soiled by coming in contact with the object under examination. Care must also be taken that the mica or glass cover does not approach too near the spring clips, otherwise the fluid may be drawn under the clips and wet the stage. Should the globules get soiled, and rubbing them with tissue paper does not clean them, they must be punched out and replaced by new ones.

The microscope was designed with special reference to the most convenient and efficient use of these globules as magnifiers. Globules of high power were first made and used by Robert Hooke, an English microscopist of the seventeenth century. These when well made show objects remarkably well. They may be made to give enormous powers, and that, too, at a cost of only a few cents. It is not a very difficult matter to obtain with these a power of 1,000 diameters, or even more. The field of view is rather small and its extent is the same for all powers. This is because it is limited by the pupil of the eye, as may be readily proved by a simple experiment. Looking through a globule lens, arrange the mirror so that just sufficient light is given to make the field visible. Then suddenly turn the mirror so as to illuminate the field with a strong light when it will be seen to contract. With the larger globules the light given by the flat mirror is sufficient, but when globules having a focus less than $\frac{1}{40}$ or $\frac{1}{50}$ of an inch are used a concave mirror will be necessary. Any person may, after a little practice, be able to make and mount his own globules.

The globules should be made of French plate or other very pure and clear glass. The glass must be cut into a narrow strip, carefully cleaned, and then drawn out into threads in the flame of a spirit lamp. The threads should be made of different thicknesses and carefully kept on a clean plate. The wick of the lamp should then be pushed down until the flame is not more than half an inch long. One end of a thread is now to be held in the flame when it will melt and run up into a globule. When the globule is seen to be perfectly spherical it must be withdrawn, held a little while to cool, broken from the thread, and put aside until wanted for mounting. The larger globules are the most difficult to make, the fine threads melt and run up into perfect globules almost as soon as thrust in the flame. The hole in the disk for the globules must be burnt in and then cleaned by rubbing it with a piece of wood. Care must be taken that the inside of the hole is made dark in order to prevent all reflection of light. A needle will be convenient for burning in the smaller holes. The globule is then to be carefully placed in a hole with the broken end of the thread to one side, and may then be fastened securely by pressing it in a little. If desired, other forms of magnifiers, such as ordinary double convex lenses, Wollaston doublets, triplets, and Coddington lenses may be used.

For the examination of infusoria, animal and vegetable tissues, and such other objects as are, or can be made transparent, these globules have been found to answer very well indeed. It is for the use of globules in such examinations that the microscope here described was devised. It was not intended for, and cannot conveniently be used as a dissecting microscope. By means of a globule magnifying over 500 diameters the writer has been able to perceive clearly the hexagonal markings on the most common diatoms found in the "Richmond earth." He has examined live diatoms and animalcules whose movements he has been able to follow, though not without difficulty when they were rapid. The reader will thus get some idea of what may be accomplished by such simple things as globules of glass.

This invention was designed by James H. Logan, who may be addressed for further information, at the National Deaf and Mute College, Washington, D. C.

Picrates---Their use as Gun and Blasting Powders.

Referring to a notice on this subject in our issue of May 15, we propose to give some further details on this new and interesting compound. In 1867, Designolle, of Paris, made powder for firearms and for blasting purposes by means of picrates. Both kinds consist of a mixture of picrate and nitrate of potassa; the only difference being that the former contains in addition an admixture of charcoal. Their manufacture, as may be inferred from the accident which recently took place in Paris, appears to be carried on to a considerable extent, and the well-known chemist, Payen, in a report to the *Société d' Encouragement*, ascribes to them several advantages over the ordinary powder. He points out that various kinds of powder may be manufactured by means of them, the relative effects of which may be varied between the limits 1: 10; viz., that, on one hand, a powder may be made, which will possess ten times the effect of common gunpowder of equal weight; while on the other hand, it is just as easy to prepare an explosive of the same projectile force, but of a less bursting tendency compared with ordinary powder It is said that between these limits all desirable kinds can be made. If so, the long sought for problem is solved; that is, an explosive can be prepared in a charge of a certain weight, which will impart a definite velocity to a projectile from a firearm of stated dimensions.

