
WET PLATE COLLODION PROCESS



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1 INTRODUCTION

There are some good instructional books on the market for those wanting to learn about this photographic technique, however I found most of them written by Americans, and although full of detail, the text can get lost in translation and many items are not available or need to be substituted or adapted from items available on this side of the pond!



Simon – black trophy aluminium (Tintype)

I found some of the information overly complicated and was not targeted at the beginner (despite professing to be so). Therefore, this guide was designed to take beginners through every stage of the process (based on my own learning) from preparing the equipment and chemicals to producing the images, however, this is not for the faint hearted or those that give up easily. Seek advice and attend a hands-on training session if you feel too inexperienced to undertake photography using this guide. I have over 40 years' experience in Photography and trained many students, but even I went on a course before purchasing any materials or equipment.

The process takes time to master and the unique nature of the work will involve many failures along the way. It can be great for weeks at a time and then BOOM – a complete mess the following day! Anyone who says they have perfected the process is deluding themselves, all we can say is that some have more experience than others and learned from their mistakes. I continue to make them, but get better every time I fail!

I have tried to remove the burden of overcomplicating the process (that some 'experts' insist on doing). This is a simple and easy process to learn, if you take your time and try to understand it. I've given as much detail as needed to jump between chapters if desired, depending on the individual's experience and requirement for learning. For instance, this is a historic technique and although segments may be familiar, some items of equipment will need to be made or adapted if they cannot be obtained commercially.

Wet plate, is the process of capturing a photographic image onto a solid plate of glass (Ambrotype) or metal (Ferrottype/Tintype). The surface of the material needs to be sensitized with chemicals so it can record the image, but the whole process (including development) needs to be completed before the chemicals dry, hence the name 'wet plate'. Early practitioners were often referred to as 'alchemists' due to the fact that they mixed variations of the original formula from raw materials, many of which were highly toxic! Images can be recorded in many cameras adapted for the purpose, however the equipment of choice is a field or large format camera, which behaves like a 'camera obscura'. In other words, images are captured back to front and upside down. Large format cameras allow large images to be captured directly in camera and when creating ambrotypes, the image can be corrected by reversing around to view as normal.

I became a devotee of the process in early 2019 and loved the more considered approach required to produce unique images in this way. The process is being revitalised by modern day practitioners and numbers are growing.

At present, it is estimated there are fewer than 7000 active practitioners worldwide (although up to as many as 10000 may have tried the process in the modern era). I use the process made popular by the man accredited with its formulation during the 1850's, Frederick Scott Archer. The process has changed little since its discovery and demands a certain 'patience' to persevere with the fickle nature of the medium.

Characterised by their artefacts (Arty-facts) at the edges of the plates, the images are not 'perfect' in the modern sense of the term, however it is precisely these imperfections together with the originality of the images (there is only one), that makes them unique.

Many of the chemicals required for the process can be bought from specialist suppliers (wetplatesupplies.com or mamutphoto.com) in premixed form and are completely safe, so there is little difficulty in making images and no more dangerous than working in a traditional darkroom.

For the more dedicated among you, mixing raw chemicals is not difficult and completely safe if the proper precautions are adhered to. Experienced practitioners will often do this without protection, but if you choose to mix your own, **I advise everyone to use gloves, masks and safety goggles when preparing to prevent mishaps of any sort and I am not accountable for any injury caused by misuse of substances. Always follow the safety data sheets for your purchased materials.** The greatest cause of photographers' death in the 1850's was from explosion! If you are unsure about handling raw chemicals, always buy premixed.

That said, there is immense satisfaction with taking control over the entire process from start to finish, mixing chemicals, making plates, taking images and producing unique, 'one of a kind' originals that the majority of today's photographers are unable to produce.

I have included links to videos, showing the overview of techniques where appropriate within the text. All are available on my YouTube Channel:

<https://www.youtube.com/@TomLeePhoto/featured>

Be careful, have fun and enjoy.

2 ACKNOWLEDGEMENTS

There are many people and books that have helped me along my journey in pursuit of this antique process. With a practise from the very origins of photography, you can imagine that researching or getting access to material or individuals who have experience in this field are rare commodities. The listings below are sources for the people and books that I have used in referencing this process. Although they have not been attributed individually in the text, all have played an equal part in my education and have offered their advice and council equally without ego and has been freely given. I am indebted to them all.

Facebook: Collodion Bastards: Wet Plate Work of Questionable Parentage
Gerald Figal
Guy Bellingham
Brandon Fernandez
Dale Wilson

YouTube: Quinn Jacobson
<https://www.youtube.com/channel/UCLVxr3JcxPuWQvPKjDeTHzw>

Borut Peterlin
<https://www.youtube.com/channel/UCCjjZ-Qc43dF7xHBC92MAuA>

Robert Bieber
<https://www.youtube.com/channel/UCKiARHwllm0-zMGamNijAeA>

Books: Quinn Jacobson : Chemical Pictures
https://www.amazon.co.uk/Chemical-Pictures-Ambrotypes-Tintypes-Negatives/dp/B0892DP6T1/r_e_f=s_r_1_4?adgrpid=53273142876&dchild=1&gclid=Cj0KCQiAhs79BRD0ARIsAC6XpaXcsswZiFAKMTkDdEAX9YfcAO7VylFGJGYCmKpCjl6kXoOUB4dpOCoaAg47EALw_wcB&hvadid=259074349123&hvdev=c&hvlocphy=1006697&hvnetw=g&hvqmt=b&hvrnd=6057609928351713859&hvtargid=kwd-300128873410&hydacr=24400_1748864&keywords=quinn+jacobson&qid=1605624313&sr=8-4&tag=googhydr-21

Mark Osterman : Basic Collodion Technique
<https://www.freestylephoto.biz/18622-Basic-Collodion-Technique-Ambrotype-and-Tintype-by-France-Scully-and>

3 DEDICATION

This publication is dedicated to my long-time friend and confidant, Podge Kelly, whose interest in alternative photographic processes got me hooked in the first place. No doubt he will curse me for putting something into print that has too many words in it!

4 A LITTLE HISTORY

Louis Daguerre developed his Daguerrotype process in 1839, closely followed in 1841 by the Calotype developed by Henry Fox Talbot, but relied on paper negatives and were 'one of a kind' derivatives. This meant that they were expensive, and difficult to make.

The Collodion technique was first theorised in 1850 by Frenchman, Gustave le Gray, but it is not until a year later that Englishman, Frederick Scott Archer published and introduced the process based on Gray's theories in 1851, and so became the most popular photographic process right up to the 1880's.

The fact that many copies could be made from a single glass plate ambrotype made it popular with the Victorians. Many of you may well be familiar with the Ferrotype (or Tintype), from which American Civil War images were captured. The Ferrotypes were very durable and soldiers could carry them in a pocket of their uniform without sustaining significant damage.

With the ability to produce Albumen prints from Ambrotype glass plates, the process developed into Carte de Visite (visiting card or CDV) which was very popular with Victorians from around 1859. The CDV tag was due to their size which was similar to a business card of the day. The thin paper print was mounted on card, mass produced and collected (just like stamps). Cabinet cards were larger and came in around 1870 and remained popular until the arrival of the Kodak brownie in 1900. Thus, the popularity of dry film emulsion and the explosion of modern-day photography which was accessible to everyone, became the norm.



Frederick Scott Archer (1813 - 1857)

Ferrotypes were actually made from thin iron sheets but were called Tintypes by the Victorians due to the 'cheapness' of how they could be reproduced, and so the name stuck! These tintypes are still collected today, but beware, many CDV's are advertised as tintypes but are actually paper copies from an ambrotype. A magnet will stick to a tintype, (because it's actually made from iron) but not to a CDV.

Regular tintypes from the Victorian era are quite reasonably priced (£5-15), whereas civil war versions could be £70-250. Ambrotypes, if you can get hold of one, will carry a similarly high price due to their fragile nature, even if they have no historical significance or are in poor condition.

5 EQUIPMENT

There are numerous items of equipment you will need for this process, some of which you will already have if you have any sort of darkroom at all. I will include most of the incidentals at the end of this section, but here we are going to concentrate on the main items required and wherever possible I have provided links to the equipment and sources I use personally.

5.1 CAMERA

It might sound daft, but I know of people who have come unstuck when they get the chemistry sorted and forget about how they will photograph their subjects! We need to use a field or large format camera, you know, the type where the photographer disappears under a black cloth behind a monstrous wooden box with a huge brass lens on the front.

This was true in the past and many photographers choose to continue in this vein, however vintage cameras from the mid 1850's and early 1900's can get quite expensive and have generally seen a lot of use. Beautiful as they are, they may also be quite fragile and you want to use yours, not just look at it!

The camera you buy will be determined by the maximum size of image you want to make. Unlike digital images that can be resized, wet plate images are taken at the size of the film/plate loaded in the back. They can be 'downsized' with what's known as a reducing back, but we will not complicate things here.



10x8" self-build camera



Intrepid 5x4" camera

I suggest you start small with a 5x4 camera from Intrepid (intrepidcamera.co.uk). These guys make new cameras to order and start from as little as £280 for the base 5x4" model and £480 for the 10x8" model. Lead times can be up to 8 weeks but it's well worth it and they will last you forever....

You can of course go for a fancy Sinar (or equivalent) rail camera costing much more money, but remember you don't know if it's worth the investment yet. You may find some used large format cameras on eBay, but I've yet to come across anything cheaper than a new Intrepid.

5.2 LENSES

Don't buy new! Although new lenses are available, they're hellish expensive and come with a UV coating. This process requires a lot of UV light to make images, so anything that blocks UV rays from reaching the sensitised plate is counter-productive. This doesn't mean you have to purchase an expensive vintage brass lens either. You can use coated lenses, it's just that they are not as efficient.

Scour the web (eBay) for second hand uncoated lenses with built-in diaphragms and shutters. These are quite numerous and reasonably priced but may be shipped from Japan, which means you will incur customs and other duties when they arrive in the country. You will need a 150mm lens for a 5x4 camera or a 300mm lens for the 10x8. These equate to an equivalent standard 50mm lenses at 35mm format. These lenses are guaranteed to be in first class condition and can start from as little as £350 including shipping. Be patient and shop around for a good one.

You will also see the lens marked as Copal 0, Copal 1 or Copal 3, (unless you have an antique brass one), this is an indication of the aperture size required in the lens board to mount the lens to your camera. The lens board is then secured to the camera and will vary in size. Just think, interchangeable lenses in the 1850's.



