

**SECRET
WRITING**



**FOR THE
AMATEUR DETECTIVE**



INVISIBLE INKS

Secret inks are often featured in detective stories—and no less often in real life. Actual facts about them, however, are rarely published.

This article tells how you can make them yourself in fact, and get plenty of fun out of it, too.

Heat Inks — Sensitive Ink — Fire Ink — Water Ink — Sun Ink — Take Your Choice.

Invisible ink is that writing fluid which, when written upon paper, leaves no visible mark. The writing can only be made to show on the application of some process which produces the necessary chemical reaction, such as, for instance, heat, sunlight, or water. In some cases this deferred visibility is only temporary; in others it is permanent.

Another ink, which comes more under the heading of a "sympathetic" than an invisible ink, is one that when first written is visible. It is not till the lapse of a certain time that these markings fade and become invisible.

Like ciphers, invisible ink has a long history.

It is unnecessary to go into this history in detail, but it may be stated that an expedient of such obvious value in warfare and in the intrigues of Courts must have had much attention paid to it by those to whom it was likely to prove of value.

Many recorded instances are extant, in fact, where invisible ink has played its part in history; but with the actual cases we are not concerned.

Many a forgotten general in the campaigns of ancient Greece and Rome, almost before history began, has sought the aid of invisible ink to com-

municate with his captains the plan of battle. Many an alchemist, consuming the midnight oil among the weird materials of his craft, has dabbled in invisible ink.

It was the mainspring of many a Court intrigue in the picturesque days of cape and ruffle, and it has proved its use right up to the present.

You Can Make Your Own

In our own days many a vital message was entrusted to the safe keeping of sympathetic ink. In the Great War — on both sides — it proved its effectiveness.

Though it has manifested its use in such exalted circles, you do not have to be a general or a king or a courtier to experience the thrill of writing letters in invisible ink.

Most of the materials are quite cheap, and, as a rule, easily come by. In some cases, even, they are common household necessities — the milk-jug, the lemon, and the onion will provide splendid natural invisible inks, for instance.

In some cases, the necessary materials are poisonous, so great care should be exercised in using them. This is especially the case with corrosive acids, such as sulphuric, to which we shall refer later.

Let us begin with those examples of invisible going farther afield than the household pantry.

ONION INK.—If you take (or otherwise acquire a common or garden onion and mash it up into pulp you will find that it yields a good deal of juice. It will also make you weep considerably.

If you can stand this bout of griefless tears, however, and strain the juice off from the mashed pulp, you will have enough invisible ink

to last you for some time.

The pounding should be done with a pestle and mortar, if you happen to have such things; but if you haven't, an earthenware jar and a hard piece of stick with a blunt end like a pestle will do.

Having strained off the juice, next you will want to see what sort of writing it makes.

Make a Preliminary Draft

For this you should use a quill pen or an old fountain pen nib of gold. The reason for this is that onion juice is of an acid nature, and if used with an ordinary steel pen would soon rust the nib and render it useless. The same thing applies to the use of any chemical acid.

The onion juice will flow from the pen-point just like pure water, and when it dries—as it very soon does—becomes quite invisible.

For this reason, by the way, you should make quite certain beforehand of what you are going to write. If you don't and want to go back and read it over, or make corrections it will be too late.

It is a good plan to write out the message beforehand in ordinary visible ink or pencil, and then copy it in the invisible ink. The same remarks can be taken to apply to all the other inks mentioned in this article which have to be developed into visibility afterwards.

Having written the message, which shows no traces of itself on the paper, the next thing to be done is to develop it.

In actual practice, this, of course, would be done by the fellow to whom you send it; but doubtless you will want to experiment for yourself.

If the paper is held in front of a bright fire the strokes of the pen will gradually make themselves manifest, appearing in a clearly legible yellowish tint. If preferred, a hot iron can be used, the paper ironed in the same way as clothes. But see you don't have the iron too hot or it will scorch the paper.

The yellow characters will remain yellow; writing done with onion juice does not fade away when the heat is removed, as does writing done with some sympathetic inks which will be mentioned later. In these cases the writing can be made to appear and reappear indefinitely.

The juice of oranges and lemons can be utilised in the same way as that of onions.

