Notes & Queries

S. asks for the best mode of preparing caustic lye, for soap making, from soda ash.

F. E. H. asks for the best means of cleaning light kid gloves.

A. R. asks: What can be mixed with clay that will harden it, without using fire?

F. D. H. asks: How can I make good liquid stains to imitate black walnut and oak?

A. H. G. asks: How can I stereotype from wood cuts? What is used for molds and how is the metal poured so that all the lines will be perfect?

W. H. H. asks: How can I make a waterproof tarpaulin cover to throw over a wagon in case of an unexpected shower?

H. D. T. asks what kind of varnish is best for transferring prints on to wood? Can colored prints with their various colors be transferred to hard wood?

S. asks: Why will a piece of cold iron covered with grease remain at the bottom of a kettle full of melted iron, while a piece that is not greased will rise to the top?

A. A. asks: Is it safe to carry a pressure of 20 lbs. to the square inch in a boiler well made of 1-16 inch copper, the dimensions of the boiler being 12 inches long x 6 inches diameter?

E. H. R. says: I have just finished building a brick kiln, and I would like to know what degree of heat it will require to dry lumber, such as flooring, etc., in the shortest possible time without injuring it?

R. B. says: I want to paint an engine. There is a good deal of grease on it, and I want to know: 1. How I can get it off best? 2. What kind of paint is best to stay on where it is hot? What kind of paint is used to make new engines look glossy?

J. P. H. asks for a practical plan for boring or scraping out the cylinder of a portable engine, without detaching it from the boiler. "Cannot scrapers be set in a wooden shaft and on paper backing to raise them to their work, the shaft being turned to fit the cylinder, which is of 6½ inches diameter?

J. M. asks: What is the cause that we cannot keep the wings on a blower which we use for cleaning grain? It is a suction blower, 1 foot diameter x 8 inches high, and it runs at 1,600 revolutions per minute. It is made thus: A ¾ inch iron shaft with a block of wood 3 inches square. The wings are of heavy sheet iron, nailed on to the block; and they tear off the nail heads. If we put them on with screws, the screws break off close to the wood.

G. W. K. says: I have a number of heavy muslin or canvas coverings which are made waterproof by being saturated with boiled linseed oil. The trouble is that when they are folded and packed away, they stick together so tightly that it requires the strength of several men to pull them apart. What can be put on and mixed with the oil to prevent sticking and yet keep them soft enough to bear folding without injury? Is there anything that is cheaper and better than the oil?

W. & Co. ask: Can any of your correspondents give us a recipe by which we can make a shingle roof fireproof? The roof is felt, composition, and sand; it has been on for 5 years and is so much bother to keep tight that we have to put on a new roof, and would much prefer shingles provided we can make them so that the danger from fire is not increased. We propose pointing or dipping the shingles before they are laid.

C. J. H. asks: What is the best thing to do to work an oil deposit most advantageously? The following are the circumstances: The bore shows about 10 feet of soil, then from 7 to 15 feet of sand saturated with petroleum, then various strata of gravel, sand, clay, each with more or less petroleum, going down to a depth of 120 feet. From this, down to 980 feet, the gravel, sand, and clay continue. The sand yields on distillation about 30 gallons, and, from the bore, a barrel or so of oil is pumped daily. Should the bore be continued? Would it be practicable to mine the chalk where there is so much gas? The chalk samples yield from 30 to 35 gallons superior oil. The chalk oil at 60° Fah. showed 922, but contains very little tarry matter. After once running, the gravity was 905, and the analysis showed: Burning oil at 60°, gravity 822, 23·3 per cent. Heavy (blue) oil, gravity 918, 63·2 per cent. Solid paraffin, a trace. Loss on refining, 2·5; by acids and alkalies, 8·5; by distillation, 2·5.

H. S. will find full directions for making Alaska scenery on p. 128, vol. 28.—C. C. can work out his problem by following the instruction on p. 257, vol. 28.

THE BOUNDARY LINE BETWEEN ARITHMETIC AND ALGEBRA.—There are many problems which can be solved as well by the arithmetical as by the algebraic method; but there are others which, although they appear to consist of conditions belonging simply to the field of arithmetic, require for their solution the algebraic mode of calling the unknown quantity by some sign, say x, and treating the resulting expression after the regular rules taught by algebra; then the solution, which otherwise is highly intricate, becomes a work of mere manipulation of signs. A problem of this kind was recently sent us by a correspondent of Cambria, Wis., who states that some persons claim that it is utterly insoluble, while others think that there is a solution, if only they could find it; he says further that the Normal School at Oshkosh cannot solve it, meaning, we presume, that some of the students were unable to do so. The question is this: "A merchant has two grades of wheat with 25 cents difference in their value; a customer buys one dollar's worth of each grade, mixes them, and finds that he has exactly two bushels of the mixtures. At what rate per bushel did he pay for each grade?" The following is the solution: Call the price per bushel of the cheapest wheat x cents, then that of the better quality is $x+25$ cents, which, when expressed in dollars is $\frac{x}{100}$ and $\frac{x+25}{100}$ of a dollar. As now the quantities obtained for the same amount of money are in an inverse ratio of the price, the relative quantities of wheat which the customer buys for one dollar each will be $\frac{100}{x}$ and $\frac{100}{x+25}$, and as the two quantities are stated to be 2 bushels, we have the equation $\frac{100}{x}+\frac{100}{x+25}=2$. Bringing these two fractions under the same denominator, by multiplying numerator and denominator of the first by $x+25$ and of the second by x, we obtain $\frac{100x+2500}{x^2+25x}+\frac{100x}{x^2+25x}=2$