Note the 10x8 lens board and 300mm lens on the left and 5x4 lens board on the right with 150mm lens. Both lenses are Copal 0

If you buy a camera from Intrepid, you can also buy a lens board mount to fit perfectly with your camera and lens combination. Lens boards come in all sorts of sizes and finding the correct one for your camera could be tricky. Even if your lens comes with a lens board it may not fit your camera. The simplest thing to do if you're unsure is make one from marine plywood with the correct aperture cut in the middle to accept the lens. I bought a Copal 0 board direct from Intrepid when I ordered my 5x4, but made a 3D printed version for my 10x8 self-build camera.

5.3 DARK CLOTH

In order to see the image on the ground glass screen at the rear of the camera, you will need to view it in subdued or even dark conditions. This is why you see photographers under a black blanket to focus the image. Contrary to what you may have seen you don't need a specialist piece of kit for this. Manufacturers will offer some pretty luxurious dark cloths for sale which basically cost a fortune for little return. Just buy some blackout curtain, a fancy-dress cloak, or even use your coat! This will be dark enough to see the image and enable focussing. There are however, some guys who want a Rolls Royce to go for the newspaper in the next street!



5.4 LOUPE



8x magnifying loupe

You will need to see clearly when focussing under your dark cloth, and this is done with a magnifying loupe. Sharpness is critical and cannot be done with the naked eye.

Under the Dark Cloth

You may already have one of these in your studio. I have my original Agfa magnifying loupe from when I used to look at slides on my light box. You can get a cheap one from Amazon costing less than £10.

5.5 PLATE HOLDER

This is the most difficult piece of kit to give advice on as there is no modern standard. If you intend to use the camera for large format sheet film shooting, there are still quite a few holders available to purchase new and used to fit most cameras, however the wet plate process is over 150 years old, and finding suitable carriers for your plates can be troublesome.

Original plate sizes were generally referred to as follows:

- Sixteenth Plate 1.5 x 1.75"
- Ninth Plate 2 x 2.5"
- Sixth Plate 2.75 x 3.25"
- Quarter Plate 3.25 x 4.25"
- Half Plate 4.25 x 5.5"
- Whole Plate 6.5 x 8.5"
- Imperial/Mammoth Larger than Whole Plate

When searching through vintage equipment you may well still see these for sale, but they are not cheap and were made of wood which may not be fully functional, warped or light tight. We also use different sizes these days (5x4, 7x5, 10x8 etc) and modern film stock is not exact – it's actually smaller than this!

5.6 MAKING A 5X4" WET PLATE HOLDER

As collodion requires the process to be carried out 'wet', you can imagine that this could leave many 'standard' items of kit in a real state after several images have been processed. It's therefore necessary to modify existing items to accept the wet plate without damaging otherwise expensive film holders and dare I say it, cameras.

Several manufacturers such as Graflex, make specialist wet plate holders, but tend to be very expensive (in the 100's of pounds). Other enterprising photographers 'butcher' an old film holder by cutting a window into the back with a surround to hold the plate in place. This can be tricky, and if you mess up you've binned a perfectly good holder also worth about £100. The trick is to make something easily without having to modify expensive holders rendering them useless for anything else.

I do a lot of internet research for almost everything I do, but tend not to take the information at face value and adapt what I find to my specific needs. I came across a YouTube video from America that seemed to describe exactly what I needed, however, it wasn't until I started making my adaptor, that several holes were evident in the 'how to' and not all instruction is created equal!

The original video can be found here : https://www.youtube.com/watch?v=fjurO_5AlcQ&t=113s

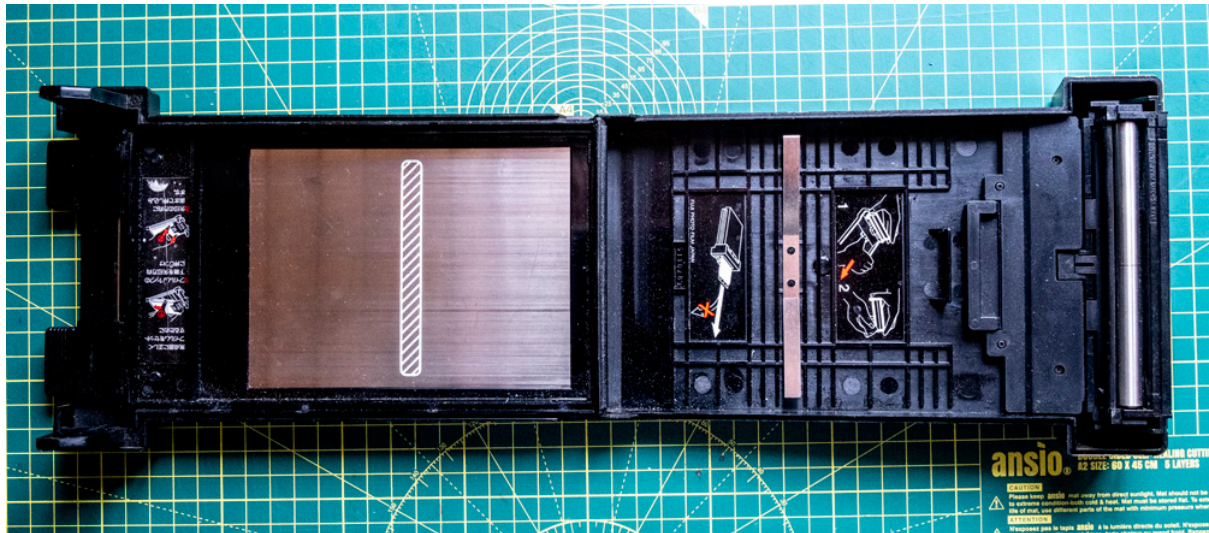
Needless to say, it's quite comprehensive until I started looking at the dimensions he used for the wooden insert. This in no way corresponded to a 5x4" plate! Now we have to fill in the holes.....

Firstly, a sheet of 5x4" film does not measure 5" x 4" (it's a generic size). The standard for 5x4" is actually something like 100mm x 120mm (slightly smaller), and the image size rendered on the film can be smaller again (110mm x 90mm). These dimensions can also vary considerably between camera models. The dimensions stated in the video, leave an aperture size of about 105mm x 72mm (a far cry from 5x4"). Secondly, when ordering your 5x4" plates for doing your tintypes, they actually come at 5x4" size exactly. This means your plates need to be cut and trimmed to fit whatever holder you use (except if your producing 5x4" plates from a 10x8" large format camera).

Let's start by looking at the holder. The Fujifilm PA-45 instant back described in the video is easy enough to get hold of on eBay, but beware, prices vary enormously and many will end up coming from Japan, meaning additional customs duty when it enters the country. Mine cost about £23 but I had to pay another £13 customs and handling duty before they would deliver it (buggers). Instant film backs (Polaroid, Fujifilm, Kodak etc;) are universal, it's the size of the image produced that varies.



PA45 Holder (closed)



PA45 Holder (open)

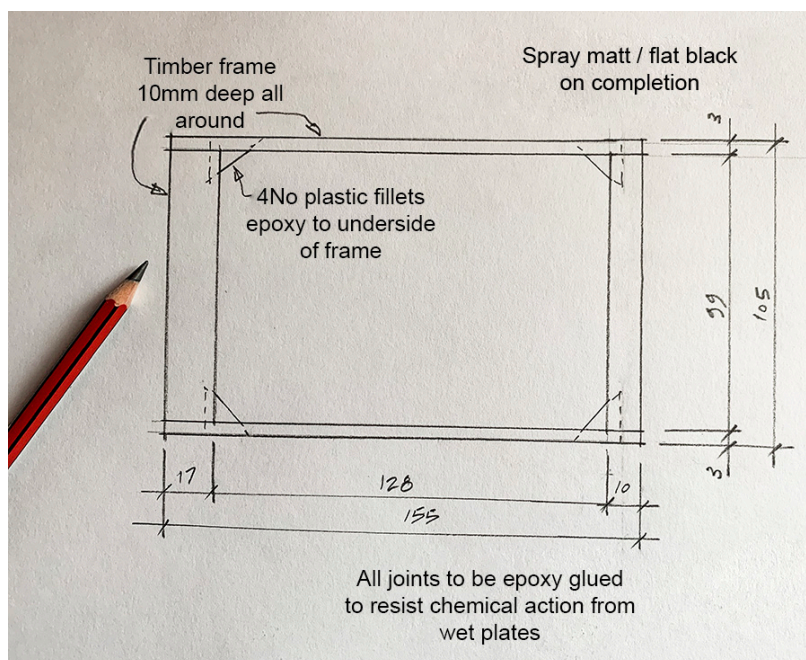
5.6.1 THE INSERT.....

I wanted to maximise the area of plate that could be exposed when taking the image. This means that although the technique for making the holder in the video was sound, I had to adjust the sizes.

I started by measuring the aperture in the PA-45 holder and found that this measures 125mm x 91mm. This is therefore the maximum size of plate I can expose. Next, I measured the internal cavity of the holder to see what size wooden frame structure I could fit in without making it too flimsy or hinder the dark slide mechanism. This is when I found the next 'hole' in the methodology....

The video shows a spring at the bottom of the holder which helps eject the new wooden insert. My unit did not have this feature. Holders and inserts get modified over time and its possible that my holder was either a later (or earlier) model than that shown in the video. As it transpires, no drama here, the spring in the top will hold the frame in place and it can easily be lifted out without the need for an 'ejection' spring.

My dimensions for the wooden frame insert are shown in the sketch (right), and allows for the maximum exposure possible of the tintype plate. The wooden frame is however, constructed exactly as stated in the video.



Timber frame insert plan



Glued sponges to act as 'pressure pads' at the back of the plate when closed

Another modification was the addition of a sponge cut and glued in the top part of the holder. This acts as a 'pressure pads' on the back of the tintype plate, stopping it from moving around in the frame. I think this is better than the plastic 'thingy' shown in the video.

The advantage of my design also allows for trimming only one side of the tintype plate. Today's material is made from 'trophy aluminium' approximately 0.5mm thick and is easily cut with a heavy-duty guillotine that delivers a clean and precise cut. The alternative is to get the trophy plate supplier to pre-cut the plates to your size prior to shipping.



