locations, this is stronger than in others. The general appearance of the region is desolate, and gaseous puffs of the acid are often seen rising from the water. The borax of commerce is made artificially, by saturating this solution with carbonate of soda, sal soda, or the barilla of soap makers. The solution is concentrated to the crystalizing point in wooden vessels lined with lead, in which leaden steam coils are placed. The crude article contains about twenty per cent of impurities, which are generally sulphates of ammonia, lime, magnesia and alumina, with chloride of iron, sulphur, etc. These are extracted by redissolving the crystals in lead lined tanks heated by steam, decanting from the impurities which have settled to the bottom, adding more carbonate of soda and recrystalizing. The result is refined borax, well known in the arts, being of a clear white color, resembling alum, of a sweetish, alkaline taste, slightly efflorescent on the surface. Sulphuric acid takes the soda from this salt when in saturated solution, leaving the boracic acid in white, shining, scaly crystals, which give to the flame of burning alcohol a greenish color—indubitable evidence of the presence of this article.

Large quantities of tincal or crude borax are brought to Europe, for refining, from the East Indies where it is collected by the natives as it exudes from the soil. It is generally in crystaline lumps, usually yellowish or greenish in color, feeling greasy and having a soapy smell, and is mixed with earthy matter.

A more lengthy account may be found in the " United States Dispensatory," which is in the library of nearly every physician and apothecary. If Mr. Lewis intends prosecuting his pursuit permanently, he would be abundantly repaid by taking a voyage to Europe. B. T.

Steam Traction on Canals.

To the Editor of the Scientific American

All other devices, except that of self-propelling of the vessel, seem to have been ruled out in offering inducements for an economical conveyance on canals. Notwithstanding this, why would not a wire rope, passing over drums located on the tow path and actuated by stationary engines at proper distances, answer the purpose ? There would be two ropes, to which boats passing either way could be attached by means of a clip on the tow rope. The promoters of this style of power advertise to transmit from " one to 300 horse power, any distance." The last named power could certainly move 150 boats, seventy-five each way, of the usual capacity. It has long been considered unprofitable to exceed four or five miles an hour speed on canals. This could easily be attained in this way, Why would it not answer ? The waste water of the locks might be used in many places. B. T.

TECHNICAL EDUCATION.—The Polytechnic Academy at Munich is frequented this winter by 900 students and non-inscribed visitors (*hospitanten*). The engineering class has the greatest number of pupils, namely, 346 students and 12 casuals, However, in the general class the casuals have a majority, being 115 strong. Of all visitors, 670 are natives of Bavaria, and 230 non-Bavarians, amongst whom are a great number of foreigners, particularly Russians and Americans. It appears that the South German and Swiss polytechnic schools at Munich, Stuttgart, Carlsruhe, and Zurich have greater attractions for these two latter nations than the North German technical institutions.

SCIENTIFIC AND PRACTICAL INFORMATION.

SICK HEADACHE.

Mr. James Lord, of Erie, Pa., writes, in reference to an article on sick headache published on page 128 of the present volume, to say that he has suffered much from this painful and distressing malady, and has, of course, tried many remedies; among these he mentions tansy tea, rhubarb, bathing in salt water, abstinence from fat and rich meats, etc. He found relief by the use of a bath of hot water, softened with carbonate of soda, taking the bath in a sitting posture and remaining in it for ten or fifteen minutes. This is the sitz bath, a favorite application of hydropathists, and is an effective means of allaying nervous irritation of any kind.

CONFLAGRATION AT JONES AND LAUGHLIN'S WORKS.

We regret to hear of a destructive fire which took place at the extensive iron manufactory of Messrs. Jones and Laughlin, Pittsburgh, Pa., on the 28th ult. This establishment is, we believe, the largest iron works in the United States, and the damage, which has only partially disabled the operations of the firm, amounts in value to $300,000. The enterprise and courage of the proprietors is characteristically exhibited by their determination to have the whole establishment again in working order in seventy days from the date of the fire, so that the employees (2,500 in number) of the firm will suffer as little as possible by the calamity.

PULVERIZED SOLID COD LIVER OIL.