Permanently Invisible

MILK.—Ordinary cows' milk can be used as a sympathetic ink, but, not being acid, a steel nib can be used. The pen should be clean and new, however, or traces of the everyday blue-black will show. The writing can be made visible by the application of heat in the same way as onion juice, and appears in a brown tint.

This about exhausts the list of handy, natural chemical inks.

For the rest we shall have to rely on the chemist. But as most of them give infinitely more interesting results, and the outlay for the necessary chemicals is not necessarily great, we shall do well to consider them.

SULPHURIC INK.—An exceptionally good invisible ink is composed of a weak solution of sulphuric acid.

Water should be mixed with it to the proportion of four parts of water to one of acid.

The quill or gold pen should be used for the

reason already stated, and care should be taken to see that you are aware of what you have written.

The solution flows from the pen in a perfectly clear state — just like water — and as it dries and quickly becomes invisible, it is impossible to see the words that have been written.

When heat is applied the acid, which has soaked into the paper, chars and becomes a beautiful deep black. This remains permanently visible and does not fade again when the heat is removed.

Another ink which is permanently visible after development is —

OIL OF VITRIOL.—This should be mixed with distilled water (or soft rain water) to the proportions of fifteen parts of water to one part of oil of vitriol.

Get The Right Proportions

The mixture has the effect of bringing about very great chemical action and heat is evolved. It should be done in an earthenware or glass vessel, and not in a metal one. The solution should be well stirred, and then allowed to cool, when it will be ready for use.

It may be found that the original writing in this solution is not quite invisible, but leaves faint marks on the paper.

They will probably appear to have been written with Chinese white. Although only a close search reveals them, it is not perfect invisibility. If this is the case, the solution should be diluted with a little more water.

The difficulty about this chemical is that if the solution is too strong the writing on the paper will be just visible, but the development

by heat will give excellently legible black characters.

On the other hand, should the solution be such as to make the written characters in the first place invisible, development after applying heat produces only characters which are of a pale tint.

The thing to do is to experiment until we get the right balance between perfect invisibility in the first place and legibility after the heat is applied. The proportions given above, however, may be taken as a safe midway guide.

So much for the class of permanently visible, heat-developed inks.

Renewable Messages

We now come to those which fade when the heat is removed, and can be revived later by the same means. There are several of these, and we will take them in order.

CHLORIDE OF COBALT.—If we make a solution of chloride of cobalt, it will appear a pale pink. The pinkness, however, is very slight, and writing done with it will appear absolutely colourless. In spite of the original pinkness there is absolutely no trace of writing to be seen after it has been used.

On warming the paper before a very hot fire or under a very hot iron, the strokes of the pen will appear as a clear bluish green. As the paper cools, in about five minutes or so, they will disappear.

ACETATE OF COBALT.—This can be used in the same way as chloride of cobalt, but the resulting writing will appear in a clear, beautiful blue.

CHLORIDE OF COPPER.—This is a chemical salt, which, when dissolved in water as de-

scribed above, is an excellent invisible ink. When the water has evaporated from the writing, no marks are visible. When heat is applied the pen marks develop to a brilliant yellow colour, and fade into invisibility again as the paper becomes cold.

SULPHATE OF COPPER.—Sulphate of copper and sal ammoniac should be dissolved in water of equal proportions, when a solution is obtained of a shade of turquoise blue. If the solution is too strong the writing appears just faintly legible in a pale greenish colour in the first place. A clear yellow colour is produced by this combination when heat is applied.

A good tip, by the way, in cases where a too strong solution of any chemical is likely to leave faint traces of itself on the paper, is to use paper as near as possible to the tint of the ink.

For instance, if a strong solution of sulphate of copper and sal ammoniac produces pale green writing, pale green paper should be used to counteract it.

This is, of course, all a matter of experiment, but when all is said and done, perfect invisibility is the thing to aim for.

A Very Sensitive Ink

SULPHOCYANIDE OF COBALT.—A solution of this chemical is unique as an invisible ink. It is different from the one already mentioned, inasmuch as it is not necessary in this case to apply a great degree of heat. It is extremely sensitive.

A rise in temperature of even a few degrees will suffice to bring the secret writing into brilliant prominence. Even the heat of the palm of the hand will reveal it. The writing appears a

pale blue.