Cutting tintype plates to size (allow 1mm all around clearance to inside of insert – i.e. 126mm x 97mm)

With bespoke wet plate holders from stenopeika.com and chamonixviewcamera.com costing from £150, and a butchered film holder costing £104, my solution cost £46 for the PA-45 holder, shipping and import duty, flat black spray and epoxy glue, scrap timber and plastic (free), and a bit of spare time. The timber frame insert works a treat, and I've had no problem placing the wet plate in or out of the frame or the frame moving in the holder. Anyone with a bit of DIY skill can make something similar.



Wooden insert placed in PA45 holder

I now have a 3D printed version of my holder insert and anyone wanting the .stl file (the coding for a 3D printed version), which requires no gluing or assembly, ensuring that all the dimensions and squareness are perfect, can download these instructions and the file from my website on the *RESOURCES* page. Both versions are suitable for tintype or glass plates.



3D printed insert

Since writing this manual, my friend Nejc Uranker from Zebra (zebradryplates.com) has started making affordable wet plate holders in many sizes and ships throughout Europe.

5.7 MAKING A 10x8" WET PLATE HOLDER

I'm not going to reinvent the wheel here, so firstly have a look at the video (linked below) and then I'll describe any changes I've made to my own design.

<https://www.youtube.com/watch?v=Vlb7DRoSSVl>

My design is almost exactly done as per the video with one exception....

Instead of using silver wire for the corner supports, I used black plastic wire ties epoxied across the corner. Pure silver wire is difficult to obtain so, just cut a small section of tie and fix to the 'front' side of the opening. This is so that the plate when loaded will be at the correct position (on the film plane) in the holder. You should also mark your holder so that the front and back parts are easily identified. You don't want to pull the dark slide out in error.

I also use a plastic flex piece to keep pressure on the aluminium or glass plate to prevent it from moving around.

If this is all too much for you, bespoke 10x8" wet plate holders are available from stenopeika.com, chamonixviewcamera.com and zebradryplates.com.

5.8 PLATES

In order to make the image you need 'film'.....in our case we use trophy aluminium or laser engraving plate. You can also use plain 2mm float glass from your local framer.

Aluminium plates come with a black coated side and an untreated side and can be ordered from various suppliers in any size you need. Bear in mind if they cut it to a precise size, they will charge you for the next whole size up, so there is no advantage unless you don't want to cut them yourself. The minimum order is usually 10, but cost less than £0.85 per plate. After trimming the plate to your holder size, the plates come with a protective plastic film on the black top face which is the side we use. All you need to do is peel off this protective sheet and you are ready to sensitise your plate.

When using glass plates, I usually get the framers to cut to the exact size for my holder. They cannot be sensitised without cleaning which is a very important part of making ambrotypes as they do not come with a protective film. Making ambrotypes is discussed in a separate section later in this manual.

5.9 DARKROOM and DARK TENT or DARKBOX

Part of the collodion process needs to be undertaken in 'safelight' conditions. If you happen to have an existing darkroom, then you're all set up to take images and process plates straight away. However, what if you're starting off or need to take your camera on the road? I'm going to make three suggestions here which can be used in any situation but are by no means the only solutions available. There are many ingenious contraptions out there constructed by very enterprising individuals indeed.

You don't need to spend big if you need a roomy solution for your studio. I have used a hydroponic grow tent 2m x 1.2m x 1.2m which is collapsible and can be erected in

about 30mins with two people (slightly longer if on your own). This means it doesn't have to be a permanent fixture and could be transported in the field if required. The only problem is the zips are all on the outside and you will need some dexterity in closing the flaps. A perfect blackout room is not necessary as the sensitivity of plates is very slow, so slight gaps at the zips will not fog your plates.

Amazon has plenty for sale at around £123. The internal faces are reflective mylar and will help 'bounce' the red safelight around to make it easier to work.

https://www.amazon.co.uk/RIMARUP-Hydroponic-Indoor-Observation-Growing/dp/B087PQSF6C/ref=sr_1_5?crid=1GHO90UAX3D5Y&dchild=1&keywords=hydroponics+growing+tent&qid=1607085064&sprefix=hydroponics+growing+%2Caps%2C162&sr=8-5



The darkroom erected in the corner of my garage with a portable worktable. Big enough for two people to work comfortably inside.

Bespoke darkrooms specifically for photography (Nova) are available but cost around £900 and may have to be ordered with long delivery times.

Folding Table:

https://www.amazon.co.uk/gp/product/B07QH77J2S/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&psc=1

Another solution is the fishing tent, of which there are many.... This is a quick pop-up tent with no floor and can be erected in about a minute on your own. The drawbacks are that you cannot fully stand inside as it's only about 5' 0" tall and you need to seal the skirt to the floor in order to prevent light intrusion. Some of them can be thin, so be careful, they may fog the plates.

https://www.amazon.co.uk/VEVOR-Pereson-Fishing-Portable-Waterproof/dp/B08DY99YYH/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&psc=1



My tent cost £70 from Amazon and comes complete with guy ropes to secure the tent to the ground. You can just as easily use a couple of heavy stones around the skirt.

This tent can be used easily in the home, studio or on location. I was unhappy about the amount of light permeating into the tent, so I just bought some blackout material and covered the inside completely.

The tent is big enough for a camping table and foldaway stool to work off when inside.

https://www.youtube.com/watch?v=JxGaOfMX2_I



Trolley: https://www.amazon.co.uk/Folding-Aluminium-Industrial-Hand-Trolley/dp/B07JGJVSTT/ref=sr_1_1_sspa?dchild=1&keywords=folding+trolley&qid=1607090370&sr=8-1-spons&psc=1&spLa=ZW5jcmlwdGVkUXVhbGlmaWVyPUExUUNNVjJCTFFZVVPpJmVuY3J5cHRlZElkPUFwMjk1OTM4MldCREtJOU1BWDkwMyZlbnmYeXB0ZWZRbZEikPUFwMzcyMjYyM0R0EiEiJFJSVo4UiZ3aWRnZXROXYW1lPNXNwX2F0ZiZhY3Rpb249Y2xpY2tSZWRpcmlVidCk805VdExUENsaWNrPXRWRWU=

https://www.amazon.co.uk/gp/product/B071DCXR93/ref=ppx_vo_dt_b_search_asin_title?ie=UTF8&psc=1

The last choice you may see is the red headlamp. These have rechargeable li-ion batteries, last longer and are more efficient. The light is also shining where you are looking and can be an advantage in some circumstances. You should be careful when choosing this option as some head torches can be too powerful and fog your plates anyway! Links provided below:

Patterson:

https://www.amazon.co.uk/PATERSON-PTP-760-Paterson-Safelight/dp/B0079F5PRW/ref=sr_1_1?dchild=1&keywords=patterson+red+safelight+for+darkroom&qid=1607092229&sr=8-1



Mains Strip LED:

https://www.amazon.co.uk/gp/product/B072NYZ187/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&psc=1



Battery LED:

https://www.amazon.co.uk/gp/product/B07F12NG4V/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&psc=1



Head Torch:

https://www.amazon.co.uk/RJ-3000-Headlamp-Rechargeable-Headlight-Waterproof/dp/B07ZRGHZVC/ref=sr_1_5?dchild=1&keywords=red+head+torch&qid=1607092410&s=lighting&sr=1-5

5.10 INCIDENTALS

There are going to be a range of other items you should consider depending on if you want to make chemistry or buy premixed, so I'm going to break down this section into essential items you need no matter which way you go, and other items you will need if you mix your own brews! Where appropriate I have included links to items that I use personally in my own process.

5.10.1 ESSENTIALS (for using premixed chemistry)

Silver Box – for sensitising plates.

10x8" Developing Tray (x2) – for developing and washing plates.

1 litre jug for water – for washing plates in darkroom or in the field.

Digital timer – for timing of exposures and the sensitising bath.

Plate rack – for standing finished plates to dry.

10 litre water container – only needed when developing in the field.

Shot glass – for pouring developer.

Alcohol burner – for prepping plates during cold weather and varnishing.

Plastic Storage bottles – for storing chemicals on the move. 250ml to 1000ml

Apron – to prevent chemical splash or spillage onto clothes.

Nitrile gloves.

Paper towels.

5.10.2 OPTIONAL (when making your own chemistry)

Measuring cylinders – 500ml or 1000ml

Glass storage bottles – various sizes

Glass stirring rods

PH strips

Hydrometer

Micro digital scales – 0.1g to 200g

Coffee filters or cotton pads

Cotton buds (for glass plates only)

Plastic funnels (various)

Safety glasses

5.10.3 MASK and FILTERS (essential when mixing your own chemistry)

These are only required if you intend to mix your own chemical formulae. Masks should be 'face fitted' to ensure a good seal around the nose and mouth. This cannot be done if buying direct from the web, however, when your mask arrives, close off the filter holes with cupped hands and suck in sharply! If you have a good seal then the mask will collapse and you will find difficulty breathing. If you can breathe normally then the mask is too loose or you do not have the correct size. Sometimes beards can affect the mask seal, and you may have to make the ultimate sacrifice and shave it off! I have included two links below for recommended mask and filter types for all of the chemicals you will be using. NEVER use a common dust mask.

3M 7502 Reusable Half Face Mask Respirator

https://www.amazon.co.uk/3M-7502-Medium-Reusable-Half-Mask/dp/B00FYNN5J6/ref=sr_1_5?crid=2BK1UYYGQBQGC&dchild=1&keywords=3m+half+mask+respirator+medium&qid=1606906047&srefix=3m+half+mask%2Caps%2C154&sr=8-5



When mixing your formula, some of the chemistry gives off 'nasties', so don't skimp on the safety gear. A good 3M mask will only cost around £25-30 so won't break the bank anyway. The mask itself will last for years and shouldn't need replacing until the seal gives out.

3M Filter 6059 ABEK1 for Gas and Vapour with 3M 5935 P3 R Particulate Filter P2R with 3M Filter Retainer 501

https://www.amazon.co.uk/Filter-Particulate-Retainer-SmartProduct-Earplugs/dp/B0849P25W4/ref=sr_1_7?dchild=1&keywords=3m+60926+vapour+filters&qid=1606906742&s=industrial&sr=1-7



Filters need replacing from time to time and are an essential part of a good safety mask. It's important to obtain the correct filters for vapours and particulates, and need to be replaced when the shelf life expires (see external of packaging). I have shown the filters and case which cost about £35 for a pair. When expired you only need to replace the filters, the case will last as long as the mask.

6 THE CHEMICALS

The following chemicals and mixes (Section 7), are what I use in my personal process and will suit all positive (tintype and ambrotype) images. Although there are variations to the ingredients, they essentially haven't changed from the original formulae published in the 1850's. Negative (ambrotypes) have not been covered in this text as the techniques and formulas are beyond that required of a novice.

