IRON AS A TANNING AGENT.

According to the Baltimore *News*, Prof. Dr. Kapp, of Brunswick, has succeeded in inventing a process for the tanning of hides which has produced a complete revolution in tanning, and will, perhaps, be of considerable importance in a politico-economical point of view. The new process does away entirely with the application of tan and consists simply in tanning by minerals which substitute a substance far less costly than tan, growing daily more rare, and saves considerable time and labor. Moreover, the process has been practically carried on for some time and sufficient, too, to establish its practical value, which, according to the present condition of things, is beyond all doubt.

Dr. Kapp's invention consists of three parts—first, the process of producing the material applied by this new mode of tanning; second, the process itself, and third, an apparatus for that purpose. To cure the leather, Dr. Kapp employs basic sulphate oxide of iron, prepared in a peculiar manner, totally different both in appearance and its other qualities from the salt of iron known by a similar name in commerce. To produce that salt he adds the necessary quantity of nitric acid to a boiling solution of the vitriol of iron. The development of gas having stopped and the oxide of iron being formed, more vitriol liquid, which, when evaporated, yields dry salt of the oxide of iron, a clear, deep, orange-colored varnish.

To cure the hides they are hung in the duly concentrated solution of the salt of iron, now cold, and they are now sufficiently cured, according to the thickness of the hide, in from two to four days, without being obliged to move, transfer or subject to any other of the mean processes.

With the preparation now ensuing it is not necessary to grease the hides nor hang them in a dry room, or tramp them in a vat or scrape off the grease by hand or work in the grain by hand. Of all the operations formerly in use none are retained in this process but to shave and perch them. The manual labor is replaced by making a solution of the greasing material in which the hides are steeped, while they are being dried and tramped at the same time.

The fats used to grease the leather are dissolved in the usual manner, and the hides are steeped into it. Besides the ordinary grease, you may apply stearine and paraffine, never before applied for that purpose. The dissolved grease combines with the solution of iron on the fibers of the hide to a soap of iron to be rubbed into the leather by a peculiarly constructed drum. This drum consists of one of those tramping vats, revolving round hollow plugs, which by means of these same plugs is fastened to a ventilator. Turning that drum the ventilator is set in motion at the same time, which during the tramping is made to ventilate the hides, being tramped and dried at the same time. Evidently the process is very simple, requires but little time, and much cheaper than the modes now in vogue. As said before, Kapp's process has fully stood the test, and will, ere long, entirely displace the old mode of tanning.

Dr. Fol, Director of the Experimental Institute for Leather Industry, in the "Industrial Papers," speaks very favorably of Kapp's process of curing leather by iron, for the first time represented at the Berlin Leather Exposition. The tanning with iron works substantially like that with alum, equal to tan materials, penetrate the hide, holding the fibers apart so they do not re-adhere. Alum, however, is dissolved in water and is washed out by it. Tanned leather is softened by rain, just like a hide, and stiffens when dry. Iron is washed out in the same way. Prof. Kapp has removed that difficulty, applying a soap of iron to the leather, by means of which the salts of iron are made insoluble and stay in the leather. Dr. Fol had boots made of that kind of leather, now worn by him, which are still pliable in spite of long usage. At the exposition named some shoes were made of iron-cured leather by the machines there exhibited.

MAKING SOAP IN CLOSED BOILERS.

A writer in the *Polytechnic Review* calls attention to an improvement in soap making devised by Mr. E. H. Gibbs, which consists essentially in introducing the ingredients into a strong closed vessel or boiler, and subjecting them therein to the effects of a high temperature and pressure, the intermixture of the ingredients being secured by mechanical agitation. In this manner, and with a very simple apparatus, the process of saponification is effected with great rapidity and economy, and it is claimed, with far more thoroughness, and, as the glycerine remains incorporated with the product, without the waste, that attends ordinary operation with the open kettle.