It will, of course, be apparent that this ink is so sensitive as to render it almost valueless where any great secrecy is wanted.

We now come to that group of invisible inks which are sympathetic, or react to sunlight.

As is to be expected, the chemicals for photography—depending on light—furnish us with the materials for making many such sympathetic inks.

NITRATE OF SILVER.—Writing done in a solution of nitrate of silver will remain invisible until the paper on which the writing occurs is exposed to brilliant sunlight, when it will reveal itself in a dark shade of chocolate brown.

It is permanent and will not fade.

It will be realised, of course, that as that ink referred to is sensitive to sunlight—or, at a slower rate of development, diffused daylight—any writing done in it should be performed by artificial light, and the dimmer the better.

A Chance for Photographers

There is an alternative method of developing this ink, and that is by holding it over a vessel containing sulphate of ammonia. In this case the writing will appear visible with a metallic, silvery sheen. The best proportions for this solution are one part of nitrate to fifteen parts of distilled water, or rain water.

In the case of developing the writing by sunlight, it will, of course, be realised that the rate of development depends on the brilliance of the sun and the strength of the solution used.

If the latter, however, should be found to be too faint, or the sun not strong enough, development can be speeded up by rubbing over the

paper with a sponge which has been dipped in salt water.

For the benefit of those chemically-inclined readers who will want to know why, we may say that the salt of the water reacts on the silver nitrate and forms silver chloride; this is more sensitive to light.

SILVER CHLORIDE.—This will be more familiar to photographers under its other name of silver bromide. Silver bromide itself can be used as an invisible ink, in fact, and those who have photographic materials handy may care to experiment with it.

It should be added, however, that silver bromide is not soluble in water, and can only be dissolved in ammonia water.

Writing done with silver bromide dissolved in ammonia water is also rendered visible by exposure to bright light, and also by immersion in the ordinary developing bath.

There is yet another chemical reaction which will render the writing of this ink visible, and that is by exposing the paper to hydrogen sulphide gas.

As it is unlikely, however, that hydrogen sulphide gas is a common feature of many households, this method need not be elaborated.

Two-Solution Inks

Mention of gas brings us to another branch of sympathetic inks in which development depends upon exposure to various chemical vapours.

There are several of these, but it will be unnecessary to mention more than one—lead nitrate.

This is used on solution, as before, and the

writing is developed by passing it over hydrogen sulphide gas. The vapour brings out the characters in a dull black tint.

POTASSIUM FERROCYANIDE.—Invisible ink made from a solution of this chemical in water can be developed by passing over the paper a sponge saturated by a solution of some iron salt. That is, a salt in which some chemical form of iron finds a place—ferric salts.

The resultant development is of a deep, brilliant blue.

CHLORATE OF SODIUM.—This is a chemical which also needs developing with the aid of another chemical—copper sulphate. The original writing is accomplished with the chlorate in solution, and to bring out the hidden written characters, the solution of copper sulphate is applied with a sponge or cotton-wool pad.

The colour obtained in this instance is green.

SALTPETRE.—There is yet another invisible ink which has been used extensively by a very well-known firm to advertise its wares. If you have come across an example of this particular kind of advertisement, probably the advertising side of it struck you rather than the invisible ink inside; but at all events invisible ink is what is clearly used.

Fire-Messages

It is unique among invisible inks in that it is developed, not with water, or sunlight or heat, but by the direct application of fire.

A glowing matchstick or cigarette end is applied to the paper at a certain spot indicated, and the message then reveals itself in a path of charred and burnt paper.

If you have seen a specimen of this ingenious

advertising, you may well have wondered how it was done. There is really no difficulty in it at all, and you may perfectly easily make these curious fire messages for yourself.

All you will need is a small quantity of saltpetre, or nitre, as is more commonly called.

This should be dissolved in water, and as strong a solution as possible made. The pen should be broad and thick, and hold as large a quantity of the ink as possible.

A pencil mark should be made on the paper where the writing is to commence, and the pen should not be lifted from the paper throughout the writing. The ink line should not be broken from start to finish.

When dry, the glowing end of a match should be touched against the point on the paper where the writing begins, as indicated by the visible mark.

Then, glowing and dropping a trail of shrivelled paper ash behind it in a little wavering path, the line of fire will follow every twist and turn of the pen, and at length reveal the message. When the end is reached, the glowing spot will extinguish itself.

