For the Scientific American.

Temperlng.

There are some kinds of steel far superior to others, both on account of their toughness and the quality of retaining a fine edge. The blades of Damascus have been famous tor ages and all the advancement made in science has not yet produced a superior steel. The Damascus is of a kind of purple and dark streaked color. Some have supposed that it was a portion of alumina along with the carbon and iron, that like the famous *wootz* of Bombay, gave the Oriental blade both its fine qualities and beautiful color. Undoubtedly a portion of alumina along with steel gives the damask color on the application of sulphuric acid, but an alloy of chromium with cast steel, in proportion of one of chromium to 100 of steel also gives a fine damask color. The great beauty of cutting instruments depends upon the forging. A graver for steel engraving of a lozenge shape, will be utterly worthless unless the point has been made out of a part of the lozenge that has been subjected to the hammer At one period it was not possible to get good gravers in this city. The foreign kinds were made for the markets cheap and worthless, and no doubt not one of them, excepting some few good Swiss gravers, were forged out in the most easy and rapid manner. Mr. Nixon, the cutler in the basement of the Sun office in this city, effected a great revolution in gravers, and now not one of the foreign kind is purchased by our engravers. Gravers have to be carefully forged, annealed and condensed by hammering cold and then hardened and tempered.

Steel is composed of a number of crystals and these exhibit like spheres or prisms all the colors of the rainbow. If we look upon bright steel surfaces we will perceive a shading of colors. Silver and tin exhibit the same appearance. This is the chromatic scale faintly exhibited by the minute prominence of the crystals which compose these metals. If we apply heat to these metals, the crystals are thereby rendered more prominent and the colors are better displayed. Thus if we take a polished knife blade and lay it on a plate of warm iron, we will soon perceive that it goes through a change of all the colors and these colors have been taken advantage of to regulate the various degrees of temper of various instruments.

When soft steel is heated cherry red and suddenly plunged in cold water, it is rendered so hard as to resist the file and is very brittle. The tempering of steel consists in reducing this excessive hardness to a moderate degree by a gentle heating, which also restores its toughness and elasticity. In 1789 a patent was obtained for tempering cutting instruments made of steel by immersion in oil heated to a regulated temperature by the thermometer. This invention was a great improvement both in certainty and speed. The common method practised before and still practised by many, was by heating the instruments over a flame or fire till a certain color produced by a film of the oxide appeared on the surface. These colors were indicated at different degrees of heat. A yellow was a hard temper and appeared from heat of 430 degrees to 480. Hard steel polished and heated to 510° appears of a purple color, and at 550° a bright blue. This is the heat for swords and watch springs, and if heated to 600° for pit saws, the metal appears of a blue black and has to be polished of its oxide to look well. If steel be heated more than 600° it becomes very soft. Tools having thick backs and thin edges are tempered by placing their backs on a hot iron plate so that the edge may not be heated more than the back. To prevent the warping of long blades they are hardened by being plunged vertically into water. The metallic bath is now used for tempering many instruments, but the oil bath is not inferior. The different colors on steel can be removed by polishing and thereby blue and bright flowers may be formed on the blade.

[We have been informed (but have not made the experiment) that a polished plate of the finest steel if smeared with soft soap heated to any tempering degree and then plunged in cold water, will retain all its pristine polish.

For the Scientific American.

Browning Gun Barrels.

The browning of gun barrels consists in a process by which the surfaces of the barrels are made into a shining brown color. Rust is the oxide of iron and the browning is just the taking advantage of this quality in iron to rust or oxidise, and converting it from an evil to a good by giving the iron a beautiful color and keeping it from further oxidisation.

The most common method of covering the barrel with a film of oxide, is by rubbing it over with a very weak solution of nitric acid and water and setting them aside for a few days, then taking them out, rubbing them over with a brush made of fine wire. This brush is made like a shaving brush, only the points of the wires are not used, but a number of fine wires are turned or bent up and twisted together, and using that end of the wires which is bent. The gun barrels are well scoured with this, then another rubbing of the weak acid given and the same course pursued as before described. In one or two days the barrels are ready to be brushed for varnishing and finishing. The acid, however, must be completely killed and this is done by pouring boiling water on the barrels. This water is made a little caustic with soda or potash, and must be washed off again with hot water, when the barrels are carefully dried and varnished with a varnish made of 2 ounces of shellac, a few grains of dragon's blood and two quarts of alcohol. This varnish is also used for varnishing gun stocks and it thus answers two purposes. Some instead of using varnish, polish with a steel burnisher, or rub well with a solution of wax and turpentine until the barrel has a shining appearance. The varnishing is the best for standing the weather, which is the great beauty of browning. We have seen some barrels that were beautifully finished, but rusted with the least dampness, either because the acid was not well killed, or because the oxide was not a sufficient protection to the iron.

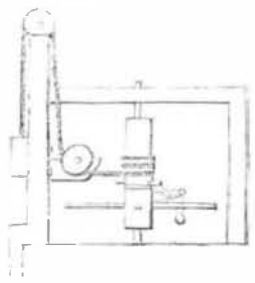
Some use a mixture of the chloride of antimony and olive oil for bronzing iron. The barrel is rubbed over with it, exposed to the air for one day and then rubbed over with a solution of weak aquafortis to quicken the operation, when the barrel is left exposed to the air till the degree of browning desired, is produced, when the same process described above is gone through for finishing.

