## SCIENTIFIC AND PRACTICAL INFORMATION.

PRESERVING ARMY CLOTHING FROM MILDEW.

An appropriation of $100,000 has recently been asked from Congress to be expended during the next fiscal year in the preservation of army clothing from moth and mildew by a patent process. The process in question appears to be that patented by George A. Cowles and others, September 20, 1864, and is based on the preservative action of sulphate of copper on vegetable fibers. By the addition of alum, the preserving qualities of the mixture are, it is claimed, greatly enhanced; and when gelatin is also combined, the fibers are said to be not only proof against decay, but also impervious to water. The ingredients are proportioned as follows: Alum 2 lbs. dissolved in 60 lbs. of water, blue vitriol 2 lbs. dissolved in 8 lbs. of water, to which is added gelatin 1 lb. in 30 lbs. of water. A still further improvement is said to be effected by acetate of lead, ½ lb. dissolved in 30 lbs. of water. The solutions are all hot and separately mixed, with the exception of the vitriol, which is added cold. The inventors claim that the process is cheap, and does not interfere with the strength of the goods.

THE HOME PRODUCTION OF STEEL RAILS.

Eight establishments in the United States are now making rails from steel made by the Bessemer process. Their annual production is 150,000 tuns, an aggregate which, it is expected, will ere long be increased some thirty-three per cent. Steel rails are becoming stronger in popularity; and as the demand increases, there is every reason to believe that our productive power will eventually prove adequate to meet its full requirements without necessitating our dependence in any degree upon foreign makers for supplies.

A SUBSTITUTE FOR BRISTLES.

The fiberous bark of the sugar palm (*arenga saccharia*) proves to be a good substitute for bristles and animal and human hair. The treatment is simple. The bark is first immersed in water and boiled for some time in an alkaline solution; the fibers are then soaked in an emulsion of fat, alkali, and water for about 12 hours, after which time they are sufficiently hard and elastic for the above named use.

SULPHIDE OF CADMIUM FOR COLORING SOAP.

The coloring power of the above mentioned material is so great that its price is of little importance. It is, however, frequently adulterated with zinc white, which may be readily discovered by digesting the suspected substance in acetic acid, filtering, and adding a solution of carbonate of soda, which produces a white precipitate if zinc be present.

DYEING FELTS WITH ANILINE COLORS.

All aniline colors are suitable for the dyeing of felt, and the coloring matters can be repeatedly applied when a deepened effect is required. As brown is a color frequently used in felt-dyeing, it may be mentioned that fine shades of this color are obtained by using certain products from fuchsin (known in the trade as cerise, maroon, etc.) mixed with indigo, carmine, picric acid, and a little sulphuric acid. The shade known as "Bismark" may be prepared from Manchester brown mixed with the last named ingredients, substituting fuchsin for sulphuric acid.

NEW SURGICAL DEVICES.

Two great surgical novelties have lately been introduced into European hospital practice. The first is the aspirator, originated by Dr. P. Smith, which has been extensively employed by Dr. Diculafoy, of Paris. By this instrument fluids can be extracted from formations at some distance from the surface, with safety and certainty. The second novelty is the introduction of a bloodless method of amputation and other operations on the limbs by means of a compressing bandage, by which the limb is blanched with a circular elastic cord, which compresses both the arteries and veins of the limb. This plan, proposed by Professor Esmarch, has been adopted by many hospital surgeons. It remains to be seen whether there are any drawbacks to this system, and especially whether, in certain cases, embolism is likely to result from displacement of clot, which may have already formed in the veins of a damaged limb.

THE RAMIE INDUSTRY.

If any inventor has a good machine capable of thoroughly, quickly, and economically preparing ramie fiber for the market, there is a good prospect of its being largely to his interest to perfect the same, and bring it before the public at as early a day as possible. The great obstacle to the introduction of this valuable plant—which, from the fact of its being an excellent substitute for silk, is destined to be one of the most important of our American products—is the difficulty of separating the fiber from the bark that envelopes it. The Chinese do this work by hand, producing one or two pounds per day of marketable fiber, and using an ordinary knife. Of course this slow process will not pay here. Several machines, we are aware, have already been invented; but for some reason, the proprietors take but little pains to bring them into notice. The plant can be successfully cultivated in California and the Gulf States. It can be cut by an ordinary mowing machine, and an acre of land will produce from 400 to 500 pounds at a cutting. The crude ramie staple is worth from $320 to $340 per tun in Europe. American manufacturers offer for it from 20 to 25 cents per pound, when furnished in considerable quantities.