1. Salt Bath (**Silver Nitrate**, Distilled Water)
2. Collodion (Plain or non-flexible USP Collodion, Denatured Alcohol, **Ether**, **Cadmium Bromide**, Ammonium Iodide)
3. Developer (Ferrous Sulphate, Glacial Acetic Acid, Denatured Alcohol, Distilled Water)
4. Fixer (Sodium Thiosulfate and Distilled Water)

Chemicals in **RED** are the most difficult to use and store, so safety precautions must be observed when handling them, for the reasons described below.

6.1 DISTILLED WATER

Always use distilled water when mixing primary chemicals. Tap water contains contaminants that will affect the 'purity' of the process. The only exception is the final wash of the plate.

6.2 SILVER NITRATE (AgNO_3)

This is one of the most expensive chemicals used in the process and its price can vary due to the precious metals market. If mishandled, this can cause blindness and is corrosive so wear protection when handling. It will stain almost anything it comes into contact with. It will eventually wear off skin (2-3 days), but will not come out of clothing!

Although the first batch is costly to make to make, once expended it can be revived with little added outlay. It takes a little getting used to, but if you want to keep your costs down I will explain in the mixing chemicals section and is something you need to master.

6.3 COLLODION

Make sure this is USP or plain collodion, this will also contain some ether, ethanol alcohol and nitrocellulose. This is not able to be used on its own and requires an iodizer to be added. The iodizer helps with flowing the solution over the plate, adhesion and keeps the solution from drying out too quickly. The collodion and iodizer (see mixing collodion section) can be stored separately and have an extended shelf life (1-2 years). Premixed collodions may expire after 1-2 months.

6.4 DENATURED ALCOHOL ($\text{C}_2\text{H}_5\text{OH}$)

This ingredient is common to most of the solutions used and can be substituted with Grain Alcohol (Vodka) or Ethanol (difficult to obtain in most countries). Do not buy Isopropyl Alcohol in error. Denatured Alcohol is toxic and you should not drink it but will help slow down the aging process of collodion. When collodion 'ages' or turns

red, it can be re-constituted by adding a small amount of alcohol to bring it back to life. The clear solution should be around 96% (with no dyes as this will contaminate your mix).

6.5 DIETHYL ETHER (C₄H₁₀O) sometimes written (C₂H₅)₂O

Used in collodion to prevent ridges forming during 'flowing the plate' in warm weather. It also helps when pouring collodion onto larger plates. Whilst there are collodions that do not contain ether, these tend to be weaker formulations and may 'lift' or dissolve during varnishing or waxing.

Ether is stable when sealed, however, once opened peroxides can form when in contact with oxygen and may even explode when unscrewing the cap or being too close to a heat source (a common problem during the early years, leading to the deaths of many a photographer). I and many others recommend using the ether up completely after opening to avoid the problem altogether. Mixed with alcohol and salts, the problem is neutralised and makes an iodizer to mix with the collodion and also has a long shelf life.

This should be ordered only in the quantities you need and used all at once. This will negate any problems of storage and safety issues.

6.6 CADMIUM BROMIDE (CdBr)

This chemical is a heavy metal and should be handled with extreme care as it is carcinogenic. Always wear your protective gloves, mask and eyewear.

This is the main salt for the collodion and helps with tonal range and shelf life. Collodion has a compressed tonal range when compared with normal black and white photographs and we need all the help we can get. Using CdBr extends the tonal range of the green spectrum. When the cadmium bromide interacts with the silver nitrate it forms silver bromide (AgBr).

6.7 AMMONIUM IODIDE (NH₄I)

This is another salt used in the collodion and helps with the contrast and speed (if you can call ISO1 speed)! It also has the adverse effect of shortening the shelf life of the working collodion but positive effect of shorter 'ripening time' (the time between making and using). This ripening time can be as little as two hours, whereas other iodides (potassium iodide) will have longer shelf life and longer ripening times (perhaps 2 months before it can be used)!

6.8 FERROUS SULFATE (FeSO)

Also known as Iron, it's the main ingredient in the developer. Buy the green crystals as they have the highest purity. This reduces the halides on the plate to pure metallic silver.

6.9 GLACIAL ACETIC ACID (C₂H₄O₂)

I do not use potassium cyanide in my formulae so it's not usually an issue, however, do not store close to this or any other acid. It creates cyanide gas which can kill you!

Glacial acetic acid acts as a restrainer in the developer to prevent it from acting too quickly and overdeveloping. Normally an image will appear in about 15 seconds which has to be arrested quickly with water.

6.10 SODIUM THIOSULFATE ($\text{Na}_2\text{S}_2\text{O}_{3.5}\text{H}_2\text{O}$)

Also known as 'Hypo' it is used to dissolve the unexposed silver from the plate and fix the image. This is less contrasty than fixer made with potassium cyanide leading to duller highlights, however its easier on the mid tones, inexpensive and safe. You should therefore mix a fresh bath every 20 plates or so, to ensure optimum quality.

7 MAKING CHEMISTRY

One of the most confusing aspects of this process is that wet plates can be described as 'positive' or 'negative'. In reality both are technically 'negative' images and actually relates to how the images are resolved, either onto aluminium or glass substrates.

'Positive' (tintype) images are made on aluminium plates that have a black coated surface finish. The image is developed as a negative, but due to the black enamelled finish on the surface, is resolved as a positive.

'Positive' (ambrotype) images are made on clear glass plates and look like traditional black and white negatives when resolved, however, when 'backed' with a bitumen coating (asphaltum) or black paint, they are also resolved as positives. The advantage is that the coated surface can be turned over so that they are viewed the right way around.

'Negative' (ambrotype) images are produced in exactly the same way as positive ambrotypes, however the difference is in the chemistry and exposure - if you intend to make traditional paper prints from ambrotypes, either by contact printing or in a darkroom enlarger, some adjustment in the collodion and developing formulae is required and increased exposure time is required, to produce extremely thin (but intense) negatives.

I will not deal with 'negative' chemistry here due to its advanced formula, but the standard mixes described below are suitable for both glass and aluminium. As a starting point, you do not want to make large volumes of chemicals so the recommended starting quantities to use have been highlighted in the tables below.

7.1 COLLODION

The collodion mix used in the process comes in two parts – the base USP collodion and the iodizer. When stored separately the shelf life is extended greatly and you can mix small quantities as you need them. USP collodion is used in the treatment of wounds and can be stored quite safely, the iodizer however, contains ingredients which can be harmful to health and explosive when stored individually, but completely safe when mixed together. Mask, apron, eyewear, and gloves are required for safety.

7.1.1 MAKING THE IODIZER

Iodizer stabilises the ether content in the collodion mix and allows it to be kept safely for long periods without the issues associated with storage. The iodizer contains ether which can cause respiratory issues but is completely safe when handled properly. When mixed and sealed the iodizer will last anywhere between 12 and 18 months. Some solutions have even been useable after 2 years!

Add the chemicals in order and mix parts A and B separately. Use all of the ether in one mixing to ensure no problems with storage, so buy only what you intend to use.

Quantities below show what is required for three separate volumes, based on your Ether stock.

1	Ether	100ml	250ml	500ml	Part A
2	Denatured Alcohol	100ml	250ml	500ml	
3	Distilled Water	2ml	3ml	3ml	Part B
4	Cadmium Bromide	1.9g	4.75g	9.5g	
5	Ammonium Iodide	2.5g	6.25g	12.5g	

Mix Part A with Part B to make 200ml, 500ml or 1000ml of iodizer. Store in a bottle and seal to prevent evaporation. If you don't have a sealable bottle, wrap some electrical tape around the cap. Label the bottle with the date of mixing so you know how useable it is.

7.1.2 WORKING COLLODION

USP collodion will be obtained ready to use in its own storage container and can be stored for over 12 months without deteriorating (as long as the container is sealed against air and evaporation). Use electrical tape around the cap to seal.

To make a working collodion solution, USP needs to be mixed with the iodizer in a 1:1.33 ratio. The fact that the two components are mixed just before use means that your chemistry will stretch over a long period of time. Working collodion will go a long way even if making several plates. You will only use 10-15ml of solution for a single 5x4" plate. I tend to mix 100ml at a time and have fresh chemistry for each session, but it will last for about 3 months when unused.

The table below shows the volumes required to make three working solutions depending on how much work you will be doing.

To Make	100ml	150ml	200ml
USP	43ml	64ml	86ml
Iodizer	57ml	85ml	114ml

Store in a small glass bottle and let it stand for about 2hrs before use (or better still the night before). Liquid should be a clear light amber colour and can be poured straight from the bottle. The colour will change and darken slightly towards red after prolonged storage and is pretty well done at this stage. Although it can be reconstituted with denatured alcohol, the mix will be pretty weak and the images may be quite fragile on your plates. It's better to store separately and mark 'old red collodion'. This can be used to excite your salt bath (see 7.2) instead of wasting fresh chemistry!

7.2 SILVER BATH (9% working solution).

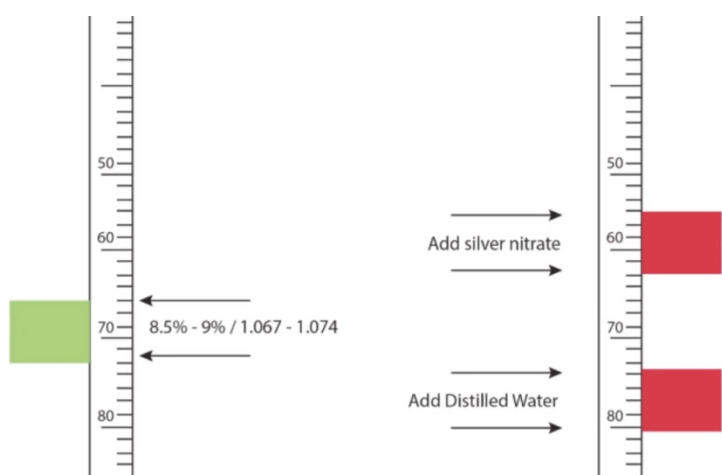
Simple to make but difficult to maintain (for some). Whilst it's a simple cocktail to make, maintaining it over time requires a little care. It's also expensive and you don't

want to throw it away! Remember this stuff will stain your hands and clothes, so use precautions. Mask, apron, eyewear, and gloves are required for safety.