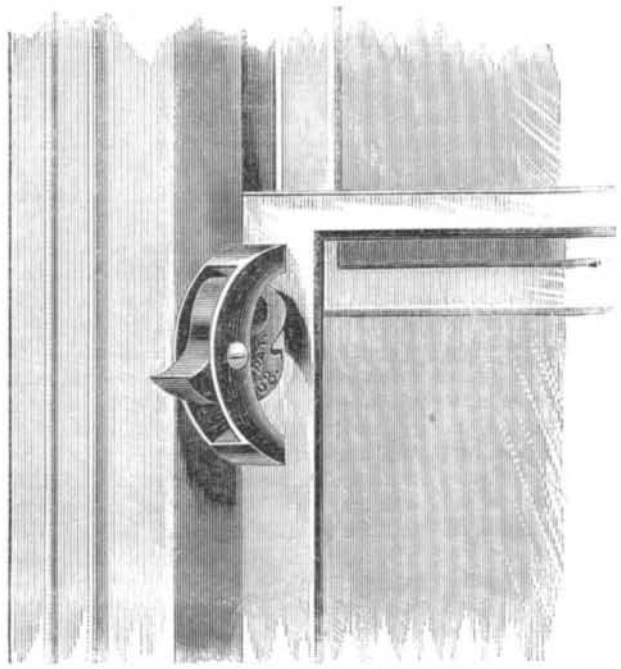
Other advantages of the picric acid compound are that its projectile force can be increased without enhancing its blasting force, or changing its manner of manufacture; the velocity of combustion may be regulated at will; and its ignition is not attended with the generation of disagreeable gases, as they consist simply of steam.

The manufacture of the powder from picrates proceeds as follows: The various ingredients are powdered in a stamping mill for at least three or at most six hours, under addition of six to fourteen per cent of water, according to their composition. The mass is now subjected to a pressure of from 600 to 1,000 hundred weight per square inch, according to the velocity of combustion to be imparted to the powder. The cake obtained is then granulated, polished and dried in the ordinary manner. The process remains the same for all kinds.

Gunpowder cannot well bear over twenty per cent of picrate of potassa, while for cannon powder, it should not exceed fifteen per cent. For the latter from eight to fifteen per cent are taken according to the desired velocity of combustion. Designolle prepares also colored fire-work compositions by means of picrates, of which the following are recipes: Gold rain—50 parts of picrate of ammonia, and 50 parts of picrate of iron; Green fire—48 parts of picrate of ammonia, and 52 parts of nitrate of baryta; Red fire—54 parts of picrate of ammonia, and 46 parts of nitrate of strontia. Until recently, the picrate of potassa has been very expensive, but improvements made in its mode of preparation enable the manufacturer to sell it at a price sufficiently low to ensure its application for all practical purposes.

WALKER'S PATENT SASH FASTENER.

Deliverance from the inconvenience and expense of cords, pulleys, and weights, attached to window sashes, seems to be an attainment much desired, and inventors are racking their brains to meet the demands of the public in this respect. Among the best devices produced are those which employ an eccentric, which by engaging with the sash at the moment it tends to fall, forces it against the side of the frame thus generating friction and holding more and more firmly, the greater the force which tends to move it.



The sash fastener we illustrate this week is not attached to the sash, but the semi-circular frame which holds the eccentric, is screwed on the window frame, close to but not touching the sash. The eccentric or cam is cut so as to give two supporting surfaces—upper and lower—one of which holds the window from being raised, and the other prevents it from falling. To raise the sash the eccentric is thrown up; to lower, it is thrown down.

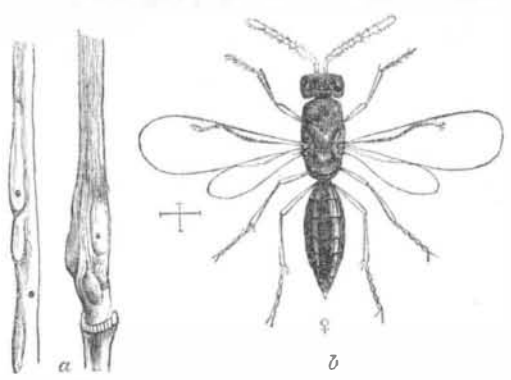
It thus acts as a lock, and precludes the necessity of a bolt or other fastening.

The inventor is aware that where sashes are of great weight, a cord, pulley, and weights, may be necessary to balance the sash, and moderate the exertion of raising it; but even in such cases, the fastener would be a valuable adjunct, as, should the cords break, as is frequently the case, the window would be securely held from dropping and the glass preserved from breakage.

This improvement was patented September 1, 1868, by Felix Walker, and is sold by Felix Walker & Co., at the Whitlock Exposition Building, Nos. 35 and 37 Park Place, New York city.

The Joint-worm.---"Isosoma hordei."

In certain years and in particular States the crops of wheat, of barley, or of rye, are observed to be greatly injured by a minute maggot, popularly known as the "Joint-worm."



