VALUABLE RECEIPTS.

Oils and Vehicles for Paints.—Linseed oil is undoubtedly the best vehicle for paints that are to be exposed to the weather. It absorbs oxygen and becomes solid and waterproof, 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 the oil, and rendering it susceptible of readily drying in the atmosphere. The oxide of lead, sulphate 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 oil. 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 original condition. The acetate of zinc should never be employed in paints, because it is a bad drier. The drying linseed oil has such an 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 canvas at the back with beeswax dissolved 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 vehicle 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 bi-carbonate of soda, and place it in three pints of soft water, it will dissolve a pound of gum shellac by boiling, thus making a lac 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 *Cosmos* it is stated that M. Oudry, of Auteuil, France, has found that benzine and coal oil are the best vehicles for paints of metallic basis (lead, zinc, &c.), as they dry rapidly and have no smell after the first twenty-four hours.

Manufacture of Wrought Iron direct from the Ore.

The following is an extract from Truran's "Iron Manufacture of Great Britain." It is of much interest to all our iron manufacturers:—

"The production of wrought-iron direct from the ore—the original mode of manufacturing—has engaged the attention of numerous practical and scientific men, and is practiced to a limited extent abroad; but the attempts made to reinstate it in this country have hitherto been, commercially speaking, unsuccessful; and though the ores and fuels we possess are unquestionably superior to the foreign for this purpose, fusion in the blast furnace and conversion into malleable iron by the puddling process are pursued with all the bar-iron now manufactured.

"The conversion direct into malleable iron dispenses with the blast furnace and appendages, and the intermediate processes of refining and puddling, and if successful, should result in the production of a finished bar of superior quality, with a smaller consumption of ore at a proportionately lower cost. In all experiments on converting on this plan, the bar is of inferior quality, the consumption of ore larger, and the cost of production augmented over that attending the manufacture by blast furnaces and refineries. The causes tending to produce this difference between the results of theory and practice are numerous, but will receive from us only a brief notice.

"The ore to be converted is ground to a coarse powder, and in mixture with a quantity of carbonaceous matter similarly divided, is charged into a reverberatory furnace not unlike the ordinary puddling furnace. The draught is forced to the production of a high temperature, reducing the ore to a semi-liquid state, when by dexterous manipulation on the part of the operative, metallic iron is separated from the extraneous matter, balled up, and shingled as in the usual manner. The theory of this operation is simple. The carbon of the carbonaceous matter is consumed by uniting with the oxygen of the ore, and the metal is left free to agglutinate into a mass. The Beaufort black band was thus converted into malleable iron, though after a few experimental trials the operation was discontinued. The principal objection to its extensive adoption seems to lie in the difficulty of effecting a complete separation of the extraneous metalloids of the ore. In the blast furnace it is accomplished by mechanical subsidation in the hearth and the extraction of the metallic iron from the low level; in the direct mode of manufacturing it is effected, to a certain degree, by severe manual labor, which, being skilled, commands a comparatively high price, and materially enhances the expenses incident to the process.

"The prolonged exposure of the metallic iron to the oxidizing influence of the flame and gases, during the process of separation from the alloyed matters, results in a considerable waste of metal, and accounts for the comparatively inferior yields.

"To obviate this loss, and to economize the fuel and labor demanded, the ground ore and carbonaceous matter have been subjected to the necessary heat in a closed supplementary chamber, whereby the combustion of the carbon is slowly carried on at the expense of the oxygen of the ore, but at a sufficiently low temperature to avoid oxidizing the mass. From this chamber it is drawn as required into the furnace, balled up and shingled; the deoxidized ore agglutinating without undergoing the puddling process, which, being essentially a decarburizing process, is unnecessary with the minimum volume of carbon consumed in the deoxydation of the ore in the close chamber.

"Ground carbonaceous ore may be substituted for the carbonaceous matter, and mixed in the necessary proportions with the same ore calcined, or with raw hermanite, the deoxidation can be effected without the usual ground coal, at a corresponding reduction in the expense. In this respect, the possession of ores of such varied character, gives the ironmasters of this country an important advantage over their foreign compeers; and, should this mode of manufacture, at some future day, become more profitable than at present, would enable them to maintain their supremacy in the trade. The rich carbonaceous ores of Scotland or Wales, mixed with the hematites of Lancashire or West Cumberland, or other similar ores, reduced in suitably-constructed furnaces, may be converted into malleable iron, at costs considerably under those incurred with the blast furnaces and subsequent decarburizing system.