$\frac{200x+2500}{x^2+25x}=2$. Multiplying each term of this equation by x^2+25x, we obtain: $200x+2500=2x^2+50x$; divide by 2, $100x+1250=x^2+25x$, or $x^2-75x=1250$. This reduces the whole problem simply to the solution of this equation of the second degree, which we do by adding to each number the square of the half of 75, or $37{\cdot}5^2=1406{\cdot}25$, which gives $x^2-75x+37{\cdot}5^2=1250+1406{\cdot}25=2656{\cdot}25$. The square root of this equation is $x-37{\cdot}5=\sqrt{2656{\cdot}25}=51{\cdot}54$, and $x=51{\cdot}54+37{\cdot}5=89{\cdot}04$ cents, which is the price of the inferior wheat per bushel; while the better quality costs $89{\cdot}04+25$ or $114{\cdot}04$ cents. We have given the operation here with much more detail than is customary in such solutions, but this is for the benefit of those not very familiar with such algebraic operations; for the satisfaction of the same we will now test the solution: The amount of wheat worth 89·04 cents per bushel, which can be had for one dollar or 100 cents, is evidently equal to $\frac{100}{89{\cdot}04}$ bushel, and for the same reason, that of 114·04 cents is equal to $\frac{100}{114{\cdot}04}$ bushel. If now we bring these two fractions under the same denomination we obtain $\frac{11432}{10154}$ and $\frac{8900}{10154}$; and adding them together, we have $\frac{20332}{10154}$ bushels, which is exactly 2 bushels.

J. asks: Will heat affect the attractive power of a permanent magnet? 2. Are oxygen and nitrogen gases combustible? Answers: 1. Heat diminishes the attractive power of magnets. 2. Oxygen supports combustion. Nitrogen does not.

C. J. C. asks for a process for tempering trap springs. "I want full directions for hardening and drawing the temper, and the best method of heating. Will a common blacksmith's forge answer, or will a Lehigh fire do?" Answer: Heat to a bright cherry red, either in a furnace, so constructed that they will not come in contact with the coal or flame, which are liable to contain sulphur or other base minerals, or they may be heated over a charcoal or coke fire. Harden by plunging, when hot, into a bath of pure whale oil (be very careful that it is not adulterated). To every gallon of oil, add 6 lbs. of rosin, 1 lb. beeswax, and 2 lbs. mutton tallow, and you may add 1 lb. pine pitch. Melt the rosin first, then add other ingredients, and melt together, and stir into the oil when hot. The vessel containing the hardening bath should be surrounded with cold water to prevent overheating. Be sure that the springs always harden to a silver white, so that a file will not cut them. After hardening, clean off the loose oil with fine saw dust, brushing off that which remains loose. Then draw the temper slowly until the oil is all burned off and steps smoking. This may be done best in an open wire cylinder over a charcoal fire in a sheet iron furnace, similar to that used for roasting peanuts or browning coffee, or it may be done in a well constructed hot blast oven, or even over a charcoal or coke blaze. Let them cool off in the atmosphere. The mixture for hardening can be kept up by occasionally adding rosin, beeswax and tallow. The principle of always getting a good spring temper is to first get the steel hardened thoroughly, without overheating or fire cracking it; then, by drawing it down to a dead blue, or until the oil is burned off. Four years experience in tempering cavalry sabers and swords taught me this.—J. E. E.

M. P. The idea of propelling canal boats by wheels running on the bottom is very old.

J. G. asks if there is any machine invented for felling large timber trees, which will save the great loss consequent upon felling with the common axe, or that will perform the work in a shorter time. If so, what is it? Answer: Several devices for this purpose have been published in the SCIENTIFIC AMERICAN, and some of them illustrated.

S. B. E. asks: When did James Watt complete his first engine, and when and to whom was the first patent given for a steam boiler? Answer: James Watt completed and patented his first engine in the year 1768-9. Papin used a steam pressure boiler in 1695, and Savory patented a steam engine with a pressure boiler in 1698.

H. A. B. asks: What proportion of burnt clay should be mixed with quick lime after the lime is slaked, to make good water lime cement? Answer: Our correspondent should read page 411 of Miller's "Elements of Inorganic Chemistry." The subject is too large to be discussed in our columns.

