Removing Paint from Iron.

Mr. A. J. Bishop, of Cleveland, O., says: The greatest difficulty I have found in using potash has been to have it remain where put, and not run off of the work. By making various experiments, I have found that good lime used in proper proportions with the potash will not only make it remain where put, but is also a benefit to the strength and quickening of the potash, the lime acting upon the grease more readily: when too great an amount of lime is used, it has a tendency to harden upon the work, and then is as difficult to remove as the paint when first starting. One can also, I find, use too great an amount of potash; in like manner, if the liquid is too strong and lime is used, it has a tendency to crystallize and become hard. There are some objections to using potash, as it may injure the hands or clothes of the user, but to avoid this I have made use of hemp packing fastened to a stick, say two and a half or three feet in length; this gives the workman plenty of distance from his work, and he does not injure himself or his clothes, and also gives him a good swab or brush with which to apply the potash.

Another objection is the surplus of potash which may be left to remain upon the work, which, if not thoroughly removed, is injurious to the durability of the paint when repainted; but this can be avoided by extreme care being taken to remove the potash. In making tests to obtain proportions and results of different strengths of potash and lime, I obtained the following: My first was composed of 5 pounds lime, 6 pounds potash, and 7 quarts water; my second, 5 pounds lime, 4 pounds potash, and 7 quarts water; and I found that the latter was two hours the quickest in removing the paint from drivers of the same engine. Another trial was made with 14 pounds lime, 12 pounds potash, and 21 quarts of water for four pairs of drivers, and with this I found that it required equally as much time to remove the surplus of lime left upon the drivers as it took in the first place to remove the paint. Other tests, being made of 1 pound lime, 4 pounds potash, and 6 quarts of water, I found to work much better than any previously tried, and am satisfied that this proportion is about right. These tests were made with crushed potash. The average time required to remove paint from two pairs of drivers has been two men, seven hours, while the time for scraping for same men would reach three and four days for same work. The paint has been removed from a tank by two men in seven hours, and other parts of a locomotive in a proportionate length of time, while with heat for burning same, or scraping cold, the time is beyond mention for comparison.

Ordnance for Harbor Defense.

The report of the Armament Board appointed in pursuance of an act of Congress to make certain tests of artillery has been made to the Secretary of War. The Board interpreted the act of Congress under which it was appointed to refer only to mortars and guns of high power for the defense of harbors, and did not take into consideration the lighter guns required for the flank defense of permanent works. The Board first directed its attention to the depth of water in the channels leading to all of the seaports, and then ascertained the number and thickness of armor of the known ironclads of the world which would enter these harbors. The powers of the guns necessary to penetrate these armors were then calculated, and the number of guns considered essential for a proper defense of the harbors was decided upon. In that determination the Board was guided by a list of guns and mortars which had been prepared by the Board of Engineers for Fortifications after careful study of the subject.

The Board submits tables which embody its views, and which, summarily stated, call for 125 eight inch guns 21·5 feet long, to weigh 13 tons each and to carry projectiles weighing 285 pounds; 226 ten inch guns 26·875 feet long, to weigh 25 tons, and to carry projectiles of 575 pounds; 306 twelve inch guns 35·11 feet long, to weigh 48 tons, and to carry 894 pound projectiles; 50 sixteen inch guns 45·93 feet long, to weigh 107·77 tons, to carry projectile of 1,631·4 pounds each; 512 twelve inch mortars 10·33 feet long, to weigh 13·06 tons; and to carry 610 pound projectiles. These guns will have a penetrating force at 5,000 yards through thicknesses of wrought iron as follows: 8 inch caliber, 10·39 inches; 10 inch caliber, 15·16 inches; 12 inch caliber, 17·25 inches; 16 inches caliber, 23·20 inches.

In conclusion the Board states that it deems it of the utmost importance that the guns and mortars above specified should be procured at the earliest date practicable.

A Formula for Nervous Headache.

