PROPERTIES AND USES OF KIESERITE.

Kieserite is a mineral composed of sulphate of magnesia and water, which occurs to the extent of 12 per cent in the salt deposits of Stassfurt, Germany. It differs from Epsom salts by its difficult solubility in water and smaller percentage of water of crystallization.

The first attempts to economize kieserite were made in 1864, when it was proposed to employ it in the preparation of sulphate of potash. Since that time the applications have greatly increased, and it has now become an important article of commerce. The largest quantity of the raw material is sent to England, where it takes the place of the sulphate of magnesia, formerly manufactured from dolomite, or Grecian magnesite, in cotton printing. Another portion of kieserite is converted into Glauber salts which, on account of its freedom from iron, is highly prized by gas manufacturers.

Manufacturers of *blanc fixe* employ kieserite instead of sulphuric acid to precipitate the sulphate of barium from chloride of barium, and in all similar cases where it is proposed to prepare a difficultly soluble sulphate, the kieserite can be advantageously used. Kieserite is recommended as a substitute for gypsum in agriculture, as a top dressing for clover, and is largely employed in England for this purpose. It is proposed to use kieserite in the manufacture of alum. There is a mineral called bauxite which chiefly consists of the hydrated oxide of aluminum; this is easily dissolved in hydrochloric acid. Cheap potash salts and the calculated quantity of kieserite are added, alum crystalizes out of the solution, and chloride of magnesium remains in the mother liquor.

The uses indicated above are wholly inadequate to consume the enormous quantities now obtained from the Stassfurt mines. Millions of pounds of kieserite are annually brought to the surface, and it is becoming a serious question to know what to do with it. If it could be used as a substitute for gypsum in building materials and cements, its cheapness would at once commend it to notice. Experiments looking to this application have been tried.

Two equivalents of kieserite and one equivalent of caustic lime were stirred to a paste in water. The mass hardened, but remained granular and brittle. On calcining it, however, again pulverizing and moistening with water, it set to a solid marble-like mass, which could be applied to many useful purposes. It is proposed to employ this material for ornamental decorations in the interior of houses and in general for the manufacture of cements and as a substitute for plaster of Paris.

Kieserite appears likely to prove a valuable accession to our supply of useful minerals, to be ranked by the side of kainite, a potash mineral also found at Stassfurth and now largely imported into the United States.

BALANCING MACHINERY.

In designing and constructing machinery, it frequently becomes necessary to make provision for balancing the weights carried by rotating shafts, and for neutralizing the effects of forces developed by the motion of either rotating or reciprocating parts. Mechanics are in the habit of distinguishing between a "standing" and a "running balance." When a heavy piece is carried upon an axis, in such a manner that it is not balanced on that axis, it exerts an effort to turn itself about the shaft until it comes to rest with its center of gravity in the lowest possible position. This effort is measured by what is called a *moment*. A moment is the product of any force into its lever arm, the latter quantity being the shortest distance from the line of direction of the force to the axis about which it tends to produce motion. In the case of a crank on its shaft, the force is the weight of the crank acting vertically downward through its center of gravity, and the lever arm is the distance from the center line of the shaft to the vertical, through the center of gravity of the crank. The moment would have a maximum value when the crank lies horizontally, and would be one thousand foot pounds were its weight five hundred pounds and its center of gravity two feet from the center of the shaft, or were the weight seven hundred and fifty pounds and this distance sixteen inches, or again, if the weight were two hundred and fifty pounds and the lever arm four feet. If opposite this crank another heavy piece is placed, of such weight and at such a distance that its moment, tending to produce rotation in one direction, is equal to that of the crank tending to turn the shaft the other way, the latter will be balanced. This will be shown by the fact that the shaft, if unacted upon by any other forces than the weights of the crank and its counterbalance, will remain in any position in which it may be placed. In this case we have an illustration of the "standing balance." Should it have happened that the counterbalance, although exerting an equal moment, was not of equal weight with the piece which it was intended to balance, it would be found that, upon setting it in motion at a sufficiently high rate of speed, the shaft would shake in its bearings; or if they were set up tight, the whole machine and even its foundation might shake in consequence of the unsteadiness of the rotating parts.