L. R. asks for further instructions on tempering steel, asking us to select a recipe suited to his case. This we are unable to do, as we have no knowledge of his requirements. We have lately given much space to this subject: and on page 283 of our current volume the matter is discussed at full length.

W. A. S. says: 1. I enclose a piece of scale from our boiler. Will you please tell me of what it is composed, and what I had better use to prevent it? 2. How long ought a stationary boiler to last with careful use? We blow off twice a week and clean out twice a year. 3. Can you give me a rule for finding the strength of any section of malleable castings or for cast iron? Which is the stronger? 4. What is the cheapest and most convenient article for making cloth or rope fireproof? 5. I have also a little invention on hand. Is there any place in Boston where I can get access to the Patent Records, that I may see if I have got anything new? Answers: 1. The scale is composed of sulphate of lime principally, with some magnesia, sand, clay, and iron oxide, and a little salt. If the incrustation does not collect with considerable rapidity, chloride of barium is a good preventive of its deposition in this dense and hard form. The scaling hammer, properly used, where the deposit is accessible, takes it off most effectually and inexpensively. 2. We have known steam boilers of the plain cylindrical class to last thirty years. Marine tubular boilers are expected to last 6 or 8 years, but sometimes are kept running more than twice that length of time. 3. The best cast iron, such as is used for ordnance, bears a tensile pull of 30,000 pounds per square inch, or more. Ordinary metal has about two thirds that strength. Malleableized cast iron has a strength of from 25,000 up to 45,000 pounds per square inch according to quality. 4. Tungstate of soda. 5. The Public Library.

M. H. B. says: I have a little engine with a cylinder 3 inches in diameter and 6 inch stroke; ought it to take about 20 lbs. of steam to run it? When I take hold of the fly wheel, it is about as much as I can do to turn it with both hands. The boiler is an upright, 6 feet high and 26 inches in diameter, with 22 two inch flues. How many horse power would that be? Is it a good idea to have nothing but a thin place in the eccentric rod to overcome the up and down motion? How long ought a boiler and the engine, made as above stated, to last? Answer: The engine is decidedly in need of attention. It ought to run, without load, with four or five pounds of steam. The eccentric rod is often so made and answers very well on very small engines. A plain boiler, well taken care of, should last many years, and the engine much longer than the boiler. Some of James Watt's engines are still at work.

G. T. R. says: A friend states that an ordinary wooden pump, placed in a well with a tight oaken platform, over which a layer of three feet of yellow clay has been tightly tamped, will work perfectly and permanently. I do not believe it will, as the water is elevated by atmospheric pressure, which in this case would be partly or wholly removed. Which is right? Answer: If the well were made absolutely air tight, the pump would not work. We think it probable that, even where arranged as described, sufficient air would enter the well through the surrounding soil or the top to allow of its operation.

C. M. D. asks: Is corn a profitable fuel at 20 cents a bushel, when wood is $5 per cord, say for a 10 horse power engine? Answer: It requires about 50 bushels of corn to weigh as much as a cord of wood; 40 will weigh as much as a cord of soft pine. The chemical constitution of wood and grain is about the same, and they therefore should be of about equal heating power, pound for pound. We can therefore conclude that, if wood is worth $5 per cord, a corresponding weight of grain at 20 cents per bushel would cost $8 or $10. Burn your wood and sell your grain.

I. W. F. asks: Can you inform me how they grind old razors, and what the machinery used is? Answer: By means of fine stones, the same as other cutlery.

C. W. O. says: In your issue of April 19, A. M. says: "I am running a saw mill making 500 revolutions per minute;" and after giving size of mandrel, kind of box, etc., he goes on to say that "the box next to the saw runs hot in spite of all efforts"; in answer to which you give a method of lining a box to prevent said heating, namely, by putting oiled paper around the journal while pouring off the Babbitt metal. Now as we are running quite a number of saws, large and small, I should like further light on this subject. We have at present a 50 inch saw on a 3 inch mandrel, making 825 revolutions per minute, in boxes lined precisely as you advise, in which it has been running for several months, during which time the box next to the saw has not run cool for a single day, though the box on the other end of the mandrel, made in the same way, runs very nearly cold. The power for driving the saw is obtained by a 12 inch belt on a 23 inch pulley at the side of the last named box. Now why does the journal at the end next the saw heat, and the one on which the weight, caused by the tension of the belt, rests run cool? The boxes have been relined three or four times in two years, and always with the same result. The motion is steady for 11 hours per day, stopping one hour at noon; and the best of oils are used. Answer: Saws unevenly ground or filed out of shape are out of balance; this will cause the box at the saw end of the mandrel to heat. When the saw is in the cut, there is little or no weight on the lower part of the box, unless the belt draws downward; or, in other words, when the saw teeth are in the cut, the tendency is to lift the mandrel and throw the pressure against the cap or upper part of the box; and the pressure of the timber against the teeth forces the arbor back against the side of the box, so that the pressure of the journal is con