From the *Maryland Medical Journal* we note that Dr. A. L. Hodgdon, of Farmwell, Va., recommends the following recipe for nervous headache:

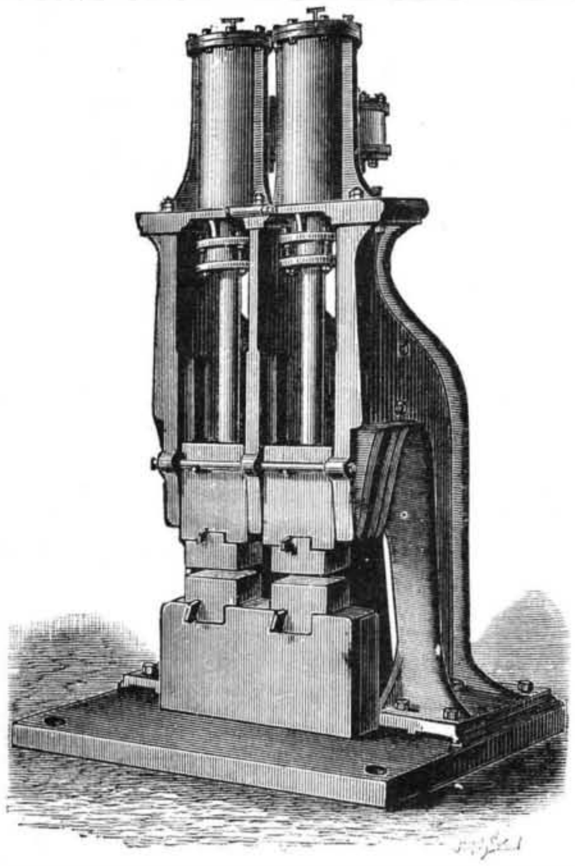
℞.	Alcohol dilut.	℥ iv.
	Olei cinnamom	♏ iv.
	Potas. bromid	ʒ v.
	Extr. hyoscyam. fl	ʒ iss.
	Fiat lotio.	

S.—One to two teaspoonfuls, if required.

Dr. Hodgdon has used this combination with universal success. It is not disagreeable to take, and has no bad effects.

DOUBLE STEAM HAMMER.

Messrs. B. and S. Massey, of Manchester, have recently constructed for Messrs. Tangye, Birmingham, a specially



DOUBLE STEAM HAMMER.

designed double steam hammer. There are, as shown, two hammers of the same size, which can be worked either together or independently. By this arrangement one hammer may be delivering sharp and rapid blows while the other is striking slowly and heavily, or one may be stopped entirely while the other is at work. This arrangement of double hammers is intended principally for work which requires to be passed quickly from one to another at the same heat, and as the two tups or hammer heads are not more than about 4 inches apart, this can be done with greatest facility. As compared with two separate hammers there is also a reduction in expense, as one base plate, one anvil block, and the central member of the framing are common to both hammers. For the same reason there is also a saving in the foundation and in the floor space required. The falling weight of each hammer, independent of top steam, is 7 cwt. It may be added that the arrangement is applicable to three or more hammers should they be required, and is not confined simply to a pair of hammers, as shown in our illustration

FRANKEL'S REGISTERING DYNAMOMETER.

The apparatus shown in the accompanying engraving is designed for ascertaining the stresses that occur in metallic bars under variable loads, and not only for observing them, but also for writing their true history from instant to instant. It makes the bar itself write this, and allows the observer to ascertain when the experiment is ended and what has taken place, and to draw all the deductions therefrom that he pleases.