Quantities below are for 1000ml of working solution, but you can pro rata the amounts for lesser volumes. You will need approximately 250ml to fill a 5x4" silver bath tank and approximately 750ml for a 10x8" silver bath tank.

90g	Silver Nitrate crystals
1000ml	Distilled Water

Mix half the crystals in 500ml of water in a 1000ml bottle or measuring cylinder and mix until all the crystals are dissolved. Pour the solution into a storage jar and repeat for the other half of the crystals. It's easier to dissolve the crystals in part rather than all at once.



Hydrometer reading for silver nitrate solution - (Quinn Jacobson)

Using a hydrometer, float into the stored solution and the Specific Gravity (SG) measurement should be at 70% (or 1.07 on the scale). This is exactly a 9% solution and perfect for sensitising plates. If the reading is above 70% add distilled water, if the reading is below 70% add a few Silver Nitrate crystals until the reading is exact.

One last thing to check is the acidity level. Using a PH testing strip, dip the end into the solution for about 15 secs and pull out to dry. The strips will have a colour guide on the packaging to measure against and unless you have inferior grade silver nitrate crystals it should be at around 4. However, it may be a little high (>4), if so you can add a few drops of 3% nitric acid to lower the PH. Don't skimp on the PH strips, you will not get an exact colour match and buying cheap from China is not advisable. They're not expensive (about £5) so buy a good one. Some of them give readings in 0.5 scale which tend to be more accurate. Don't worry too much if your reading is not exactly at PH4 (this is the ideal), anywhere between 3 and 5 should be OK.

Before using the silver bath, you need to 'excite' or 'charge' the solution. When the solution is in your tank, take a small glass plate and flow it with collodion (see making a plate), leave it in the tank overnight and it is ready to use. You can re-use the glass plate by cleaning off the old collodion and preparing it again for making an image.

7.2.1 MAINTAINING THE SILVER BATH

After a while the silver bath becomes exhausted and will not sensitise the plates properly (you will only learn this by experience). Plates will no longer have the milky smooth appearance of a properly coated surface and images will not stick to the plate. Plates will have low contrast, streaks or spots and will often be the first signs

of the silver bath needing maintenance. See also troubleshooting at the end of this guide.

At this point you need to buy some more premixed or maintain what you have. It's expensive to buy new every time and difficult to dispose of correctly so it's worth learning how to do this.

7.2.1.1 LOW MAINTAINANCE

After prolonged usage, the silver solution becomes contaminated with ether and other particulates from the plates and collodion. Pour the solution from the silver bath into a clear storage bottle that has been thoroughly washed with distilled water. Do not use tap water as this contains chlorine which will contaminate your silver solution even more. Use a funnel to catch any drops (remember this stuff stains) and filter as you pour by placing coffee filters or cotton pads in the base of the funnel. This will catch the initial contaminants from your silver bath. Remove the filters from the funnel and discard into a waste bin.

The filtered silver solution now needs to be 'sunned' to remove any organic material left in the solution. This will react with the UV light, turn black and drop to the bottom of the jar. Sunning is done by leaving the jar outside in the sun for several hours. (More sun = less time). Leave the top off the jar and cover the opening with a breathable material like cotton. As the solution is sunned, any trapped alcohol or ether from the collodion will evaporate away and the cloth cover will stop insects or dust from falling into the mix.

In the UK, we are starved of the sun so I supplement the sunning process with a UV lamp and leave it on all day! Some practitioners will 'boil' the solution, however this can lead to explosion so I do not teach or recommend this process ever!

Once sunning is complete we need to filter the solution again into its final storage bottle. Use the funnel and pack it with your coffee filters or cotton pads and slowly filter back into a fresh jar that has been cleaned with distilled water. Once complete we just need to check the SG and PH as we did when making fresh solution.

There is no need to 'charge' the solution before you use the silver bath as we did when making the fresh batch.

7.2.1.2 HEAVY MAINTAINANCE

At some point your silver bath will no longer function after low maintenance and a complete reconstitution is necessary. I can't really tell you how often this needs to be done because it depends on how you keep up with the low maintenance. Before maintenance you will need to neutralise the bath before sunning. This requires you to neutralise the bath by lowering the PH value to 7, by the use of sodium bicarbonate (baking soda).

1. Mix 30g of sodium bicarbonate with 100ml distilled water and add only 'a few drops at a time' to your silver bath. **BE VERY CAREFUL – do this slowly** because you are adding a base to an acid and is reactive. You will need all your safety gear. Keep checking your PH until it reaches 7 (which is neutral).

2. Now you can sun the liquid (or use UV lamps as described above). This will take some time and leave you with a 'sludge' in the bottom.
3. Filter out the clear liquid which contains your silver (several times) and discard the sludge. You will know when this process is complete when there is no black residue on your filter material.
4. Reconstitute the bath with fresh silver nitrate crystals (mix in 5g at a time) and distilled water until you reach SG of 70% and PH 4.

This is now considered 'as new' and will work as if you have made it from scratch as in 7.1.1, without the expense of 90g of silver nitrate! You will never have to discard your silver either which is not environmentally friendly. There is no need to 'charge' the solution before you use the silver bath as we did when making the fresh batch.

7.3 DEVELOPER

Developer is another easy mix to make, and as always precautions should be taken with eyewear, gloves and mask. The table below show the quantities for 250ml, 500ml and 1 litre. You only need 10ml for a 5x4" plate and 20ml for a 10x8" plate so don't make large amounts unless you're going to have a good run at it!

To Make	250ml	50ml	1000ml
Ferrous Sulphate	10g	20g	40g
Denatured Alcohol	10ml	20ml	40ml
Glacial Acetic Acid	7.5ml	15ml	30ml
Distilled Water	232ml	465ml	930ml

Mix the Ferrous Sulfate with 200ml distilled water then add denatured alcohol and acetic acid. Mix well and top off with remaining distilled water. Store in a stock bottle and label it with the date. Although I have given amounts for alcohol, this should be reduced to a low as you can get it (perhaps half), this is only required for flowing smoothly and easily over the plate. A fresh silver bath needs less alcohol in the developer than a used silver bath! Used silver nitrate hinders flow of developer.

Although the developer can be used in a tray as in normal print developing, it is not recommended due to the short developing time required (15 secs). It is also cheap to make and lasts a long time, therefore we only use it in a single shot (less than 10ml per 5x4" plate) and then discard it. (see making a plate).

7.4 FIXER (HYPO 30% SOLUTION)

Although developing can be done in a dip tank (similar to the salt bath), I prefer to do my development in an open tray as it's easy to see what is going on. Most fixing dip tanks will use less solution and have a clear screen to see the final image forming, however it's easier to keep the agitation of the image going through the process until fully cleared.

To Make	500ml	1000ml
Sodium Thiosulphate	150g	300g
Distilled Water	500ml	1000ml

Mix Sodium Thiosulfate with half of the distilled water in a bottle and shake until dissolved. Top up with remaining distilled water and is ready to use.

7.5 GLASS PLATE CLEANER (for AMBROTYPES)

Plates need to be squeaky clean before flowing with collodion and this solution will make sure that no detritus affects the film or clarity of the image and also helps the adhesion to the glass. Cleaning is described more thoroughly in the section on making plates.

Find a suitable 250ml plastic storage bottle and mix the following items:

20g Calcium Carbonate
100ml Distilled Water
100ml Denatured Alcohol

Shake well each time before use so all parts are well mixed. Solids will settle between uses and will not clean the plates well.

7.6 ALBUMEN (for AMBROTYPES)

Sometimes collodion will 'lift' from the edges of glass plates and require some additional assistance with adhesion. This is not always necessary in summer or warm weather if cleaning of the plates has been meticulous. See also making a plate.

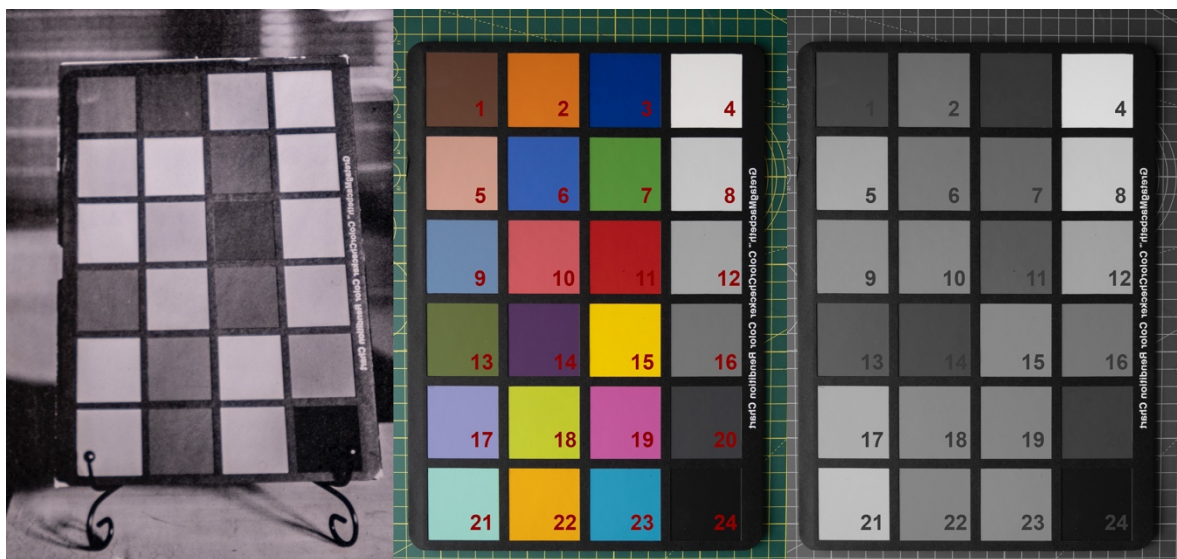
Find a suitable container and mix 1 egg white (discard the yolk) with 300ml of Distilled Water. Shake well to thoroughly mix and then filter into a clean 250ml plastic bottle ready to use. Discard everything else after filtering.

8 COLOURS

When making Wet Plate images, it can be confusing as to why some images are better than others. Take a look at the effect of colour and its relationship to collodion.

Collodion is a monotonal process which resolves colour images (in reverse) on extremely low sensitivity chemical layers, Using my trusty GetagMacbeth colour checker chart as a comparison. The colour chart is scientifically designed to ensure true to life images under any lighting condition. It gives an accurate representation of colours in nature and is accepted as an industry standard.