It would thus become evident that a standing balance and a running balance are not secured by similar conditions. In fact, we have to deal with quite different forces. In the first case we have to equilibrate the force of gravity; in the second, we have to neutralize the effects of the force of inertia as developed by bodies in motion. The force of gravity has an effect simply proportioned to the weight of the piece, while inertia produces an effort proportional to the weight of the mass and, also, to the square of the velocity with which it moves. When a piece swings about a center, as in the case of the crank just considered, or of a stone in a sling, the force with which it tends to break its connection with the center, its centrifugal force, is due to a constant tendency to move in a straight line, and is a consequence of its inertia. The intensity of this force is measured by the product of the weight of the body into the square of its velocity per second, divided by sixteen and one twelfth times the diameter in feet of the circle in which it moves. Algebraically expressed, this force is $F = \frac{WV^2}{16\frac{1}{12}D}$

We may assume, without great error, that this force acts at the center of gravity of the piece. Then our crank, weighing 500 pounds, would have a centrifugal force, at 50 revolutions per minute, of $\frac{500 \times (2 \times 3{\cdot}1416 \times \frac{5}{6})^2}{16\frac{1}{12} \times 4} = 213$ pounds. At 100 revolutions per minute, this would become four times as great, or 852 pounds, and at 150 revolutions the force would become 1917 pounds. Such forces as are thus developed at high speeds frequently have very serious effects, and it sometimes becomes absolutely necessary to secure a good running balance by neutralizing them. Were it attempted to effect a balance by a piece placed opposite, at a double distance, but of half the weight, the counterbalance would have a double centrifugal force, and hence, although a standing balance would be obtained, it would not give a running balance. To secure the latter, it would be necessary to reduce the weight of the counterbalance one half, and this, in turn, would destroy the standing balance.

En resumé, the condition of a standing balance is that the moments of the weights carried by the axis shall neutralize each other. The condition of a running balance is that each piece shall have a counterbalance of equal *vis viva*. By *vis viva* is meant the quantity obtained by multiplying the weight of a moving body by the square of its velocity.

The condition of a combined standing and running balance is that each rotating mass shall have a counterbalance of equal moment and of equal *vis viva*. This is complied with when the counterbalance is of equal weight, and equally distant from the axis with the piece which it balances. If there are several masses revolving on the same shaft, it may happen that, although no two have the same *vis viva*, the sum of the excesses may equal the sum of the defects, and an equilibrium may still occur. In most instances where the balance is secured in such arrangements by trial, this latter case is exemplified.

In high speed engines, and notably in locomotives, it becomes necessary to balance the reciprocating parts. In this case the same principles apply as in procuring a running balance of rotating parts, and the problem is solved by securing equal and opposite *vis viva*.

We will continue this article in a subsequent number of the SCIENTIFIC AMERICAN.

THE SEWING MACHINE MONOPOLY.

An extended article on the application of A. B. Wilson, for another extension of his sewing machine patent, is in type, but is necessarily crowded out this week for want of space.

Sewing machine manufacturers and patentees who are not members of the gigantic sewing machine monopoly should bestir themselves at once if they would avert another seven years' servitude to this oppressive combination. Action should be taken immediately, and every honorable means be adopted to prevent Congress from passing the bill, should the Committee on Patents be wheedled into recommending it. An inexpensive and practical mode of enlightening the people throughout the country in regard to this scheme, which pecuniarily effects every user of sewing machines, will be to send circulars to every postmaster, merchant and manufacturer in the United States explaining how excessive has been the profit exacted from every seamstress and family now using sewing machines, and the heavy tax which every new purchaser will have to pay in consequence of the existence of the sewing machine monopoly, and which another extension of the Wilson patent would further perpetuate. With this circular (requesting the obtaining of as large a list as possible in the shortest time) should be sent a blank petition for the signature of persons opposed to the extension, with a request to forward to the member of Congress from the District where the names are obtained, as soon as a number of signatures are registered.

TO INTENDING EXHIBITORS AT THE VIENNA SHOW.

Mr. Van Buren, the United States Commissioner, in a recent card reminds intending exhibitors that they should hurry up or it will be too late to send their goods. He expects that Congress will pay for freighting the articles over to Austria. But exhibitors may expect to pay pretty freely to have their merchandise looked after and displayed on arrival. This was the case at the Paris Exposition, and the Austrian charges will be much higher. The late war has greatly increased the prices of living in Vienna. The great show will be a money harvest for the people of that city.

PRACTICAL ADVICE TO EXHIBITORS IN AUSTRIA.

The worthlessness of the pretended protection offered by the Austrian government to exhibitors, at the coming Vienna show, is set forth in the accompanying letter from Mr. Hotchkiss. This gentleman is an American patentee who, in the course of regular proceedings under the Austrian patent laws, has become practically acquainted with their working, and his views may be relied upon. We advise intending exhibitors to profit by his advice.