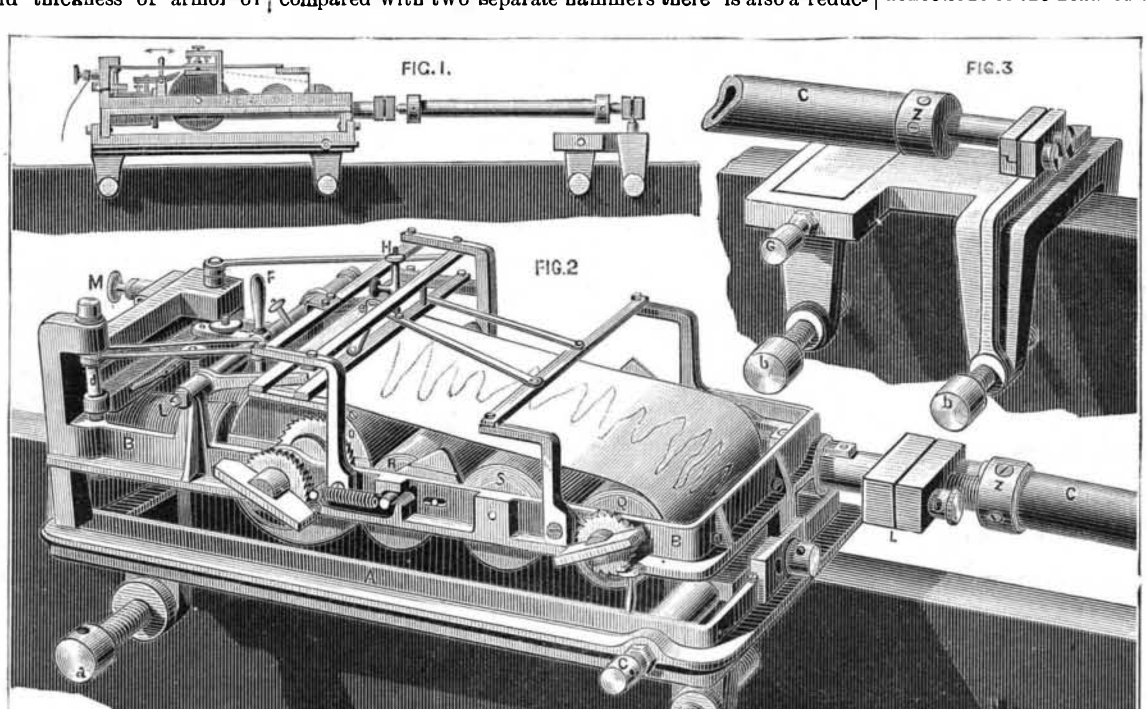
Every one knows that when we pull on a wire or rod it elongates. If the bar be compressed, it shortens. The whole science of the calculation of resistances is founded upon the simple fact that, in the same rod, the elongations or contractions are proportional to the stresses undergone. And, again, such variations in length are proportional to the stresses per unit of section per square millimeter (1 millimeter = 0·0394 inch), for example, in rods of any dimensions whatever. This is what is taught by the theory of elasticity.

It is this very simple property that Dr. Frankel has utilized in the invention of his registering dynamometer.

He takes a certain length of the wire that is to be examined, fixes clamps to its extremities, and makes it inscribe upon an unwinding sheet of paper the variations that it is undergoing in length. For example, knowing that with iron a length of one meter (39·4 inches) increases 0·05 millimeter when the tension that is exerted is one kilogramme (2·204 pounds) per square millimeter, it will be easy, by measuring the elongation inscribed upon the paper, to find how much the section of the bar experimented with has been stretched or compressed per square millimeter.

The principal part of the apparatus consists of a cast iron frame, A (Figs. 1 and 2), which is firmly fixed to the rod experimented with by means of a binding screw, and which carries the registering mechanism. Along one of its sides, and parallel with the bar, there is a round movable rod, whose head, L, projects from the frame and receives a small sphere that belongs to another hollow rod, C, about 0·8 meter (31·5 inches) in length. The other extremity of this latter carries an analogous sphere, which is set into a head like the first (Fig. 3), that is carried by an independent jaw fixed to the bar. The screw, *b*, of this jaw, and the corresponding screw, *a*, of the frame, A, determine the length of the bar on which the experiment is made. The head, L, being fixed to the jaw, the rod, C, will be carried along if the bar elongates or shortens, and, while at the same time keeping at a constant length itself, its other extremity will move with respect to the principal frame, A.

Let us imagine, then, that such extremity has a plane surface, and that against it there presses, under the influence of a spring, a small sphere carried by a lever jointed to a fixed axis. This part is unfortunately hidden by the apparatus (Fig. 2). Every motion of the rod, C, will cause the lever to move, and if the proportions of its two arms are properly chosen, its other extremity will amplify the motions of the little sphere that is in contact with the rod. A new transmission of motion, effected by means of a pinion and a toothed sector, will permit of a further amplification of the motions observed, and, without our entering into details, it will be seen that we shall finally obtain, through the inscribing pencil, H, motions that will be an exact multiple of the deflections of the head of the rod, C. In the apparatus, as constructed, this multiplication is always about 170 times the variation of the length to be measured. In starting from the figure indicated above, it will be readily seen that if a millimeter per meter of real elongation of the rod corresponded to a stress of 20 kilogrammes per square millimeter, one millimeter of the diagram obtained would correspond to $\frac{20}{170} = 0·117$ k. (4·14 ounces) per millimeter (0·0394 inch).



FRANKEL'S REGISTERING DYNAMOMETER.

