Oils for Mixing up Paints.

Linseed oil is undoubtedly the best mixture for paints that are to be exposed to the weather. It absorbs oxygen, and becomes solid and water-proof, and yet it always possesses some elasticity which prevents it from cracking. Oils contain a considerable portion of glycerine, which is hygroscopic fat. It has been found that some metallic oxides possess the quality of combining with glycerine in in the oil, and rendering it susceptible of readily drying in the atmosphere. The oxide of lead, sulphuret of zinc, and the oxide of manganese boiled with oils, communicate to them great drying properties, and for this reason oils treated in this manner are called drying oils, and are in common use. Some works recommend the use of both sulphate of zinc and the acetate of lead mixed together for making drying oils. These two metallic salts, when brought together, produce two new compounds by double decomposition—namely, the acetate of zinc and the sulphate of lead, and the oil is restored to its natural condition. The acetate of zinc should never be employed in paints, because it is a bad drier. The drying of linseed oil has such an affinity for oxygen as to promote chemical union with it and the coloring pigment, and thus destroy the beauty of the color. There are many delicate pigments which cannot be employed with oil in paint without suffering injury. This is the case with chrome yellow, verdigris, gamboge and a number of the lakes. But wax is a very useful corrective for this deteriorating quality of the oil. Wax is a powerful antiseptic, and has great preservative powers. Added to painters' varnishes it tends to prevent them cracking—an evil which has destroyed the beauty of many excellent works of art. It is said that Titian painted on a red ground, and imbued his canvass on the back with beeswax in oil. Bleached wax is easily dissolved in hot oils, both volatile and fixed, it is not changed by exposure to the atmosphere, and is but very feebly acted upon by the strongest acids. Its appropriateness, therefore, as a mixture for paints is self evident. Many persons mix shellac varnish with common paint, in order to render the latter less expensive, because a considerable quantity of water can be added to the varnish and combined with the paint. Thus, if we take three ounces of the oil of bicarbonate of soda, and place it in three pints of soft water, it will dissolve a pound of gum shellac by boiling, thus making a lack varnish. To this is usually added half-a-pint of alcohol and two quarts of soft water, and it is then mixed with common oil paint. For inside work in houses it may answer, but it should never be applied to the outside of buildings because it cannot resist atmospheric influences like paint which contains only oil and a pigment. Gum shellac varnish made with the carbonate of soda does not stand the action of rain so well as varnish for which alcohol has been employed as a solvent. It should, therefore, never be used for any work exposed to the weather. In *Pasmas* it is stated that M. Dusbry, of Antemb, France, has found that benzine and coal oil are the best vehicles for paints of metallic bases (lead, zinc, &c.) as they dry rapidly, and have no smell after the first twenty-four hours.

Cold Weather and Steam Engines.

During the winter much more care is necessary to preserve steam engines from injury than in milder seasons. Feed pumps are particularly liable to be damaged by frost, and much delay and expense results from inattention to them. Every pump should be provided with a small cock, so that the water could be drawn off every night, and the same should be left open so that no driblets or leaks from the suction or supply pipe could run in and cause damage, as pumps are so situated that this might occur sometimes. A steam cylinder needs a warm coat in winter as much as a man does, and if at no other time of the year, the pipes and all other parts containing steam should be "lagged" or felted heavily, as the loss by radiation is something to be considered. Engineers who pride themselves on a good reputation in small bills for fuel and supplies, should see to it that they do not overlook this matter. It is no argument to say that the engine room is itself warm enough, for this is not so; heat is radiated from all bodies, whether their temperature be the same or nearly the same as surrounding bodies; for it is the tendency of heat to place itself in equilibrium. The strain on a feed pump, induced by freezing the contents, amounts to one-eleventh of their bulk, as water expands in that ratio by freezing. An unloaded shell, it is said, was once filled with water and exposed during a cold day. The hole was stopped with a plug which was thrown violently out of the shell, when the water froze, to a distance of 400 feet, while a cylinder of ice eight inches long protruded from the aperture. This experiment is one easily tried by our soldier mechanics, and though it may not be entirely successful, it serves to illustrate the force with which freezing water expands. In excessively cold weather, where steam boilers are allowed to get entirely cold over night and are fired up again in the morning, they will soon become leaky; as the constant extremes of expansion and contraction tend to produce that effect. An immense amount of fuel is wasted every year, even with the most careful supervision; but the quantity becomes enormous when little or no care is taken to prevent loss. In the winter this is particularly the case, and some steam pipes are as cold as if they had never had a pound of pressure in them; the result is easily seen at the end of the year.—*Scientific American.*

Steel Boilers in Prussia.

A steel boiler of the egg-end shape, 4 feet in diameter and thirty feet in length, without flues was tried. It had a steam drum 2 feet in diameter and 2 feet in height, and the plates were one-fourth of an inch in thickness. Beside it there was placed another boiler, similar in every respect, excepting that the plates were of iron 0·414 of an inch in thickness. The steel boiler was tested by hydraulic pressure up to 195 pounds on the inch, without showing leakage, and both the iron and steel boilers were worked under a pressure of 65 pounds on the inch for about one year and a half. During this period, the steel boiler generated 25 per cent. more steam than the iron one, and when they were thoroughly examined after eighteen months' practical working, there was less scale in