The difficulty of overcoming the nauseating qualities of cod liver oil has attracted the attention of many pharmaceutists, among others of M. Tissier. He takes of white gelatin, 4 parts, distilled water 25 parts, simple sirup, 25 parts, refined sugar in powder, 50 parts. The gelatin should be heated, in a water bath, with the water and sirup till dissolved, the cod liver oil and sugar being mixed in a mortar; the two compounds should then be stirred together, and the stirring continued till the mixture is cold. It will then appear as a gelatinous mass, and powdered sugar should then be added till a firm paste is made, which, after being cut in small pieces, must be left to become so hard as to be easily granulated in a mortar. The second addition of powdered sugar will bring the quantity up to 250 parts, 20 per cent of which will be cod liver oil. It should be kept in a tightly stoppered bottle.

MINERAL CAOUTCHOUC.

A Parisian journal reports the finding, in Australia, of a mineral substance resembling caoutchouc in most of its characteristics. It contains 82 per cent of an oily hydrocarbon. We shall be interested in any further particulars of this discovery, as they may lead, on future investigation, to the production, by synthesis, of one more organic substance.

MERCURIC SULPHIDE.

A metallic substance, previously unknown to science, has recently been found in California, in Lake county. On analysis, it exhibits all the powers of mercuric sulphide, and is undoubtedly that compound, formed naturally. It has a metallic appearance, a dark gray color, and a specific gravity of 7·701. It is proposed to call it metacinnabarite.

UTILIZING SUBTERRANEAN FIRES.

The island of Ischia, off the coast of Naples, has for over two thousand years been a favorite resort of Italian invalids, on account of its hot sulphurous and other springs. This land was evidently thrown up by volcanic agency, and a large proportion of the soil is still kept at an abnormal temperature by subterranean fires. It is proposed to use this heat for the evaporation of sea water and the manufacture of salt, and the project seems feasible and likely to be a success.

ABSORPTION OF MATTER BY PHOSPHORUS.

The red amorphous phosphorus (not the red scales obtained by spontaneous sublimation, by the heat of the sun, in a Torricellian vacuum), possess a power, similar to that of porous carbon, of absorbing many substances without acting chemically upon them. Rosanilin, iodine, and sulphur are perceptibly taken up by the phosphorus. The powdered phosphorus, shaken up with the violet solution of iodine in bisulphide of carbon, or of rosanilin in ether, will take up the iodine or rosanilin and leave the fluid colorless; and the rosanilin may be recovered from the phosphorus by treatment with alcohol. Signor Testini recently published these facts as the results of personal investigation.

Hydrofluoric Acid on Glass Viewed Microscopically.

The hydrofluoric acid was prepared in the ordinary method, from calcium fluoride by the action of sulphuric acid. The solution was then diluted and kept in a lead bottle for use when required.

When the acid was first dropped upon the glass, no action was evident, the appearance presented being simply that of a drop of water on glass. In a very short time, however, the drop became a little duller, but this almost immediately cleared away, and several small particles, seemingly of glass, were seen floating in the drop. These seemed to be undergoing a process of fusion, the appearance being similar to that seen when a small portion of metal is thrown into some of the same substance in a state of fusion; it is tossed about for some time, and then finally disappears. This was what evidently appeared to me to be going on here, the hydrofluoric acid having apparently a solvent action on the glass. What strengthened this opinion was the presence of magnificent colors, changing every moment as these small portions of glass were liberated from the larger piece and were undergoing the process of solution, thus leading one to suppose they consisted of small glass prisms, the colors being more perfect than those obtained by water prisms, simply. Some of these particles were completely surrounded by a halo of color, as if they had been thrown into a variegated solution. The principal color evident in such cases was a deep green, but dark blue was also seen at rare intervals.

The above observations were repeated several times, and always with the same results, with the exception that the small particles of glass floating in the drop of acid exploded now and then, causing a great commotion in the liquid and throwing up little jets of finely divided acid, behaving as if the small glass particles were hollow spheres. I may also mention that when these explosions occurred, bright flashes of light were visible, resembling closely the appearance of rainbows seen in waterfalls.—*Microscopical Journal.*

Ignition of Explosives.