The inscription is made upon a paper which unwinds slowly under the pencil. The cylinder, Q, contains a tension spring which does the unwinding, and the motion of the paper is regulated by a clockwork movement in the drum, D. The other, and intermediate, drums are designed for regulating the tension of the paper and keeping it close to the surface upon which the pencil bears. The rectilinear motion of the latter is obtained by an upper parallelogram, and, in order to have a sure datum point, a second pencil, near a lever handle, F, traces a continuous line to which are easily referred the ordinates of the curve obtained.

As the paper unwinds with a certain velocity, it is important that it be not wasted when no experiment is being tried. For this reason the starting may be effected by hand or electrically by means of the lever, F, and it may be rendered automatic, especially, for example, when a train is about to cross a bridge whose working it is desired to examine. The stoppage is effected by the hand of the observer. The same electric current also causes datum points to be marked upon the paper that permit of mathematically ascertaining the instant at which an observation should be made; for example, when the passage of a wheel is occurring at a precise point.

The curves that are obtained upon the paper are much finer than would be expected, in view of the slight variations in length observed. We give herewith two specimens of the tracings, reduced to a small scale, and showing a registering that has occurred during the passage of trains and locomotives.

Fig. 4 relates to an observation made upon a Zove's iron sleeper placed under a rail over which passed, first in one direction and then in the other, a four wheeled locomotive and its tender. It will be seen that one of the wheels, which was more loaded than the other, has produced greater stresses.

In the original, as one millimeter of ordinate represented a stress of 0·12 k. (4·54 ounces) per square millimeter, we conclude therefrom that the iron has undergone during the passage a maximum stress of $0{\cdot}12 \times 75 = 9$ kilogrammes (19·85 pounds), due to the first wheel of the engine, a little less for the second, and then a stress of 4·92 k. (10·85 pounds) per millimeter,* due to the tender. After the passage, the stress has disappeared with the elongation of the metal.

Fig. 5 gives a tracing produced by the instrument fixed to one of the terminal lattice bars of a bridge girder during the passage of a freight train pushed by an engine. The

Figs. 4 and 5.—SPECIMENS OF THE CURVES OBTAINED.

train having come on slowly and then stopped, the pencil has traced a but slightly varied curve. It seems that during this time an equilibrium was established quite slowly. There will be observed two sudden projections of the curve, due to the machine being momentarily out of regulation; but when the train began to move again it will be seen that there occurred variations due to the successive passage of the wheels at the point corresponding to the diagonal. We can perceive quite clearly (and better yet in the original tracing) every car that is passing. Then finally comes the locomotive, which produces a maximum stress; and after this the bridge, being entirely unloaded, gives no further tracing of the weight that has just left it.

The apparatus is not limited in application to fixed pieces, but, in spite of its apparent delicacy, may be attached to the connecting rods of locomotives, in order to register the alternate tensions and compressions to which they are submitted.—*La Nature.*

The Proposed Saharan Sea.

With reference to the daring French project for flooding the desert of Sahara with what would be virtually a new sea, it may be well, says *Engineering,* to recall the opinion expressed by M. Elisee Reclus, that at one period in the world's history the desert was covered by a sea very similar to the Mediterranean, and that this sea exercised a very great influence upon the temperature of France, as comparatively cold —or at any rate cool—winds blew over it, while now the winds which prevail in the great expanse are of a much higher temperature, and are, in fact, sometimes suffocatingly hot. The appearance of the desert seems to support the theory of M. Elisee Reclus, that it was at one time the bed of a sea of considerable extent, of which the great inland African lakes recently discovered are possibly the remains.

The present vast extent and configuration of the African continent would also appear to support the conclusion that at one time it comprised a less area of land than it does at present. The serious question which arises, assuming that the theory of M. Elisee Reclus is substantially correct, is, What will be the effect of the creation of a second African sea in the room of that which has disappeared? Would the temperature of France, and possibly even of England, be again reduced? It is a geological theory that in the glacial period of the world's history Great Britain was covered with ice and snow very much as Greenland is at present. Some great influences must clearly have been brought to bear upon France and Great Britain, which rolled the ice over so many hundred miles northward. What was this influence? Was it the large African sea which French enterprise is endeavoring to recreate? If it were, we should say that whatever the French may gain in Africa by the realization of a Saharan Sea would be much more than counterbalanced by what they would lose in France itself.