The apparatus employed in this process consists of a cylindrical steam boiler, through the center of which passes a shaft provided with wings or other suitable devices. This shaft set in motion either by hand or by power, according to the size of the boiler, serves to keep the charge in constant agitation during the operation of saponification, and thus to insure the complete intermixture and contact of the ingredients.

The boiler is charged through a hopper with the ingredients, grease, tallow, or oil, alkali, resin, etc., in the usual proportions, and the boiler being fired, the charge is subjected, under constant agitation, to a pressure of from 120 to 150 pounds per square inch, which is found to effect the complete decomposition of the fatty matter and its saponification in the space of six hours. With a boiler 30 inches in diameter and 11 feet long, it is affirmed that 2,000 pounds of soap can be made and put in the frames in three hours, so that where four runs per day are made from one of these boilers, which we are informed can be done in case of necessity, (three runs daily being the average), the apparatus will make as much soap as 24 boilers of the same size would by the ordinary process with the open kettle.

It is officially stated that the New York Central and Hudson River Railroad Company's January earnings were $800,000 more than in any previous month in the history of the company, and that the total earnings for the past four months aggregated $10,000,000.

A CHANCE FOR OUR INDUSTRIES IN AUSTRALIA.

The Australian International Exhibition of 1879, seems likely to be of considerable importance. This will be especially true to those engaged in the industries of this coast, for Australia is a thriving trade-neighbor of ours. We should by all means show her what fine manufactures and productions we can furnish to her. Australian papers state that arrangements are in progress for the International Exhibition proposed to be held in Melbourne in 1879, and the scheme has the approval of the Legislative Assembly. The Governor, speaking recently at Stawell, said that the proposal could not fairly be described in any quarter as premature, if regard were had for the wonderful progress which the Australian colonies have already achieved. In 1879 the aggregate public revenue of the several Australian colonies will exceed sixteen millions sterling, while their trade, including exports and imports, will amount to nearly ninety millions in value. In other words, Australasia, as a whole, could already take her place among the 10 or 12 great nations of the world in point of value of their trade and general importance, for there are only seven or eight nations with a larger public revenue than sixteen millions. The three powerful colonies of Victoria, New South Wales and New Zealand have each a revenue and trade which would place them on a higher scale than ancient European kingdoms, like Sweden, Denmark, and Saxony. The single colony of Victoria, with its yearly revenue of four and one-half millions, is already equal in wealth and importance to the kingdom of Portugal, while Melbourne is considerably above Lisbon in wealth and trade. The success of the exhibition, he pointed out, would depend in a great measure upon the cordial co-operation of the mother country and the sister colonies of Australasia. His Excellency further stated that he was in correspondence with the Secretary of State for the colonies, who was anxious to give every possible assistance, and that the presence of the Prince of Wales was all that was needed to render the exhibition a triumphant success. He expressed himself confident that his Royal Highness, if invited by both Houses of Parliament, might be induced to come out to open the exhibition, and he was certain he would be received with enthusiasm.

DELICATE TEST FOR GOLD.

Faraday's researches upon the nature of thin films of gold and other metals, and upon the size of finely divided particles of gold diffused through various liquids, are reviewed by the *Jeweler*: Availing himself of the well-known reducing power of phosphorus, he floated small particles of it upon the surface of weak solutions of chloride of gold. In the course of 24 hours he found that the surfaces of the liquids were covered with films of metallic gold, which were thicker near the pieces of phosphorus, possessing the full golden reflective power of the metal, but becoming so thin by gradations as to be scarcely perceptible. They acted as thin plates upon light, producing the concentric rings of colors round the phosphorus at their first formation, though their thickness then could scarcely be the 1-100th, perhaps not the 1-500th of a wave undulation of light. By treating very dilute solutions of gold with phosphorus, he obtained the metal diffused through the liquid in extremely fine particles, producing a beautiful ruby color. These particles, when in their finest state, often remain unchanged for months, and have all the appearance of solutions, but they never are such, containing in fact no dissolved but only diffused gold. The particles are rendered evident by gathering the rays of the sun, or a lamp, into a cone by a lens and sending the part of the cone near the focus into the fluid; the cone becomes visible, and though the illuminated particles cannot be distinguished, because of their minuteness, yet the light they reflect is golden in character and seen to be abundant in proportion to the quantity of gold present. Portions of gold, so diluted as to show no trace of gold by color or appearance, can have the presence of the diffused solid particles rendered evident by the sun in this way.