Suffice is to say that collodion does not behave in a way that most of us would associate with 'normal' black and white imagery, either digital or film processes and has a sensitivity range of about ISO1. Exposure is also dependant on the available UV light, rather than the normal visible light spectrum to resolve the image on the sensitised plate.



A collodion print (left), standard colour chart (centre), and a desaturated colour image (right), comparing the compressed tonal range of the collodion colour gamut.

The collodion tonal range is somewhat muted and compressed. We can see that comparing the colour patches with the collodion patches that warmer colours render darker from the midtone grey (patch 16), and the cooler tones render lighter from midtone. Greens appear to more representative of mid grey in the sample.

The tonal range of collodion seems to be rendered into three distinct areas of lights, darks and midtones.

- Darks – Patches 2, 11, 22 and 24
- Midtones – Patches 1, 7, 13, 15, 18 and 20
- Lights – Patches 3, 4, 5, 6, 8, 9, 10, 12, 14, 16, 17, 19, 21 and 23

So how does this help us? Let's take a seascape – difficult to do with collodion as everything has to be produced on location....we may have blue sky, white clouds and turquoise waters. (Patches 3, 4, 6, 8, 9, 12, 16, 20, 21 and 23). All the patches are in the Lights range meaning that the tonal differences are minimal, making for an image with restricted tonal range. A digital image converted to black and white would be easy to manipulate the tones to give a pleasant image, however this is not possible in collodion plates. What you see is what you get.

Even in a studio portrait, a person with ruddy complexion and freckles wearing a red t-shirt will all reproduce in darker or midtones, also rendering a muddy or compressed tonal range.

If we look at the greyscale patches (white to black), the difference is extremely nuanced until squares 20 and 24. This means that the image will have to rely on the shadows and contrast contained in the image to provide separation in the tonal ranges. So, when choosing clothing and backgrounds for our portraits, the selection of clothing can play a big part in enhancing the result. Remember also that white is not actually white – it's silver!

The choice of colour within a portrait or scene is equally important as the composition. If the portrait subject has dark or ruddy skin, choose a contrasting clothing colour such as white, blue or green, then use lighting direction to produce sculpted shadows to provide depth.

It's not always possible (particularly in a landscape), but if we understand colour relationship it may affect our choice of viewpoint.

9 EXPOSURE

We have already discussed the low sensitivity of collodion, so using a lightmeter isn't going to be much use, but it can help in getting us into the right ballpark. Most lightmeters will only let you set the lowest ISO to 3 and we will be exposing at about ISO1(ish). Add to that the collodion is most receptive to the UV component of visible light which is only a small part of the exposure value.

After a while, you will have a gut feel for the exposure, but again this is a best guess based on experience and of no help when you're starting off. Apart from the actual amount of EV that visible light has, there are many other variables that will affect your exposure:

- The type of lens you are using and bellows extension.
- The collodion formula, development formula and the age of the chemicals.
- Heat and humidity – summer and winter.
- If the sun is out, cloudy or late in the day, indoors will affect the UV content.
- Positive or negative ambrotypes.
- The size and format of your image (4x5, 10x8 etc).
- Add contrast by under exposing and over developing.
- Reduce contrast by over exposing and under developing.
- Increase highlight detail by over exposing and over developing.

You may think looking at the above that it's really just guesswork, but after a while you will develop your own 'gut feel', and we can get a good starting point by following my good start guide.....

9.1 DAYLIGHT EXPOSURES

Exposure table for ISO 3 metering in Sunny outdoor conditions.
(Add two stops for ISO1) - Add half a stop for cloudy conditions.

Decrease Exposure..... Full Stop IncrementsIncrease Exposure						
<div> <div> Increase Exposure </div> <div> Half Stop Increments. </div> <div> Decrease Exposure. </div> </div>	30s	64s	2m 8s	4m 16s		
	20s	45s	1m 31s	3m	6m	
	15s	30s	64s	2m 8s	4m 16s	
	10s	20s	45s	1m 31s	3m	6m
	8s	15s	30s	64s	2m 8s	4m 16s
	6s	10s	20s	45s	1m 31s	3m
	4s	8s	15s	30s	64s	2m 8s
	3s	6s	10s	20s	45s	1m 31s
	2s	4s	8s	15s	30s	64s
	1.5s	3s	6s	10s	20s	45s
	1s	2s	4s	8s	15s	30s
	0.6 (1/1.5)	1.5s	3s	6s	10s	20s
	0.5 (1/2)	1s	2s	4s	8s	15s
	0.33 (1/3)	0.6 (1/1.5)	1.5s	3s	6s	10s
	0.25 (1/4)	0.5 (1/2)	1s	2s	4s	8s
	0.16 (1/6)	0.33 (1/3)	0.6 (1/1.5)	1.5s	3s	6s
	0.125 (1/8)	0.25 (1/4)	0.5 (1/2)	1s	2s	4s
	0.1 (1/10)	0.16 (1/6)	0.33 (1/3)	0.6 (1/1.5)	1.5s	3s
	0.06 (1/15)	0.125 (1/8)	0.25 (1/4)	0.5 (1/2)	1s	2s
	0.05 (1/20)	0.1 (1/10)	0.16 (1/6)	0.33 (1/3)	0.6 (1/1.5)	1.5s
	0.03 (1/30)	0.06 (1/15)	0.125 (1/8)	0.25 (1/4)	0.5 (1/2)	1s
	0.02 (1/45)	0.05 (1/20)	0.1 (1/10)	0.16 (1/6)	0.33 (1/3)	0.6 (1/1.5)
		0.03 (1/30)	0.06 (1/15)	0.125 (1/8)	0.25 (1/4)	0.5 (1/2)

The exposure table above and a good light meter will get you in the right ballpark, after which you should be able to make a slight adjustment and get it right with your second attempt.

- **Set your meter to ISO 3** and choose the aperture you want to make your exposure for.
- Look at meter reading (in seconds) and scan across column two stops for ISO1 and atmospherics. (Add an extra half stop for cloudy conditions).
- This is a 'best guess' exposure only and will not be the same for every subject or distance to camera.
- Inspect your plate after following the process in section 10 (Making Your First Plate). A darker image will be under exposed, a brighter image will be over exposed.
- Adjust your exposure after first plate.

Remember you don't have to be ultra-exact with your timings, particularly with the longer exposures. The difference between 15 and 20 secs may only be ½ stop.

Under normal circumstances, try not to expose for longer than 10 mins (600 secs), as this is the point at which your collodion will start to dry out (unless you are shooting in high humidity), and images may not develop. This is also the point at which your gut feel really is guesswork!

You should be able to make several plates with the same exposure within an hour, unless you move location or change lighting conditions, and then you will have to start again. Try not to be over ambitious and make too many plates on your first attempts, this is when you rush the technique and mistakes happen. If you make three an hour you are doing well.



¼ sec @ f5.6 –
Sunny Day



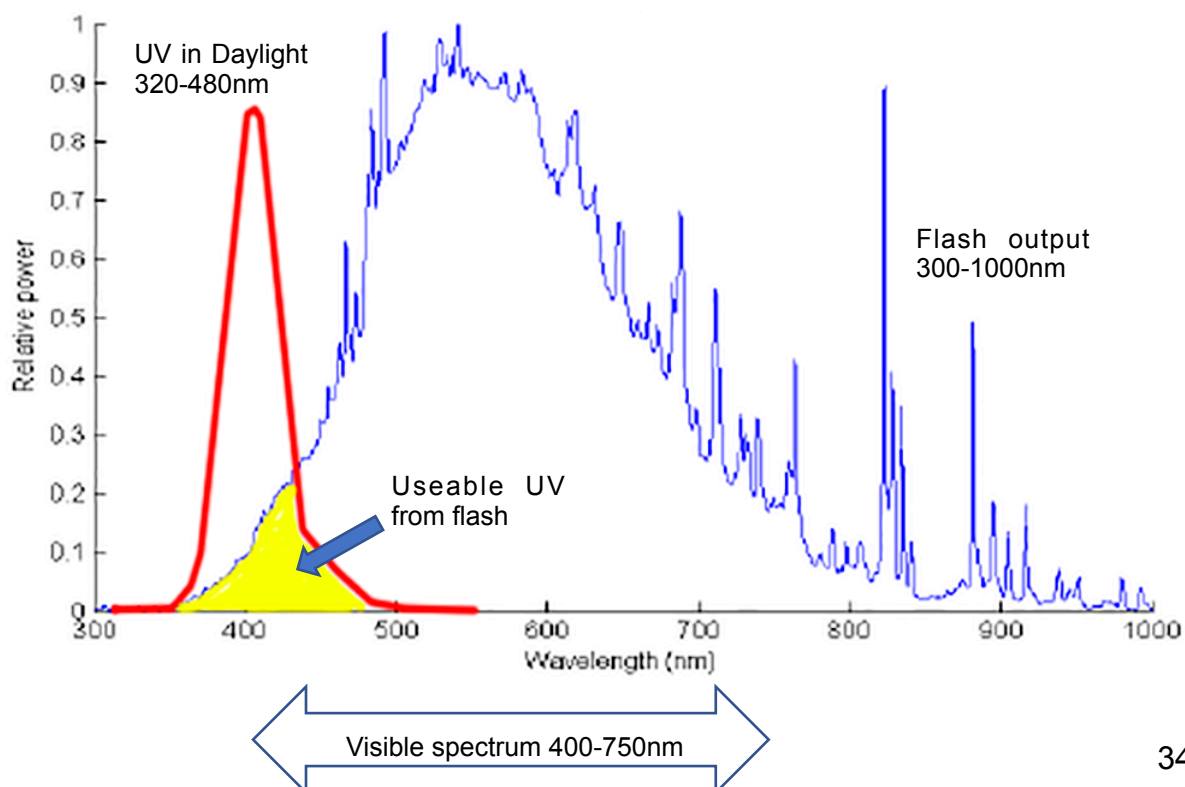
$\frac{1}{8}$ sec @ f5.6 –
Sunny Day

The images above were taken on a very bright summers day with fresh chemistry. The top image was my first attempt with the bottom image (30 mins later) adjusted by 'gut feel' to ensure more detail was recorded in the highlights. In retrospect, I should have kept the initial exposure and developed for longer, and this would have been perfect.

Remember that when your chemistry gets older (i.e.; one or two months), your exposure and developing times will increase.