* Approximately, 1 millimeter = 1/25 of an inch.

THE NEW ORLEANS EXPOSITION.

This great enterprise, illustrated on our first page, has steadily grown in proportions from the day of its inception to the date of opening. Originally proposed by the Cotton Planters' National Association in October, 1882, to signalize our first exports of cotton one hundred years ago this fall, the plan was successively enlarged to cover also a National and International Industrial Exposition, as the importance of cotton itself, in all its relations to the commerce, the industries, and the general well being of the world, seemed to grow upon the minds of the originators of the project.

With this also there has undoubtedly been a great deal of patriotic emulation among the people of the Mississippi Valley and of the far West, as well as of the entire South, to make this exhibition as pronounced a success as possible, in order thus to promote trade relations with Mexico, the West Indies, and Central and South America, which at present seem to afford the most promising fields for enlarging our foreign commerce.

The main exhibition building, which it was at first supposed would cover all requirements, is of the enormous size of 1,378 by 905 feet, or embracing an area of 33 acres, while the area of the main building at the Philadelphia Exposition of 1876 was only 20 acres. In this New Orleans building there are no partitions, and the interior is surrounded by wide galleries, 23 feet high, supported by the pillars which also support the roof, the latter being mostly of glass. The machinery department occupies a space 300 feet wide for the whole length of the main building, but this has been found insufficient, and large extensions have been made necessary by the great number of applications for space in this section. In the center of the main building is the Music Hall, with chairs enough to accommodate 11,000 people, a platform for 600 musicians, a mammoth organ, etc.

A special building for United States and State exhibits is 885 by 565 feet in size. Congress, besides loaning the management $1,000,000 to forward the enterprise, has made liberal appropriations for a most thorough representation of the leading departments of the government. The department of State will show here samples of cotton, wool, and other fibers, and their products, from all parts of the world. The Post Office department will show all the modern improved facilities in this branch of the public service, besides having working offices on the grounds. The Treasury will exhibit the work of the coast survey, lighthouse, and customs service, engraving, printing, etc. The War Office will make an imposing display of arms, ordnance, engineering, medical, surgical, and hospital service; while the Navy, the Interior, and other departments will all be more fully represented than they ever were before at one exhibition. Collective State exhibits and a general educational display will also be located in this building.

Horticultural Hall, 600 x 194 feet, has been substantially built as a durable structure to subsequently become the property of the city of New Orleans. It has a tower 90 feet high, roofed with glass, beneath which will be a grand fountain in constant play. Around this hall will be arranged a great variety of rare tropical and semi-tropical plants, flowers, and shrubbery. Cash premiums to the amount of $32,000 are offered in this department, and the contributions thereto will be largely from Mexico, Central America, and the West Indies.

The Art Gallery, 250 by 100 feet, is an iron building, calculated for permanent use for such purpose, in its arrangements for mounting pictures, giving them the desired light, etc.

The Mexican National building, 300 by 190 feet in size, will probably afford the most prominent of all the foreign exhibits. The whole space of this building, which was specially erected by the Mexican Government for the display from that country, has been found much too small for the exhibits offered. There is to be a famous Mexican band of fifty pieces in attendance, with a regiment of cavalry and another of infantry of the Mexican army. The Mexican Government appropriated $200,000 to further their national display here, and General Diaz, the Mexican President, announced his intention of being present at the inauguration ceremonies.

Notwithstanding that the opening of the exposition was postponed from Dec. 1 to Dec. 16, there was, as is almost always the case in such great enterprises, a good deal of dilatoriness among many of the exhibitors. This was most conspicuously the case with European participants, the principal portion of their exhibits being placed on the Great Eastern, which was not expected to leave London till Dec. 13. This great vessel, during the time of her stay here, will be not one of the least attractive features for visitors to the exhibition.

Besides the buildings above mentioned, there are several others, for individual exhibits, or as additions to those at first found too small for their original purposes, which are being and probably will continue to be erected for some weeks to come. The applications for space have, from the outset, outrun all the anticipations of the management; but the officers made every exertion to have the exposition in as complete shape as possible on the 16th of December, the day finally appointed for the opening.

The different groupings of exhibits, under which all articles wrought by man or produced by nature are classified, is as follows: 1, Agriculture. 2, Horticulture. 3, Pisciculture. 4, Ores and Minerals. 5, Raw and Manufactured Products. 6, Furniture and Accessories. 7, Textile Fabrics, Clothing and Accessories. 8, The Industrial Arts. 9, Alimentary Products. 10, Education and Instruction. 11, Works of Art.

