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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 286,

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PRINTING INK.

A few years ago the preparation of printing ink was considered a part of the printer's trade; now there are very few printers who have more than a remote idea as to the composition or preparation of the inks they use.

The manufacture of such inks has of late years developed into a distinct industry, employing hundreds of thousands of dollars capital, and turning out hundreds of tons of ink annually.

The basis of all ordinary printing inks, from the cheap poster and news to the finer lithographic and plate inks, is a varnish, prepared from oils, chiefly linseed, although nut oil is sometimes used, and rosin oil frequently introduced in the cheaper grades.

Where linseed oil is used this *varnish* is practically anhydride of linoleic acid, the fatty constituents of the oil—glycerine, palmatine, etc.—having been volatilized by heat. For the better class of inks old oil is preferred. It is usually purified by heating it for several hours by injected steam or otherwise, with oil of vitriol (sulphuric acid) diluted with about three times its weight of water. The acid solution having been drawn off the oil is washed by agitation with boiling water, and, after standing to allow the latter to separate, is run off into storing vessels. From these the oil is transferred to iron caldrons provided with stirring apparatus and covers. A moderate fire in a small furnace beneath gradually heats the oil, which only half fills the vessel (to prevent accident by foaming) and the stirring apparatus is set in motion. The moisture in the oil is gradually dissipated, and as the temperature approaches 570° Fah., an inflammable vapor or smoke begins to escape from the boiling oil; a scrap of burning paper secured in the cleft of a long stick is thrust into the smoke, which is thereby ignited. The fire below is drawn and smothered; the oil, or rather the gases given off by the oil, are allowed to blaze, the combustion being kept within bounds by partly covering the pot if necessary. Samples of the oil are taken out from time to time and tested by cooling a few drops on a plate of glass or tile. When the drops thus chilled glaze over quickly and draw out into strings of about half an inch between the fingers, the flame is extinguished by putting the cover tightly over the pot. The oil is then again heated over a moderate fire to the boiling point, and the heat and stirring kept up for several hours, small quantities of drier being introduced by some manufacturers.

Varnishes of several degrees of thickness—from greater or less boiling—are prepared in this way to satisfy the requirements of the different kinds or grades of ink, and to modify their consistence to suit the climate where used, thinner ink being required in cold than in warm climates.

For black letter-press ink the color and character are usually imparted to the varnish by the incorporation with it of lampblack or carbon black, Prussian blue, indigo, resin, and soap. The proportion of these vary according to the purpose for which the ink is intended. The following will serve as an illustration of the composition of a good letter-press ink: Varnish (prepared as above), 1 gallon; resin, 4 pounds; brown resin soap, 1⅛ pounds; purified lampblack, 5 pounds; Prussian blue and indigo, each 1¾ ounces.

In compounding the ink the resin is finely powdered and gradually stirred into the varnish, made hot enough to melt and dissolve it. The soap, previously cut into thin slices, dried, and rubbed into fine crumbs, is next introduced, a very little at a time, as the moisture it still retains is apt to occasion a violent commotion as it is driven out by contact with the hot varnish. The addition of soap to printing ink increases the sharpness of the print and tends to prevent smearing or clouding of the work. The mixture, after cooling somewhat, is poured over the lampblack, and finely powdered blue pigments placed in the bottom of a suitable vessel, and the whole is well stirred together and then ground in a paint mill until reduced to a very fine, smooth, and uniform paste.

The quality of such inks depends largely upon the thoroughness with which the pigments are incorporated with the paste by grinding.

Lithographic inks are simply very fine printing inks made somewhat more fluid than required for letter-press or cut work. The ink used for engraved or plate work is usually a heavy printing ink made with ivory black, or ivory and carbon blacks, instead of lampblack.

Colored printing inks are made from fine, clear linseed oil, boiled into a varnish as above described, and appropriate pigments. The pigments used are carmine, lakes, vermilion, red lead, Indian and Venetian reds, chrome yellow, chrome orange or red sienna, gallstone, Roman and yellow ochers, verdigris, indigo, Prussian blue, Antwerp blue, ultramarine, luster, umber, sepia, and various mixtures of these.

A very fine printing ink may be prepared without burning, and the risks attending boiling oil may be avoided, by using the following receipt: Balsam of capivi, 9 ounces; resin soap, dry, 3 ounces; lampblack, purified, 3 ounces; Prussian blue, 1¼ ounces; Indian red, ¾ ounce; creosote, 3 drops. Grind all together on a stone slab, with a muller, to a very smooth and uniform paste. Any of the colors above enumerated may be substituted for the lampblack and other pigments in the above formula to produce colored inks.