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HIPPOPHAGY in France is increasing. During July, August, and September of 1873, the meat of 1,548 horses, 140 asses, and 15 mules, was consumed in Paris, showing an increase of nearly 100 per cent over the same months in 1872.

## The Application of Solar Heat as a Motor Force.

That the heat of the sun may be transformed into mechanical force no one can doubt; for we see daily what masses of water solar heat raises into the air, to be precipitated to the earth; and we know what an enormous mechanical force is here represented.

But while solar heat is the cause of nearly all mechanical force developed on the earth, we have yet hitherto known of no means whereby it may be directly utilized for mechanical work. It has been proposed, indeed, to employ solar heat, concentrated by lenses or mirrors, for driving a steam or caloric machine. These machines, however, are not suited for this, as they involve too great a waste of heat. Moreover, in concentration a large quantity of heat must be lost.

Machines which serve for the transformation of heat into mechanical work rest on the principle that a liquid or gaseous substance, acted on by the heat, undergoes a molecular change, through which a certain mechanical force is developed. The changes of solid bodies, under influence of heat, are too small for transformation of the heat into mechanical work, or to render them means of movement, although, through such molecular change, a certain mechanical force is developed. Gaseous bodies have been applied as a means of movement in the caloric and gas machines; but with the small differences of temperature which occur in some machines, they cannot be employed as such, with advantage. Thus nothing remains but to employ a liquid; and it must be one whose boiling point is very low. There are several such liquids, sulphurous acid, methylic chloride, methylic ether, etc. Of all these, sulphurous acid best deserves attention, as it has several useful properties for the end in view. It is not difficult to condense. The keeping of it presents no difficulties, and it may quite well be put in ordinary steam boilers.

Take a vessel, A, filled with sulphurous acid, exposed to the sun's rays; the tension of the sulphurous acid vapor, if the temperature of this vessel exceeds that of the surrounding air by 10° or 20°, must be from 1 to 3 atmospheres higher than that of the sulphurous acid vapor in another vessel B, similarly filled with sulphurous acid, but which has only the temperature of the surrounding air. We can thus arrange an engine, which agrees in principle with the steam engine with merely this difference, that the water is replaced by sulphurous acid, the fuel by the solar heat; while the vessel exposed to the sun's rays represents the steam boiler, the vessel kept at ordinary temperature may represent the condenser. The sulphurous acid, condensed after doing work in vessel B, could easily be driven back by a force pump into the boiler representing vessel A. The capability of work of such a machine must naturally increase with the amount of the heat communicated to vessel A, or be proportional to the surface exposed to the solar rays.

If now, we conceive a factory or shop, the roof of which is covered with vessels containing sulphuric acid, and which is furnished with a sun machine, made on the above principle; such a machine might indeed work while there was sunshine but in default of this, the establishment would be brought to a standstill. True, the solar heat might be replaced by the heat of the air, if the temperature of the air were pretty high, and one had at hand a cooling substance like ice. But as this is not always the case, the establishment should have, besides the sun machine, an apparatus which might "store up" some of the work done by this. As such, Natterer's apparatus for condensing carbonic acid might with great advantage be used. If a supply of carbonic acid were kept in a large gasometer, like those in ordinary gasworks, the Natterer apparatus might be fed from this. In a wrought iron vessel thus filled with liquid carbonic acid, we should have an enormous store of mechanical force, which might be made to replace the action of solar heat in the sun machine, partially or wholly. After work done, the carbonic acid, becoming gaseous again, might be collected in the gasometer. Or, again, the sun machine, while in action, might drive an ice machine, and might, in default of sunshine, profit by the ice it had produced, for maintenance of its working.

We thus see that, from the present standpoint of Science, it is possible to construct a constantly working sun machine.—*G. A. Bergh, in Poggendorff's Annalen.*

## To Inventors.

C. E. G. lays down the following maxims for the guidance of inventors.

1. Know definitely what you want to accomplish, stick to it, and let other matters go, for the time.

2. Post yourself thoroughly as to the laws governing the action of each part of your machine.

3. Always bear in mind that whatever is gained in time is lost in power, and *vice versa.*

4. Think over every machine, of a nature similar to yours, which you have seen; and when your idea is clear in your head, compare it with those of inventors who have preceded you in the same line.

5. Be sure that the cost of your device will not prevent its use.

6. Avoid all complicated arrangements; make every machine of as few parts as possible.

7. Imagination, judgment, and memory are the faculties to employ. Imagination will bring forth new forms and actions, judgement will compare them with other devices and determine their relative value, and memory will store up the results for future use.