To the Editor of the Scientific American:

I am very much gratified to see the articles in your valuable paper concerning Austrian and other European patent laws, and the gross injustice now practiced under them. There are two or three important points which I have no touched upon in connection with the working of patents in Austria, and in connection with the Exposition certificates proposed.

I would advise inventors designing to exhibit at Vienna not to avail themselves of the proposed exposition protection, but to apply for their patents before the exposition of their goods takes place, for the reason that an Austrian may take a patent for the same thing, during the existence of the Exposition protection, and claim that he was the original inventor, thus creating a dispute between the holder of the patent and the holder of the certificate of protection.

In taking patents the inventor should be particular about his drawings and specifications, and not describe more than one mode of accomplishing his object, for the Austrian patent office demands, if an inventor describes two, or three, or more different ways in which his invention can be made, that, in working his patent within the first year, he shall work it in all the different modes described in his patent, no matter how indifferent some of the modifications may be.

Under the present working of the patent office, where an invention has several modes or modifications described, they allow you to prove the general principle working, and then afterwards demand of you to prove that you have worked some one of the modifications; and if you fail to prove that you have worked any one of them, no matter how trivial or insignificant a matter it may be, the patent becomes void.

Inventors must not expect to have any favors or liberality shown them under the Austrian patent laws.

I hope that you will give publicity to these suggestions and facts, for the benefit of those who propose to be exhibitors at Vienna. B. B. HOTCHKISS.

Paris, December 20, 1872.

AN INTERNATIONAL SHOW IN SPAIN.

A grand international exhibition is to be held in Spain in 1875; and if the policy of paying out the money of the United States to assist foreign shows is to be continued, of which the Austrian exhibit is an example, we hope that poor Spain will not be forgotten. She really needs help.

If the public funds *must* be used for such wrongful purposes, we suggest that a fair division be made, and we hope that some of the Senators will introduce an amendment to the bill of Commissioner Van Buren, which calls for one hundred thousand dollars for Austria, so as to give half of the amount for the Spanish show. Fifty thousand dollars is quite enough to support our Commissioner for six months in Vienna.

Louis de Coudres.

Died, in Brooklyn, N. Y., on the 16th ult., Mr. Louis De Coudres, in the 83d year of his age.

Mr. De Coudres was one of the very few yet living who had a hand in fabricating the machinery of the first steamboats. At the early age of thirteen, he was taken by James P. Allaire as his first apprentice, Mr. Allaire at this time carrying on a small brass and bell foundry. It was at this establishment that the brass castings were made for Mr. McQueen, who had machine works and did the work for Robert Fulton in applying his steam engine to the first paddle wheel steamboat, the North River, of Clermont. Several years later, Mr. Allaire started his steam engine works, in Cherry street, which became the leading establishment of the city and famous over the entire country for the number and character of the engines it supplied to the first steamboats which plowed the waters of this continent. Mr. De Coudres continued with Mr. Allaire more than half a century, some of the time as superintendent of the iron foundery and all of the time in charge of the brass casting department, in which art his reputation was pre-eminent. This branch of the Allaire works possessed for many years almost a monopoly of the trade of bell casting. The first great fire alarm bells, put up in the City Hall park, were cast here by Mr. De Coudres. He was in his 83d year, and was probably the oldest brass founder in this country.

THE Citizens Association of Des Moines, Iowa, invites men of capital to come there to build new factories and to enlarge the factories already established. Those for agricultural implements and farm machinery are greatly needed. Starch factories, cotton mills, factories for boots and shoes, hats and caps, canning fruit, and sewing machines, are also required; copper and brass founders, glass works, cooperage, furniture, chairs, baskets, brushes, etc., are all here offered manufacturing inducements. A vinegar factory, possibly a tannery, and many other establishments, and indeed every department of productive industry, must contribute to the great demand of this new and extensive business field.

A TRANSANDINE RAILWAY.—A transandine survey, made jointly by the Argentine and the Chilian Governments, leaves little doubt of the possibility of railway communication between the Atlantic and Pacific. The length of such a communication would be about 1,200 miles, of which nearly 400 miles are actually made.

IMMUTABILITY OF SPECIES.—Cats and dogs embalmed in Egypt four thousand years ago are precisely like those of today, said the late Sir David Brewster. What have the revolutionists to say to that fact? Four thousand years are nothing, so gradually are organic changes brought about—would probably be the Darwinian answer.

"I HAVE been a constant reader of the SCIENTIFIC AMERICAN for many years," says a renewing subscriber, "and would not be without it for many times its cost. It has been the key to unlock many problems which have agitated my mind."