9.2 STUDIO LIGHTING

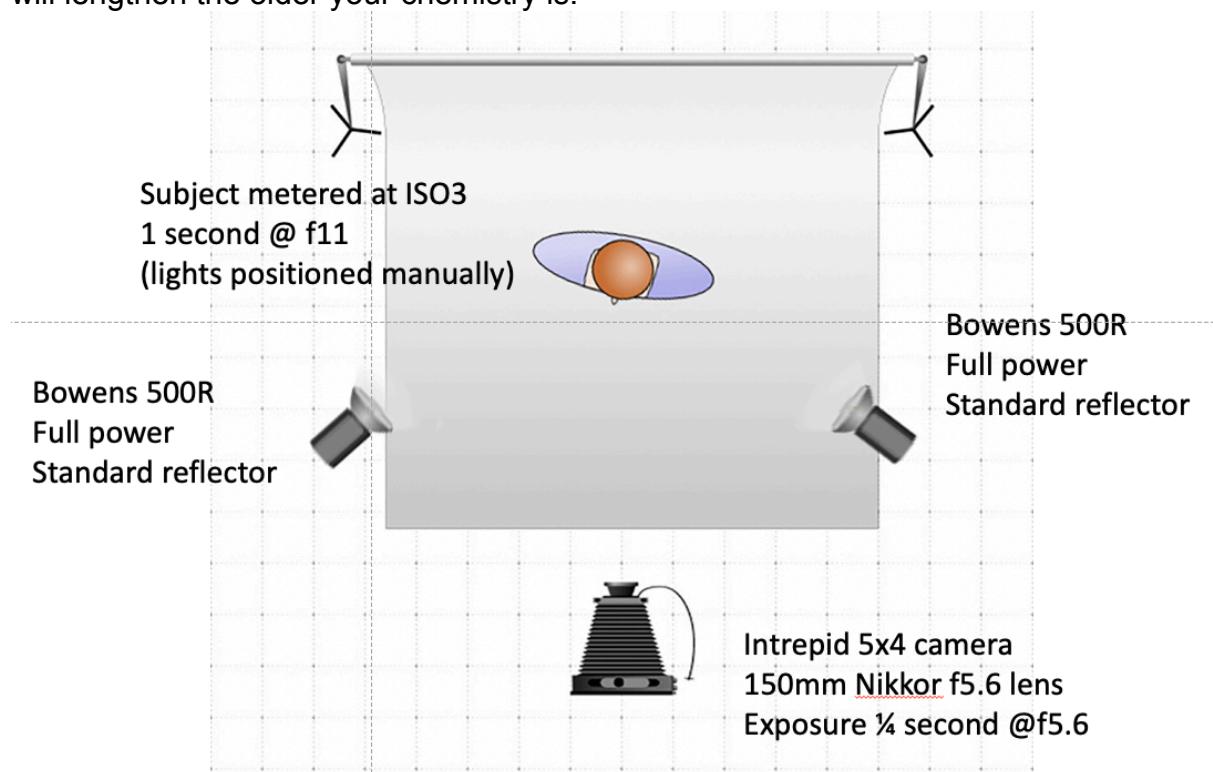
Flash lighting in the studio is far more predictable than ambient conditions. The only problem is, you need a lot of it! The chart below shows how much light is given off by a typical studio light.



You can see from the chart that the amount of UV produced is quite small, which is why many American publications suggest massive power units up to 2400w/s and several of them!!!! `all I can say is that if you want to nuke your subjects go ahead (blindness is only temporary!) This is not only discomforting for your subjects, it could well be dangerous.

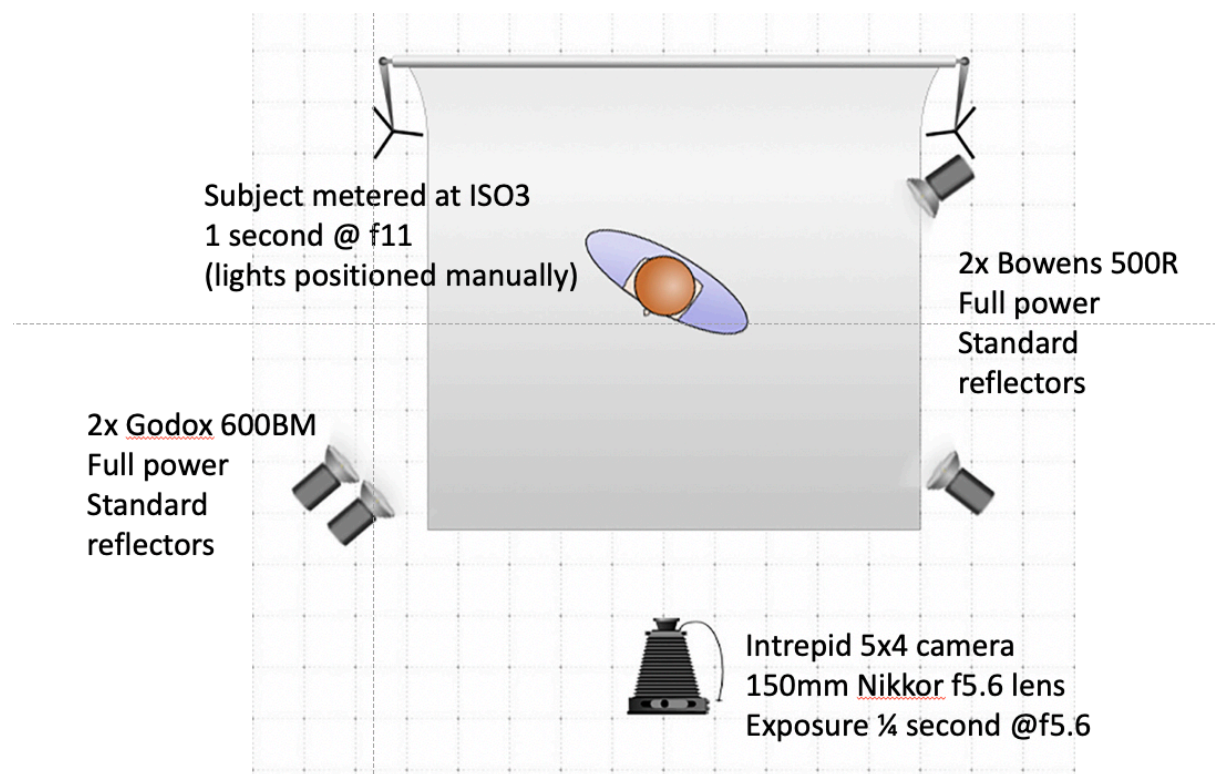
I would suggest smaller powered lights (500w/s) but more of them (say 4). The diagrams below show my original setup with two units and my more advanced setup with 4. The total output was equivalent to 2400w/s but allows for shaping the light around your subjects. Adding modifiers such as softboxes will cut out UV so just use the standard metal reflectors. It may be a harsher light than you're used to but helps with the contrast in your finished plate and the UV output becomes more efficient.

Use your meter set to ISO3 and position at the subject facing the camera. Take an incident reading and manually position the lights until the reading gives you 1 second exposure at f5.6. This is approximately equivalent to ¼ second at f5.6 at ISO1. All I can say is that this works for my system, but work from here and you will have little problem in working out what works for your setup. Just keep notes on your metered exposure, aperture settings and lights to subject distance. Remember that exposure will lengthen the older your chemistry is!





Basic lighting does not inspire great results and tend to be quite stark, however it will allow you to experiment and images are better if the exposure is extended beyond the initial flash by 1 or 2 seconds, allowing any available light to fill in the shadows.





An image captured with four lights. Start with your lights approximately 1m from subject and then adjust the distance based on your metering.

10 MAKING YOUR FIRST PLATE

Now we're getting to the exciting part. Those of you who have worked in a darkroom environment before, will have some sense of the anticipation and excitement that photographers feel when the 'magic' happens, and the image you have carefully crafted comes to life and appears before your eyes!

First of all, don't get your hopes up that your first image will be perfect; it won't be - except by sheer fluke. The nature of the process is fickle, so have patience and persevere. That said, this is what wet plate imagery is all about, an authentic reproduction of a historic and unique process, handcrafted by the skills of a talented artist and technician.

Sections 10.1, 10.2, 10.5, 10.7, 10.8, 10.9 and 10.10.....can all be done in normal daylight, however sections 10.3, 10.4 and 10.6 can only to be done under safe light conditions, i.e.: in the darkroom or darkbox. These sections are in red text just as a reminder!

10.1 PREPARE THE PLATE

10.1.1 TINTYPES

The aluminium plate will have a plastic film on the surface which can be peeled off and discarded, but keep the plate vertical to prevent dust and other particulates from settling on the surface until you flow the plate.

10.1.2 AMBROTYPES

Glass plates need a really good clean to remove grease and other dirt from the surface. Because they don't have a front or back surface, I tend to clean each surface the same. You should firstly de-burr the edges to prevent cuts and it also helps keep the collodion from spilling off the plate. Use some sandpaper or a sharpening stone just to round off the edges.

When finished, use some warm water and mild detergent in the sink to wipe off any grease or other marks and dust with a dish sponge. The type that has a plastic scrubber on one side is perfect. It isn't too harsh and will not mark the surface of the glass.

Dry using a paper towel, then using the glass cleaner you made in section 7.5, pour onto the surface of the plate and clean the surfaces thoroughly with a fresh towel and finally polish, paying close attention to the edges. Your plate will be super sparkly!

Collodion on glass plates tend to lift at the edges if the glass is not very clean so there is an additional step prior to flowing the plate. This is particularly important in cooler weather (less than 15°C). Using the Albumen (section 7.6), take a cotton bud and smear some on the edges of the plate and let it dry for about 30secs, then you can move on to 10.2.

10.2 FLOWING THE PLATE (Ambrotype and Tintype)

It helps before you start each operation to prepare your workspace with the chemicals, trays, gloves etc; that you need so you don't waste time looking for stuff you should already have, particularly when starting off.

You should already have your working collodion to hand (USP collodion + iodizer – section 7.1.2) along with your gloves. In cooler weather (less than 15°C), it helps to warm the plate over your alcohol lamp. Hold the plate above the flame to remove moisture and help smooth the flow the collodion, which may cause problems with your emulsion. This step is not usually required in the summer.

Don't let the plate get too hot, glass will break with excessive heat and aluminium heats up rapidly and will burn fingers!