Errors in Using Surveyors' Compasses.—A correspondent of *The Engineering and Mining Journal* mentions some minor sources of error in taking readings from the compass while surveying. After noticing certain inexplicable vagaries of a compass needle, and testing the metal of the instrument, and afterward examining the observer's pockets to determine whether anything of iron or steel was on his person, the cause of variation was discovered in the frame of the magnifying glass. The frame was of vulcanite, or hard rubber, polished to a high gloss; this frame was liable to become electrified by the slightest friction, such as is caused by carrying in the pocket. Further investigation showed that from a variety of similar causes, all ordinary frames of magnifiers are apt to give like trouble, and now ones had to be specially made which were free from the defect. The impure metal of cases, rivets and other parts may give rise to this attraction; an iron ring is sometimes inserted to fix the glass in the frame. Sometimes the observer may unconsciously carry the iron in his hat, in the wire that stiffens the brim. Aluminium, especially when hammered, has the polarizing property. Finally, there is a story of a land surveyor who had the appearance of his compass improved by nickel plating, which was applied to almost the entire instrument—ball, socket and sights—the effect of the needle being the same as if the brass had been coated with iron.

Hardening Small Tools.—It is said that the engravers and watchmakers of Germany harden their tools in sealing wax. The tool is heated to a whiteness and plunged into the wax, withdrawn after an instant and plunged in again, the process being repeated until the steel is too cold to enter the wax. The steel is said to become, after this process, almost as hard as the diamond, and when touched with a little oil or turpentine, the tools are excellent for engraving, and also for piercing the hardest metals.

THE EVAPORATIVE POWER OF LOCOMOTIVE BOILERS.

This important mechanical subject was discussed recently by an English society of mechanical engineers. The effort was to set at rest certain widely diverging opinions which existed among practical men with reference to the evaporating efficiency of the various elements of a locomotive boiler, such as the area of the fire-grate compared with the total heating surface, the ratio between the tube surface and the fire-box surface and the rate of combustion per square foot of the fire-grate. The results of the discussion seem to be as follows: That no fixed rule could be established as the best for the relative proportions of the fire-grate, fire-box and tube surfaces; that length of tube had nothing to do with economic effect; that the diameter of the tube was also a matter of indifference; that economy of fuel did not depend upon the rate of firing; that when the quantity of fuel burnt was moderate, say 50 pounds or 60 pounds per square foot of grate per hour, the combustion was nearly perfect, while with hard firing there was considerable loss from carbonic oxide passing away unconsumed, and that a large increase of heating surface in proportion to coal burnt only slightly increased the economic effect, which, within the limits of practice in locomotive engines, was nearly in proportion to the fourth root of the heating surface.

In an Addendum the action of the blast-pipe was discussed. It was contended that, though a powerful agent in affecting rapid combustion, it was, *per se*, a very extravagant one; yet in general, in the case of locomotive engines, this extravagance was not chargeable to it, since there was a large quantity of steam which was available and would otherwise be wasted. A formula was given for calculating the power of a jet of stream, as an agent for creating a draft, based upon experiments made in 1851 and 1852. When applied to the blast-pipe of the locomotive, this showed that, on an average, the power required to force the air and gases through the fire-grate and tubes was only about 8½ % of the potential power of the steam escaping through the blast-pipe. In conclusion, it was pointed out that a large increase of effect would be obtained by subdividing the exhaust steam into a number of small jets instead of relying upon one large one, and that, under certain circumstances, this increase of power would be of great utility.