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AS A TEST for red wine, which is sometimes artificially colored, Cottini recommends nitric acid: 50 parts wine are mixed with 6 parts of nitric acid (of 42° B.) and heated to 95° Fah. The natural wine will not change its color if left for some hours, but the artificially colored will lose its hue in a few minutes.

## ABOUT OURSELVES.

"The steel engraving 'Men of Progress' is received, for which accept my thanks. The few subscribers I have sent you were not worthy the acknowledgment you have given for them."

"I beg to acknowledge the receipt of the magnificent steel plate engraving entitled 'Men of Progress,' and can assure you it surpasses anything I had the least conception of; it not only being collectively a most appropriate subject, but also one that cannot fail to be appreciated by all."

The above are extracts from a couple of letters received from patrons in Canada and in Indiana, who have obtained clubs of subscribers for us. Their views are but examples of many others, whose appreciative commendations of our efforts reach us daily.

The rapidity with which our subscription lists are augmenting and the constant addition of new names, not singly but by tens and twenties, indicate quite clearly that the stringency of the late panic has all but disappeared, and that business, especially in mechanical and manufacturing establishments, has resumed its wonted vigor. So far from our circulation having become diminished by the financial troubles, we are happy to announce that it never has been nearly as large at this season of the year, nor have we ever known a new year which, dating from its beginning, has brought us so large an accession of new subscribers or such prompt renewals from old patrons. It would indeed be ungrateful on our parts did we fail to acknowledge our appreciation of the kind words which reach us, and the more substantial, though not more agreeable, recognition of our efforts evinced by the constantly increasing ranks of our army of readers. It remains for us to strive to merit the praise already accorded, by making the SCIENTIFIC AMERICAN, for the coming year, better and more useful than ever before

## The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the months of October and November, 1873:

The number of visits made during these months was 2,449, and the number of boilers inspected, 4,919; of which inspections 1,441 were internal and entire. The hydraulic pressure was applied in 3?5 cases. The number of defects discovered was 2,083, of which 555 were regarded as dangerous. These defects in detail were as follows:

Furnaces out of shape, 80—14 dangerous; fractures, 194—93 dangerous; burned plates, 118—40 dangerous; blistered plates, 314—52 dangerous; deposit of sediment, 394 cases, of which 62 were regarded as dangerous; cases of incrustation and scale, 355—26 dangerous; cases of external corrosion, 127—37 dangerous; internal corrosion, 88—24 dangerous; internal grooving, 31—9 dangerous; water gages defective, 85—9 dangerous; blow-out defective, 38—12 dangerous; safety valve overloaded, 37—16 dangerous; pressure gages defective, 288—58 dangerously so. These variations were from —7 to +20. Boilers without gages, 157—5 of these were run at high pressures; deficiency of water, 23 cases—5 dangerous; braces and stays loose and broken, 102—49 dangerous; boilers condemned, 28. Corrosion, either internal or external, has in many cases been found to be making great injury during these two months. In one case, three boilers were found connected together by cast iron pipe over the bridge wall. The joints in this pipe were made with copper gaskets. At the connection on No. 1, the shell around the flange was badly eaten by corrosion, and very thin. In another case, eight soft patches of copper were found on a boiler. Five boilers that had been long neglected were found in bad condition, the flues being corroded entirely through. When boilers are not blown down frequently, impurities in the water become concentrated, and act very injuriously on the iron. The number of condemned boilers was unusually large, and they were in a dangerous condition, liable to accident at any moment.

## Chainmakers' Peculiarities.

"The Troy chainmakers in that city," says the Troy *Times*, "are a peculiar set of men. They are eighteen in number, and are all English. Each chainmaker employs three assistants, and earns, when at work, about $25 per day. After paying three helpers, the chainmakers have from $10 to $15 per day for themselves. They are stubborn, industrious and saving. This branch of manufacturing is in its infancy in this country; and as the workers are few, they have a practical control of the trade. When strikes and lock-outs occur, they are able to hold out longer than other mechanics. Their extraordinary wages and their disposition to save what they earn almost invariably enable them to hold out until their employers yield. Their stubborness was well illustrated two or three years ago. They held out until their savings were all gone; then they went to work upon the streets and elsewhere for $1.50 per day until matters were arranged between the owners of the chain works and themselves.

"Last spring these men were working at an advance of ten per cent over the wages paid when gold was selling at fifty cents premium. During the summer they demanded and received another advance of ten per cent. In November, the lack of work compelled the owners to close the works. A few weeks since they secured an order for about sixty tuns of chain cable of a peculiar kind. Only three of the chainmakers can work upon these cables, and to these three the owners offered work at the highest wages. They refused to go to work unless the other chainmakers were also furnished employment. In this position affairs are at present. The firms have work for only three chainmakers."