The writing done should be at least four times as large as your ordinary handwriting, and — this is the important point to remember — should not be broken throughout its length. Each letter should be connected with the next, and each word with the next. No enclosed spaces should be made (such as the middle of an O) that will drop out when the message is completed.

The "Watermark" Ink

NITRIC ACID.—The strong variety of this corrosive provides us with an invisible ink of unique properties. Unlike the others — it is not used in solution — that is, mixed with water — but by itself.

The acid should be as strong as can be obtained, and the writing done with a quill or gold nib. When the acid evaporates, the paper shows no traces of writing, but when it is immersed in water the characters immediately become visible if the writing is held up to the light.

The pen strokes will be seen to be more transparent than the rest of the paper, like a watermark.

When the paper dries the writing vanishes again, but it can be made to reappear as many times as you like by further wettings.

There is yet another sympathetic ink — different from all those already described — which, if you use it on any document such as an IOU or promissory note or a cheque will land you in trouble, for its use in such cases is illegal.

This very interesting ink is apparently quite ordinary in appearance when first put on paper, but fades and disappears after two or three days.

It is composed of starch and iodine. This is how it is made —

Obtain some ordinary household starch, and make a thin solution by dissolving it in water. Then add a drop or two of tincture of iodine, a small bottle of which can be obtained from any chemist's for a few pence.

The addition of the iodine will make the starch solution turn a dark blue.

Disappearing Ink

When you have prepared this mixture and stirred it well, keep it in a tightly corked bottle.

Writing done with it may vary in colour and may be anything from a pale blue to a dark violet. The point is, however, that it looks just like ordinary blue-black or indelible violet ink.

What happens afterwards is this.

The iodine in the starch is volatile — it immediately begins to vaporise. When every trace of it has left the starch the latter returns to its original white colour, and to its normal powdery state.

There is nothing now left to hold it to the paper, so it crumbles away leaving no trace of the writing.

This happens after the lapse of about forty-eight hours. The time actually taken is variable, depending as it does upon certain causes.

The writing of a strong solution would disappear more slowly than that of a weak one, while writing exposed to the air would vanish sooner than that which was protected from it.

If you wrote a letter in this ink, and it was laid on the desk of a man who received it, and was open to the air, the writing would soon vanish, as it would also if he folded it and put it in his pocket. The chafing movement of the paper as his body moved would hasten the crumbling process. But if he put it between the leaves of a book, the disappearance of the pen marks would be delayed.

The reason for this curious property is that the colouring matter provided by the iodine does not actually soak into the fibres of the paper as do other inks. It is merely held in contact by the starch.

Safety First!

For this reason it is better, when writing with this ink, not to use a sharp pointed or scratchy pen, which roughens or abrades the surface of the paper, and provides a better hold for the starch.

The best materials are smooth glazed paper, and an empty ball pointed pen which is dipped into the solution. But don't write anything important in this ink for the reason mentioned above!

In writing letters in any of the secret inks, it is a much better plan to write the invisible (and real) message between the lines of a visible but inconsequential letter in ordinary ink. Should the letter fall into wrong hands and a blank sheet be found, the interceptor will almost certainly guess that it contains some secret invisible writing.

Unlike ciphers or codes, there are not many ways of decoding secret ink messages, and he has not many to choose from. The finder would first try heat, then water, and so on until he got a response from the paper.

The ordinary and misleading letter would put him off his guard.

Again to go to the other extreme, a blank sheet of paper might easily be destroyed as valueless. Or, if too great a care were taken to preserve it, suspicion might be aroused.

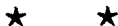
One last word on the subject generally.

Use the harmless natural inks mentioned in preference, but if you must use the others, remember the motto, Safety First!

But this is not intended to scare you. It is safe to use the materials specified if a little care

is taken. Reasonable precautions should enable you to dabble in this fascinating branch of secret writing to your heart's content, and in safety and pleasure.

And once you begin to dabble you will find that there is no end of fun to be got out of it.



The State Library of Victoria
"ALMA CONJURING COLLECTION"

Printed by

ABARIS PRINTING & PUBLISHING
CO. PTY. LTD.

12 Watson Place, Melbourne
Phone MF 1697