In Germany an ink, prepared as follows, has been used, and is said to yield a very clear and fine impression when properly prepared: Venice turpentine, 2¼ ounces; soap, in thick paste, 2½ ounces; olein, rectified, 1 ounce; carbon black, 1¼ ounces; Paris blue, ¼ ounce; oxalic acid, ⅛ ounce; water, ¼ ounce.

The three last ingredients are mixed into a paste. The turpentine and olein are mixed at a gentle heat, the soap and carbon then introduced, and, after cooling, the blue paste is added, the whole being ground beneath a muller to a very fine and smooth paste.

The following are patented inks: Colophonic tar, 14 pounds; lampblack, 3 pounds; indigo, 8 ounces; Indian red, 4 ounces; yellow resin soap, 1 pound.

The colophonic tar referred to is the residuum from the distillation of rosin for rosin oil.

Linseed oil, 40 gallons; litharge, 4 pounds; lead acetate, 2 pounds.

The oil is heated to about 600° Fah., for from forty-eight to sixty-five hours according to quality of varnish required, the lead salts being added as driers. To each gallon of this varnish, 4 pounds of gum copal is added and dissolved. For common news ink the proportions are as follows: Of the above varnish, 15 pounds; rosin, 10 pounds; soap, brown resin, 2 pounds; lampblack, 5½ pounds.

A fine ink, suitable for use with rubber type, is prepared from nigrosine, soluble, 1 ounce; glycerine, pure, 4½ ounces; soap, white curd, ¼ ounce; water, *q. s.*

The nigrosine, finely powdered, is mixed into a stiff paste with the water, hot, and after standing a few hours this is mixed with the glycerine and soap, and the paste rubbed down with a muller on a hot stone slab.

For colored inks of this description the nigrosine may be substituted by almost any of the soluble coal tar dyes.

THE PROBLEM OF HEALTHY WATER.

Much complaint has arisen within the last two months, in this city, about the quality of the Croton water. It was alleged that it had a fishy taste that was far from agreeable, and apprehensions were expressed that it might be unfit for use. The Board of Health promptly had it analyzed and published the results. They were reassuring, and the public were told that they could drink all they desired with impunity. While this assertion was made on the strength of the analysis, it was fortified by the fact that no disease had been traced to the Croton, although it had been complained of for several weeks before the publication of the analysis. The timely investigation seems to have quieted the alarm, and in this way probably considerable good was done. Whether it proved anything concerning the water is another question.

A chemist or scientific man who takes the position of a non-alarmist where he can at all conscientiously do so, does much better than one who raises the cry of danger on a small provocation. This last has been done recently at the meetings of a certain social science association in the matter of adulteration. A certain person gave a formidable category of substances used for the purpose. It did not matter to him that some of the adulterants were more expensive than the original substances; he put them down in his list just the same.

But the question we are thinking of is whether the analysis proved that the Croton water was good. Water analysis is simple enough in its practice, but what is the verdict as to its value? Where it is necessary to know if water can be used for a steam boiler the determination of its solid mineral constituents can be made close enough without trouble. Even in this determination of the total mineral matters there are difficulties as yet unsolved. After the water is evaporated to dryness the organic matter is disposed of by ignition. In this ignition, however, some of the nitrates and carbonates present will be decomposed, and cannot be restored to precisely their original state. No question on its face seems simpler and is so hard in reality. Still, it can be done closely enough for practical purposes.

A reliable determination of the character of the organic matter, which was the vital point in our case, is unknown. All authorities admit its difficulty. Those who have their own methods uphold them, but still consider it an intricate question. The total nitrogen and albuminoid nitrogen found by the methods used by Dr. Waller are of value to a limited extent only. Water of a most dangerous character might pass the ordeal of such an analysis much better than a safe fluid. The above tests in this case bad a certain comparative value, as they were made in a regular series of Croton water analyses. It is from this point of view that they appear best. We do not doubt that on inquiry it would be found that it was their comparative value that the analyst would most insist on. It is easily conceivable that a water from the same source might acquire an additional amount of dangerous impurity and suffer a greater loss of innocuous organic substance at the same time. In such a case it would analyze better. It would have less organic matter and less nitrogen of both types. Yet it would be more dangerous, and the comparative value of the analysis would be *nil.*

The dreaded impurities are the fermentable substances and living organisms, or rather germs. Some years ago a simple test for urea, founded on its fermentation, appeared in our scientific journals. It was suggested as useful to distinguish contaminations of water with coal gas liquor and sewage respectively. Both these substances produce or contain ammonia, so that a test to distinguish the origin of that ammonia was very desirable. Here is a hint of what would be a grand achievement in water analysis; a reliable and practicable determination of the fermentable constituents. By the use of different reagents they might be distinguished from each other, just as the ammoniacal contamination due to gas liquor was distinguished from that due to