This maggot is but little more than one eighth of an inch long, and of a pale yellow color with the exception of the jaws which are dark brown. It inhabits a little cell, which is situated in the internal substance of the stem of the affected plant, usually a short distance above the first or second knot from the root, the outer surface of the stem being elevated in a corresponding elongate blister-like swelling; and when, as is generally the case, from three to ten of these cells lie close together in the same spot, the whole forms a woody enlargement honey-combed by cells, and is in reality a many-celled gall. In the figure, *a*, will be seen a sketch of one of these galls, the little holes being the orifices through which the flies produced from the joint-worms have escaped. At first sight, these knotty swellings of the stem are apt to elude observation, because, being almost always situated just above the joint or knot on that stem—whence comes the popular name "Joint-worms"—they are enwrapped and hidden by the sheath of the blade; but on stripping off the sheath, as is supposed to have been done in the engraving, they become at once very conspicuous objects. We have observed that the "internodes," as botanists call them, or the spaces between the knots, in infected straws, are always much contracted in length; none out of a lot of over fifty specimens examined by us, exceeding six inches in length, and many being reduced to only one and a half inches. A similar phenomenon occurs in two "polythalamous" galls formed by certain gall-gnats (*Cecidomyia*) upon the tips of the twigs of certain species of willow.

DAMAGE DONE BY THE JOINT-WORM.—The damage occasioned by the joint-worm is, in certain seasons and in certain localities, ruinously great. In the year 1851, throughout a large part of Virginia, many crops of wheat were hardly worth cutting on account of its attacks, and all that we have seen or heard of, except one, were badly hurt by it. According to Prof. Cabell, of the University of Virginia, the loss occasioned by this insect often amounts to one third of the average crop, and is sometimes much greater; and in 1851 "some farmers did not reap as much as they sowed." In 1860 the rye crop was considerably injured by this little pest in Lycoming Co., Pennsylvania; and according to Mr. Norton, the species is very common upon rye "in Connecticut and probably the other New England States." As long ago as 1829, it had been noticed in various parts of the New England States to attack the barley, causing it in some places "to yield only a very small crop, and on some farms not much than the seed sown;" although since that date it does not appear to have been materially troublesome in that region. But in central New York, formerly the great barley-growing district of America, it has been ruinously destructive to the barley since about 1850. In the words of Mr. George Geddes, "Formerly we expected forty bushels of barley to the acre; now we cannot rely on more than twenty." And he goes on to state that this falling off is principally due to the depredations of the joint-worm; and that, unless some relief from it is found, the farmers of Central New York will have to discontinue raising this crop. Lastly, in Canada West, in the neighborhood of Grimsby, it was very abundant upon barley in the years 1866 and '67.

NATURAL HISTORY OF THE JOINT-WORM.—The mode in which the joint-worm produces its destructive effects upon small grain, may be readily explained. Not only is the sap of the plant abstracted on its road to the ear, in order to form the abnormal woody enlargement or gall, in which the larvæ are embedded, each in his own private and peculiar cell, but a very large supply of sap must be wasted in feeding the larvæ themselves.

The joint-worm fly, b, makes its appearance in the North in the fore part and middle of June, and in southern latitudes in the middle of May. After coupling in the usual manner, the female joint-worm fly proceeds to lay her eggs in the stems of the growing grain.

Before commencing operations they walk leisurely up one side of the plant as far as the last leaf, and then down the other, apparently to make sure that it has not already been oviposited in. Head downward, they then begin by bending the abdomen downward, and placing the tip of the ovipositor on the straw at right angles with the body, when the abdomen resumes its natural position, and the ovipositor is gradually worked into the plant to its full extent. Very shortly after this the egg must hatch out.

By the beginning of September, the infested grain having ripened long before this period, the galls are already dry and hard, and the larvæ contained in them full grown, measuring now about 0·13 inch in length. The great majority of these larvæ are destined to remain in that state, inclosed in their little cells, until the succeeding spring; but—as happens with many different insects—a small percentage of them seem to pass into the pupa, and thence into the perfect state, the same summer that the eggs are deposited.

REMEDY.—Whenever you discover the stems of your small grain to be badly affected near the root, in the manner shown in the figure a, then you ought to burn off your stubble ground any time before the following summer, and burn up all the tailings and refuse straw after thrashing. If you do this and can persuade your neighbors to do the same, you will soon kill out the joint-worm; if you neglect it, the parasites sent by a kind Providence may perhaps do the work for you; and again it may be possible that, in spite of the parasites, the joint-worm may increase upon you year after year.—*The American Entomologist.*

THE library of Congress has recently acquired a valuable addition of books in the Spanish language, largely relating to America, many of which formed a portion of what is known as the Maximilian library, recently sold at Leipsic The library now contains 180,000 volumes, about 2,000 of which have been added within the past sixty days.

MENDING PLASTER MODELS.—Wax and resin, or shellac varnish, is recommended in the last number of the *Dental Cosmos* for the above purpose. Dr. Chaim suggests the use of liquid silex. Wet the two surfaces with it, and allow a few moments for it to dry. It will be found very useful in cases of accident to a cast.