"With existing modes of operation, the advantages of direct conversion are principally confined to the comparatively small capital required to establish the manufacture, which may be on the smallest scale, yet, to a corresponding extent, profitable. Hence it is especially applicable to new districts, requiring an immediate small supply, and to countries deficient in the capital necessary for carrying on operations on a large scale with blast furnaces, and attendant refining and puddling furnaces. To establish on a sound basis works consisting of blast furnaces, refineries, puddling forges, and rolling mills, a capital of at least £20,000 per blast furnace, where there are four, is required; with a fewer number, more. In the direct mode wrought-iron in proportionately smaller quantity may be manufactured, with a capital of only one-twentieth or one-thirtieth of that sum. In this respect, therefore, it is more advantageous, and may consequently, under certain circumstances, merit the preference over the established system."

The Work and Fate of the Sun.

The following is an interesting extract from a lecture of Rev. W. Leitch, D. D., of Queen's College, Canada:—

"Almost all the mechanical power on the face of the earth is traced to the sun. The sum of force in the universe is always the same, just as the sum of matter is always the same. The force may change its form, but its amount is always the same. This principle is known by the name of correlation of physical force. When the river leaps over the Niagara Falls and reaches the level beneath, its mechanical force is lost as to form, but it is transmuted into heat. The water at the bottom of the fall is increased in temperature, and were this heat collected it would be converted into mechanical power, exactly adequate to raise the water to its former level. The heat of explosion is converted into mechanical power when the ball is impelled from a gun. The mechanical power is reconverted into heat when the ball is suddenly arrested in its flight. The ball will be found to be hot exactly in proportion to its velocity when arrested. Now this is the case with the sun's heat. All the mechanical power employed by man can be traced to the sun. The water-wheel is turned by the sun. Its heat raises the water from the ocean and deposits it in the form of rain on the mountain's side. The river collects the rain, fills the buckets of the water-wheel, and by this process the sun indirectly works the machinery of the mill. The steam engine is not an exception. Its power is derived from the heat of the furnace, but the furnace depends for its power on fuel. But how should fuel possess this power? It has derived it from the sun. The fuel as growing wood stored up the power dispensed by the sun. The tree is the concentrated power of many summers' heat, and, though it may lie for thousands of years as coal in the bowels of the earth, it retains the power till it is evolved by burning. But you will say that animal power is surely different? Such is not the case. Every exercise of animal power costs some waste of tissue; that tissue is ultimately derived from vegetable matter, and the vegetable matter owes its power to the rays of the sun. Volition cannot create mechanical power; it can only direct and apply it. The only power not derived from the sun is that of the rise and fall of the tide, as far as this is due to the moon. The trade winds may also be regarded as an exception. This power is derived from the rotation of the earth, though the heat of the sun is necessary to develop the power. But the sun's fuel is limited, and the combustion must at last cease. The researches of the German chemists lead to the conclusion that the photosphere is fluid not gaseous. It cannot be conceived a continuous solid. It is also probable that the region of the incandescent metals in the state of vapor is the rose-colored stratum seen in total eclipses. Science has distinctly traced the doom written on the solar system. It is destined to pass away. The machine is running down. The central fire will at last be exhausted. The planets and satellites in their spiral courses will come to a standstill. But are we to arrive at the conclusion that God's glory shall no longer be manifested in the heavens? or that this system is to rush into annihilation? No, there is no ground in science for the belief that a single particle of matter will ever be annihilated; but there is every ground for the belief that the passing-away of the solar system is only one phase of some grander revolution, and that from the ashes of the present system more glorious worlds and systems may arise. All this is in perfect, almost literal, accordance with the Scriptures, which represent the heavens passing away as a scroll. 'They shall wax old as a garment; as a vesture shalt thou change them, and they shall be changed.' It represents the phenomenal world as ever changing—in a state of unceasing fluctuation—while the great absolute I AM remains ever the same!"

The copper shoe-tips, now so extensively used for children's shoes, are manufactured at Lewiston, Maine. Three million pair of tips are turned out annually at the factory.

In France every steam boiler is required by law to be furnished with a safety plug of fusible metal. It is composed of tin, 3 parts; lead, 2; bismuth, 4.