Coal-Tar Colors.—In a recent lecture, in London, Prof. Armstrong reverted to the proposed extensive production of coloring matters from coal tar, from which great things were prophesied some years ago. It was found that though aniline was yielded from coal tar in but small quantities, benzol was yielded plentifully, and that, by the addition of nitric acid to it, nitro-benzol was formed, and this, when submitted to the action of reducing agents, was converted into aniline. Thus a cheap and plentiful source of aniline from coal tar was some 20 years ago discovered. From this aniline we have dyes of violets, reds, yellow, green, blue and many newly-discovered shades. Since England has so large a supply of coal, it might have been expected that she would soon have been independent of the supply of animal and vegetable dyes from abroad and have been the greatest color-producing country in the world. This has, however, not been realized and England is gradually falling further and further behind Germany and France. The reason is given by Prof. Armstrong as follows: "Our manufacturers do not attempt to employ the co-operation of skilled chemists. If they were to seek them in England, they would not obtain them, as there are so few that have had the requisite training to conduct the work. We have in England no school where instruction is given in the particular kind of chemical work that is required." This result Prof. Armstrong attributed partly to the indifference of English Universities to the practical wants of the country.

Prize for Researches Concerning Oxygen.—The influence of the animal organism of breathing pure oxygen gas of density corresponding to ordinary atmospheric pressure, has not hitherto been adequately determined. The Royal Society of Gottingen, says *Nature*, therefore offer a prize for new researches on the subject, made both on homoithermal, and, as far as possible, on poikilothermal animals. In these researches, while certain externally visible phenomena in the animal will have to be considered, special attention is desired to be given to the nature of the blood and the exchange of material (excretion of carbonic acid and nature of urine). The oxygen used should be carefully freed from all foreign matters apt to occur in manufacture, while a limited (and perhaps hardly avoidable) admixture of atmospheric nitrogen would not compromise the results. In the Mathematical class, the Gottingen society desires (and offers a prize for) new researches in the nature of the unpolarized light-ray, "fitted to bring the conceptions of natural light of any origin near (in definiteness) to those which theory connects with the various kinds of polarized light."

Test for Alcohol.—A very sensitive reagent for alcohol, and one that is very simple in its mode of application, says the *English Mechanic*, has been found by M. Jacquemart. It is a solution of nitrate of mercury, obtained by treating the metal wfth a little nitric acid of average concentration. The action is vigorous and rapid. The mercury is brought in part to the minimum of oxidation, and if a little ammonia be added to the mixture after reaction, a dark precipitate is obtained, which is darker the more of alcohol there is in the product suspect. Methylic alcohols and similar liquids do not give a dark precipitate with ammonia.

Aneroid Barometers.—For measuring hights not exceeding one-quarter mile above the sea by means of the aneroid, Admiral Fitzroy proposed the following method: Divide the difference between the reading at the upper and lower stations by 0.011; the quotient is the approximate hight in feet.

AN ENGLISH IMPROVEMENT IN BLASTING CARTRIDGES.

We read that improvements devised by Englishmen have for their object the affording of greater security, ease and facility than heretofore in manipulating, transporting, and storing cartridges, and consist in making cartridges filled or to be filled with gunpowder or other equivalent explosive matter, in the ordinary manufactured state or in any state of manufacture, hollow, with an inner tube or tubes passing through them, and by means of such tubular or hollow space or spaces, passing one or more fuses through such cartridges; and also, when it is required to increase the charge afforded by one such loaded cartridge, stringing two or more of such cartridges together on the said fuse or fuses. Also in turning up, looping, or otherwise treating the fuse or fuses so introduced for the purpose of securing and firing the cartridge or cartridges strung thereon. The cartridge is to be made of any convenient material, tubular or any desired shape in section, and of an inner and outer tube or chamber arranged concentrically one within the other, or otherwise, and forming between them a hollow receptacle for the reception of the gunpowder or any other explosive equivalent; and the ends of such chamber or hollow receptacle are to be formed of or secured by annular disc or other shaped pieces, so secured to the walls of the hollow receptacles that when completed and charged the explosive material shall not fall out; or other convenient modes of securing the ends may be employed, but in all cases so arranged that the fuse or fuses pass easily, and so a hollow cartridge be formed ready for stringing on a fuse or fuses.