Another plan is to make up in a quart measure 1 ounce of aquafortis, 1 ounce of alcohol and 3 ounces of blue vitriol and copperas half and half, along with as much water as will fill the measure. This is applied to the barrel with a fine rag or sponge till the whole surface is moist, and the barrel allowed to stand about one day, when the oxide is to be brushed off with a very stiff brush and the same operation repeated two or three times, till the barrel acquires the requisite color.—The gun barrels must all be perfectly free from grease and bright before the browning liquid is applied, or else if there is any grease on any part of the barrel (and there is danger of this from the oil used by the gunsmith,) the browning will be uneven. The barrel therefore should be rubbed first with lime and water to take away the rust and the lime has the effect of making the barrel a beautiful buff color, if it is allowed to stand on the barrel. Some of our gunsmiths may therefore make buff-colored barrels, merely using lime for browning and then varnishing on the top.—When the sulphate of copper is used in a browning solution, the wire brush must not be neglected in rubbing off the scales. Burnished muskets although giving an army a showy appearance, still should not be used—they are troublesome to keep clean and confer no benefit on the soldier. No rifle should be left unbrowned. The streaked appearance in gun barrels is given by browning with a pencil or any other means to make one stroke darker than another, by using a weak solution, or penciling one streak and not the other. The mixture with the sulphate of copper is to give a damask appearance.

For burnished muskets, the electrotyping process for silverizing, as described in the last number of the Scientific American, may be valuable and certainly not very expensive, while it would most effectually prevent all rusting.

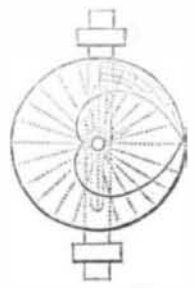
MECHANICAL MOVEMENTS.

Pile Driver.



This is a machine which has often been used for driving piles, in which the circular motion of the central perpendicular shaft is converted into alternate perpendicular motion in the weight on the left. The principal contrivance by which the weight is relieved when at its highest elevation is effected by the progressive increase of the coils of rope on the central shaft which press on a small lever to the right hand, and disengages the upper part of the shaft and allows the weight to run down, the upper part of the shaft being again re-connected as soon as the rope is run off.

Eccentric for an Uniform Traverse.



As eccentrics are used to copy different forms in Mechanical manipulation—so are they also used to produce or communicate different motions to machinery. As the true principles of sculpture and architecture are derived from a study of geometry, so are those of mechanical arrangement. Every mechanic should study the relationship of forms and their properties. The above figure belongs to the epicycloid and will produce that motion in machinery indicated by its title above, as the plane of the cam or revolving circle forms a constant angle with the plane of the fundamental circle. Romer, the Danish philosopher, who discovered the progressive motion of light was the first who proposed this curve for the teeth of wheels and which brought into use bevel gearing.

Benzoin Acid.

The tree which produces Benzoin is a native of the East Indies, particularly of the island of Siam and Sumatra. The juice exudes from incisions, in the form of a thick white balsam. If collected as soon as it has grown somewhat solid, it proves internally white like almond, and hence it is called Benzoe Amygdaloides; if suffered to lie long exposed to the sun and air, it changes more and more to a brownish, and at last to a quite reddish brown color.

This resin is moderately hard and brittle, and yields an agreeable smell when rubbed or warmed. When chewed it impresses a slight sweetness on the palate. It is totally soluble in alcohol; from which, like other resins, it may be precipitated by the addition of water. Its specific gravity is 1,092.

The white opaque fluid thus obtained has been called Lac Virginale; and is still sold, with other fragrant additions, by perfumers, as a cosmetic.

For Weak Ankles and Wrists.

Press round the muscles of the heel with the two thumbs, or more especially, the muscles below the ankle. If an assistant can be had, he can do it better. This operation strengthens the parts and promotes the circulation of the blood in its return to the heart. For the wrist, press and champoo the joint with the fingers.

Photography.

M. Niepce de St. Victor, in making some experiments in photography, finds that if a sheet of paper on which there is writing or printed characters, or a drawing, be exposed for a few minutes to the vapor of iodine, and there be applied immediately afterwards a coating of starch moistened by slightly acidulated water, a faithful tracing of the writing, printing, or tracing will be obtained. M. Niepce has also discovered that a great number of substances, such as nitric acid, phosphoric acid, chlorurets of lime and mercury, &c., act in a similar manner, and that various vapors, particularly those of ammonia have the effect of vivifying the images that are obtained by photography.

Sound Destroyed By Sound.

A tuning fork being struck and held over a glass jar produces one continued sound. Now take two tuning forks of the same note, and after fastening a circular piece of card on one of the prongs of each, put a little sealing wax on one to make it heavier than the other. On striking them both and holding them over the jar, there will be periods of silence, and periods of sound. This arises from the fact that sounds proceed in waves, and the periods above mentioned are according as the longer waves arising from one of the forks, overtakes and interferes with the sherter waves arising from the other.

Tracing Paper.

Mix 6 parts by weight of pure turpentine, 1 part of rosin and 1 part of boiled nut oil and apply it to the paper with a sponge. Then dry and you will have a tracing paper to suit to a bird's eye. Plumbago, a very small quantity mixed with the above composition and applied along with it makes very good paper for manifold letter writers.

Oil of Ben.

This is obtained from the Ben nut by simple pressure. It is remarkable for its not growing rancid in keeping, or at least not untill it has stood for a number of years, and on this account it is used in extracting the aromatic principle of such odoriferous flowers as yield little or no essential oil in distillation.

French Varnish.

Eight gills alcohol, pure; 4 ounces of shellac and 1 ounce of gum sanderac Put the gum sanderac and the shellac into spirits of wine in a stone bottle and set it past in a moderately warm place, shaking the bottle once or twice every day till all be dissolved.