Interesting experiments were recently made by Messrs. Leygue and Champion, to ascertain the temperature at which certain explosives ignite. They used for this purpose a bar of copper, which was heated at one end only. It was provided with small grooves, placed 10 centimeters apart from each other, and provided with metallic alloys of different fusibility, so that the temperature of each part of the bar was easily ascertained. The substance under trial was then strewn upon the bar in small quantities, and the place where it ignited gave the temperature of ignition. Thus was it shown that, for their explosion, was required for:

	Deg. Cent.	Fahr.
Chassepôt percussion cap powder	191	374
Fulminate of mercury	200	392
Equal parts of sulphur and chlorate of potassium	200	392
Gun cotton	220	428
Nitro-glycerin	257	494·4
Chasse powder	288	550·2
Cannon powder	295	562·8
Picrates of mercury, lead and iron	296	564·6
Picrate powder for torpedoes	315	598·8
" " musket	358	676·2
" " cannon	380	715·8

These researches prove the great explosive power of fulminates and nitrite compounds, while our ordinary gunpowder and picrate powder may be employed with much greater safety.

Prussian Steel Field Guns.

It appears that the great artillery question, as to the best material for field cannon, has recently been decided in Prussia in favor of cast steel. The materials considered were ordinary gun metal, cast steel, cast iron, wrought iron, and phosphoric bronze, which latter alloy was repeatedly recommended for its great strength and tenacity. The large stores of old smooth-bore guns of gun metal in Prussia, and the enormous augmentation which they had received during the war, in the shape of captured French bronze ordnance, had to be taken under careful consideration, in order to utilize their value. The final decision, however, was in favor of steel, at at least for field pieces, and large orders have been received at Krupp's steel works, at Essen, while gun metal will be reserved for middle sized ordnance in fortresses only. The advocates of gun metal at the *Artillerie Pruefungs Commission* were not few, but steel remained the favorite, in spite of its very disagreeable property of getting brittle in great cold. Your correspondent had some experience as to this quality, when he commanded, during the late siege of Belfort, a battery of long cast steel 24 pounders. Though the guns were almost new, and handled with very great care, the cold was so intense, up to —16° R., or —4 Fahr., that after a fortnight's firing the sudden expansion had caused fine flaws, near the expanding ring which acts as a gas check. These flaws increased rapidly in size, and the cannon had to be readjusted. Under ordinary circumstances, the guns would have stood at least twice as long.—*Engineering.*

A NEW EXPLOSIVE.—A new explosive has been lately brought under public notice by Dr. Justus Fuchs, of Alt Berun, in Prussian Silesia. It is called fulminatine, and is another kind of nitrite explosive. This new agent differs from dynamite in having a considerably larger contents of nitro-glycerin, and in the 25 per cent of silica contained by the latter being replaced by 15 per cent of a chemically prepared substance. This hitherto unknown substance is said to possess much greater absorbing power than *kieselguhr*, and, when ignited, to be almost entirely dissipated as gases, thus considerably augmenting the explosive effect. While all the silica of the dynamite is left as a white residue after explosion, fulminatine only leaves a little black carbonaceous remnant. The prices of both explosives are the same.

NITRO-GLYCERIN can be analyzed by means of an eudiometer, which is an instrument for ascertaining the quantities of certain gases in any given bulk of elastic fluid. Hydrogen and oxygen are introduced within the instrument after having first been carefully weighed, and a small quantity of nitro-glycerin is finally added. An explosion of the mixture is then effected by means of an electric spark. The gas produced within the eudiometer can then be readily analyzed, showing the following to be the constituents of nitro-glycerin: Carbonic acid, 45·72; binoxide of nitrogen, 20·36; nitrogen, 33·52.

A PLAN, to make all railroad cars throughout Germany of one pattern, so that repairs may be facilitated and prices equalized, has been proposed by a scientific association of railroads in that country. The question of "typical locomotives" has been thoroughly ventilated by the same parties, without favorable results. We doubt whether, aside from the practical side of the idea, the same could be successfully carried out, since it adoption would prevent sound competition and forbid the introduction of improvements.