A Special Car.—Mr. Johnson, a traveling musician, being in Garland, Colorado, and anxious to depart, manufactured a velocipede, with which he proposed to travel into Texas. Having become possessed of two two-wheeled velocipedes, such as were in common use a few years ago, he proceeded to fasten them together to run on a railroad. Wooden axles were constructed so that the machine could be adapted to any gauge of track; a broader tread was placed on the wheels, to which were added flanges made of whisky barrel hoops; levers were fitted to give means for using the hands as well as the feet to gain motive power. The whole arrangement was given a coat of red paint, and it was placed on the track at Garland ready for service. The machine weighs about 40 pounds and is easily handled. The operator sits on a seat, resting across what were the two seats of the old velocipedes. Johnson mounted his novel traveling apparatus at Garland, and proceeded without accident, traveling at the rate of 15 miles per hour. Altering the gauge of his car to suit that of the Atchison, Topeka & Santa Fe railroad, he started for the East. Johnson is an old railroad man, and always provides himself with a time-card, so that he can keep out of the way of the regular trains. His apparatus is so light that it can be moved from the rails in a moment.

Retrogression at Sheffield.—The *Ironmonger's Review* says: A few days ago one of the oldest scissors manufacturers in Sheffield, whose business lies chiefly with London houses, called upon a well-known firm in Bond street, and the principal informed him that they were going to exhibit at the Paris Exhibition, and they wanted him to make them a set of elaborately worked scissors, something that would show the progress that had been made of late years in this special branch of industry. "I couldn't do it," was the answer. "Oh! nonsence," said the gentleman of Bond street; "you remember those splendid goods you made us more than 20 years ago, and which we had at the Exhibition of 1851. Here they are;" and he produced from a drawer some of the most exquisitely beautiful scissors that had ever left a Sheffield workshop. The manufacturer looked upon them with almost paternal affection, and then said, "I could not make you such goods now if my life depended upon their production." The result of the interview was that these old scissors were brought back to Sheffield to be polished up, and they will do duty again in the Paris Exhibition; and we venture to predict that they will command no small amount of admiration.

The Cost of Railroads.—In reply to an assertion by Mr. Huntington that the Pennsylvania railroad cost $400,000 per mile, Mr. Thos. A. Scott stated before a Committee of Congress that this was simply untrue, and added: "If you will take up the report of that road for the last fiscal year, you will see that the cost was $38,000,000 on 360 miles of road, or $120,000 a mile, a very moderate cost for one of the best constructed and equipped roads (having a double track and steel rails) in the United States, if not in the world." The cheapness of railroad construction in these hard times is very clearly shown by the fact that the Chicago & Alton Company, which is not one that will put up with anything less than a first-class structure, has let a contract for the extension of its Missouri line to Kansas City at the rate of $15,000 per mile, excepting the bridge over the Missouri, the bridges to be iron and the rails steel. As the company can get money at about 6%, it will only need to make about $1,000 a year net earnings to pay interest on this cost.

The President and the Surveys.—A dispatch from Washington says that President Hayes, in company with Albert Bierstadt, the artist, who is now visiting the Executive Mansion, spent a considerable portion of an afternoon at the Washington headquarters of the Hayden survey of the Territories, and evinced great interest in the exhibit made by the Professor and his assistants of the methods and results of the scientific work of the various expeditions.

Manufacturers' Railways.—Krupp's vast cannon and rail manufacturing establishment in Germany, says the *Railway Age*, illustrates the adaptability of the steam road to private industrial uses, as it contains over 37 miles of railway, with 24 locomotives and 700 cars. Of stationary engines and boilers there are no less than 298, representing 25,000 horse power.