The grounds on which the exposition is to be held consist of 247 acres, known as the City Park, about four miles from the business center of the city, and with a frontage of about half a mile on the Mississippi River, affording ready landing for steamers, besides excellent rail facilities. The temperature of New Orleans from the 1st of December to the last of May averages about 65° F., the thermometer seldom falling below freezing point, while the fields and forests retain their foliage, and nature presents a most attractive appearance to one visiting the city from the harsher clime of a northern latitude.

For the photographs from which our views are made we are indebted to Mr. E. L. Wilson, who has been appointed Superintendent of the Photography Section of the exposition, and Mr. F. C. Beach, who has charge of the Amateur Photographers' portion of the display.

Steel or Tin Plates.

A correspondent of the *Ironmonger* who has paid a visit to nearly ever tin plate works in South Wales, the principal seat of this industry, says that the trade has nearly passed through a very complete revolution, caused by the introduction of steel bars. It has been found that steel bars made by the Siemens-Martin process are fully equal to, or rather better than, the best charcoal bars made by the old process of refining iron scrap with charcoal refineries, while the price is altogether out of all proportion in favor of the steel. There are makers still using both charcoal and coke iron, but they are anxiously watching the progress of their formidable rival, and will undoubtedly find themselves obliged to abandon the manufacture of iron bars. A considerably greater number of plates can be made from a ton of steel bars than from a ton of coke iron bars, and in consequence of the greater closeness of grain and beautiful surface of the black steel plates before tinning, considerably less tin is required to make a steel plate look equal to one of iron.

Beyond strengthening some of the rolling mills, no alteration of plant is required to work steel. At present, the Siemens-Martin steel is used for bars known as charcoal bars, and the Bessemer for bars known as coke bars. The only difference seems to be a want of reliability and uniformity in the Bessemer bars, which will probably be remedied, as they sometimes come in too hard for working in the mills, and the plates will not always stand the bending test both ways. On this point there is scarcely full knowledge, and it is the opinion of some that it will take years to fully appreciate all that can be done with steel.

With reference to the alleged poisonous nature of some plates, there does not appear to be the slightest ground for supposing that the tin can be adulterated in any way without detection; and the minute black specks sometimes complained of are due to a variety of causes, which may be traced back to a few microscopical portions of manganese being left in the steel ingot. The presence of lead would be at once detected, in however small a quantity. It has been suggested that possibly terne plates may have been accidentally used for canning meat. These, being coated with a mixture of lead and tin, can be safely used for packing dry goods; but if used for wet goods or acids, would be highly dangerous. It has been pointed out that the air acting on the contents of a tin of fish might cause the formation of oxide of tin, and it appears safer to remove the contents as soon as opened to a china jar, rather than use them from the opened tin itself. Palm oil is universally used as a flux in the tinning houses. Some patent oils and a few compositions having resin as a basis have been tried, but have not made any great progress, and palm oil still holds its own. The introduction of the "Morewood" rolls in the tinning pots has quite revolutionized the system, as the coating is much more equal, while much less tin is wasted than by the old listing pot, so that all plates may be said to be coated by this process now. By regulating the speed of the rolls, the maker can arrange the amount of tin to be deposited on each plate to an almost exact nicety.

Hard into Soft Castings.

In a communication to the Academie des Sciences, M. Forquignon states that when white iron castings are heated to a point a little under that of fusion, they become transformed into gray iron. The change is due to the separation of carbon from its previous combination with the metal, and its deposition in the bulk of the casting. By careful experiments recently conducted, M. Forquignon has found the following results: He heated a number of white iron pigs for 172 hours in a stove from which the gas was carefully exhausted, and afterward analyzed the product. The iron originally contained 3 per cent of combined carbon; while the material as taken out of the experimental furnace was found to contain only 0·895 per cent of carbon in combination, and 2·061 per cent of carbon in the graphitic state. This change must have been due wholly to the slow and continued heating of the metal. It is not stated whether there was any perceptible difference between the outside and inside of the metal under treatment, which might be expected under such conditions. The process has a certain resemblance to the usual method of softening steel, in which the effect of continued heating is to decompose the mixture of pure metal and carbon.