- Hold your plate flat (like a waiter tray on your fingertips) over a tray to catch any spills.
- Pour a 'puddle' of collodion in the middle of the plate to within ½" of the edges. Go slowly, you have more time than you think.
- Rock the pool of collodion to each of the four corners in turn.
- When you get to the last corner, pour the excess back into the pour bottle by tipping the plate almost vertically and rock from side to side to prevent ridges in the collodion.
- Use a paper towel to tap the drip corner and mop up any excess collodion. When it stops making a mark on the towel it has set sufficiently to put into the silver bath.
- Holding the plate by the edges and use a second paper towel to clean up the back of the plate.

The collodion will reach an initial 'set' when the plate is tacky. This can be tested by pressing a gloved finger in the corner of the plate. If it feels like a sticky sweet – its ready! If you wait too long it will dry out and the film will not sensitize properly in the silver bath and will happen more quickly in warm weather. I prefer to 'guesstimate' that its ready after around 30 secs, because I don't want to mark the corner of my plate with a big fat finger mark.

Don't forget to replace the cap on your working collodion bottle to prevent evaporation and contaminants entering your solution.

10.3 SENSITISING THE PLATE

Only part of this step can be undertaken in daylight! Anything done under a safelight condition (darkroom) is in **red text**. I'm assuming that most people will have bought silver bath dip tanks, which will come with their own 'dipper'. Usually a plastic handle with a ledge for supporting the plate in the silver bath.

- Take your flowed plate (by the edges) and place it in your dipper.
- Slowly lower the plate fully into your salt bath tank, taking care not to splash or jerk it about too much. This would produce a line on the emulsion which will resolve in the final image.
- Close the lid of your salt bath tank.

We now need to wait for the salts in the collodion to turn to silver bromide and silver iodides, therefore making the plate sensitive to light. The process can take anywhere from 2-5 mins, depending on the temperature. (Approx. 3 mins for summer and 4 mins in autumn/winter). Do not pull the plate too early as the image will lack contrast and density, but don't fret over the time. If you leave the plate in too long (8 mins) due to the temperature, you will end up depleting your salt bath early and have other issues like fogging, muddy or other marks on the plate.

You can actually check by examining the plate under safelight. Lift the lid of your salt bath and slowly pull out the plate. You will notice that the once transparent collodion has turned to a milky opaque colour indicating the reaction is taking place. The sensitising process is complete when the surface is flat and smooth. If you see rivers flowing on the surface (think of water on a freshly waxed car), then it needs to continue soaking. Lower the plate back into the bath and replace the lid.

Whilst the plate is sensitising, you can use this time to prepare your developer in a small shot glass and open your plate holder, perhaps pre-focus the camera to allow plenty of time in your process. Remember, once you have loaded your plate in the holder, the chemicals are already starting to dry out and you're on the clock!

10.4 LOADING THE PLATE

Once the plate is ready, remove the lid and slowly take the plate out of the silver bath. It is now sensitive to light. Do not touch the sensitised surface!

- Slowly pull the plate with the dipper out of the silver bath. If you splash silver nitrate it will stain anything it touches.
- Carefully prise the plate away from the dipper (it may be stuck due to liquid tension), and drain any excess silver nitrate back into the tank.
- Place the lid back on the tank to prevent spills and contaminants entering the bath.
- Holding the edges of your plate, tap and drain any excess off the plate onto a paper towel. Using a fresh towel, wipe the back of the plate to prevent contamination of your holder and camera.
- Place the plate into your holder (ensuring it's the right way around!) It can be difficult with ambrotypes under safelight conditions to know which side you have sensitised.
- Close the back of your holder and exit your darkroom.

10.5 TAKE THE PHOTO

You will have already pre-focussed and composed your image at this point, so, with the plate safely in the holder, we're ready to expose the image. Load the holder into the camera and set your exposure and aperture according to your guesstimate or calculations as described in section 9.

If everything is ready, remove the dark slide from the holder and expose your image. Don't forget to replace the dark slide when finished. I've spoilt several images by fogging! I failed in this regard several times. Everything is so automatic with modern cameras, it's so easy to forget when reverting to traditional cameras.

Remove the holder from the camera and retreat to the darkroom.

10.6 DEVELOP THE IMAGE

As we're now safely back in our darkroom (red light conditions) we can unload the plate from the holder. You will have already prepared a 10-20ml solution of developer into a shot glass or beaker whilst waiting for the plate to sensitise (section 10.3). You can do it now, but this only serves to clutter your working space with additional bottles and chemicals. If you're working in a darkbox, this is at a premium.

- Unload the plate from the holder.
- Rest the plate on your fingertips (waiter tray style) as we did when flowing the plate. Do this over a sink or tray to catch the spill.
- In one smooth sweeping motion, flow developer quickly along one edge (usually the longest side) of the plate and let it drain over the surface. If you splash or 'dump' the developer it will have artefact's, islands or other looks that will not be desirable. (see Troubleshooting).
- Let whatever is on the plate soak into the emulsion – hold the plate relatively flat but rock in a circular motion to keep the developer moving.
- The image should start appearing in around 10-15 seconds (in negative). If it takes longer than 20 seconds, you may have the exposure wrong or chemicals will be starting to deplete. Keep going – we don't know which it is yet!
- When you think it's about done.....stop the development immediately with plain tapwater from a jug. You don't need much but if you don't do it quickly the plate will continue to develop and may go too far.

After washing the plate (front and back) over the sink or spill tray, you will be able to turn normal lights on or exit your darkroom to complete the fixing process. It's important to wash the back of your plate also to prevent developer contamination of your fixer.

10.7 FIXING THE PLATE

This can be done in a fixing tank or tray in normal light. I prefer the tray because it's easier to use and see the image forming. Fixing the image now removes the silver from the unexposed areas of the plate revealing the positive image.

- Pour some fixer (Hypo) into a tray and tilt to one end.
- Place the plate into the tray and then rock the fixer over the plate in a gentle rhythm until cleared.
- This will take two or three minutes with fresh solution, but up to 10 mins with tired chemicals. There is no harm in leaving it longer and may brighten the image.
- Make sure all the unexposed silver has been washed away.

If you're only going to be doing three or four plates in a session, you can pour the fixer back in the bottle to use again, however it should be discarded after the next session. Fixer will contain dissolved silver and affect the look of future plates, making them less bright and dull. Fixer is cheap to make so don't waste effort making it last longer than necessary.

10.8 FINAL WASH

Some photographers wash for a short time and end up having problems with the varnishing stage. You **MUST** wash your plates thoroughly to remove all traces of fixer and anything else which has 'stuck' to your plate. I recommend at least 10 mins under fresh water, or at least 5 changes of water in a tray.

If you don't have a sink dedicated to photography (I don't recommend the kitchen!), try my method of using a spare tray....

Most people will have a garden hose and a drain close by. With the tray slightly elevated at one end, let the hose fill the tray at the elevated end and place the plate at the other end. Turn the hose on to a slow (but steady) flow and let it fill up to overflowing. The excess will drain away whilst the hose keeps a constant change of fresh water. You can even leave it unattended whilst you are doing your next plate.

Do not run the water too fast, or dump water straight onto the plate. This may end up stripping the image off the plate, particularly with ambrotypes. In the field I do a couple of quick tray washes and place them in a storage box ready for a proper wash when I get home.

10.9 CLEAN YOUR GEAR!

Remember that chemicals can get everywhere and you don't want it ruining expensive cameras or creating unwanted artefacts from a dirty plate holder. Apart from a general clean-up of your darkroom, trays and other paraphernalia, your plate holder is the biggest source of problems with your images.

Using paper towels, wipe down the holder between each shot, making sure it's completely dry. When a new plate is inserted, the chemicals encourage capillary action of anything already on the holder and it can migrate to both the back and front of your plate. It doesn't have to be squeaky clean, just dry. A good wash and thorough drying are only required during your main clean-up.

10.10 FINISHING

I only recommend two types of finishing to plates – varnishing with either shellac or sandarac and black gloss spray (ambrotypes only). Some people recommend archival wax such as Renaissance, however with fragile plates this can 'lift' the image off the plate and doesn't give as good a finish. It does however do away with the need for an alcohol lamp.

10.10.1 SANDARAC VARNISH (or Shellac)

It is not necessary to varnish your plates. Plates left unvarnished will often appear brighter than after varnishing. Indeed, many old tintypes were left this way prior to placing in their glass case. This however leaves them vulnerable to atmospheric contaminants and scratching, particularly when contact printing or alternative processing.

Varnishing with either sandarac or shellac is done exactly the same way for tintypes or ambrotypes. The varnish is applied to the 'silvered' side of the plate with the

added advantage that ambrotypes will look the right way around instead of reversed. Be careful as the varnish can catch fire, so don't get too close.

Varnishing is best done soon after washing and the plate has completely dried. You can leave overnight in a drying rack, or warm your plates over the alcohol lamp to speed up the process.

- First stand the varnish bottle in a bowl of warm water. (It flows better when warm, but may not be necessary in summer months.)
- The plate must be warm when varnishing. Light the alcohol lamp and slowly heat the entire plate from the underside until you can still hold it without burning fingers. Tintypes heat up quickly and cool down fast, whereas ambrotypes are the opposite. Beware heating glass too much as it may crack and your hard work will be ruined.
- Place the lamp away from your varnish and plate when pouring to avoid fires!
- Pour the varnish in exactly the same way we poured the collodion. (waiter tray style on fingertips, puddle, then rock in circular motion to cover the plate.) I wear gloves and pour over a spill tray to avoid accidents. It flows much quicker than the collodion so go easy!
- After tipping the excess varnish off the corner of the plate back into the bottle, wait until the drips stop and dry the end onto a paper towel until no more appears on the towel.
- Hold the plate at the edges and dry the plate again over the alcohol lamp. You may see some steam evaporating off the plate when warming but don't be alarmed. The plate is 'set' after a minute or so.

The surface will still be soft so try not to touch for about an hour. It will be safe to handle but will not be completely cured for about a week.

10.10.2 PAINT OR ASPHALTUM (Ambrotypes only)

An alternative to varnishing is to coat the silvered side of the plate with a black coating so the image can be viewed as a positive. Traditionalists will use asphaltum (bitumen or road tar mixed with mineral spirits), but it's messy and another bunch of stuff to keep around the studio.

I prefer to use a high gloss black acrylic paint (the finishing coat to car bodywork), which doesn't take up much room and is ready to use. It's also dry in an hour and is tough enough to last a lifetime.

- Make a cardboard spray booth, by using any large box from the supermarket.
- Tape up the corners so no paint escapes through the gaps.
- Lay the plate (silver side up) and spray an even coat across the image. Do this in a well-ventilated area (aerosols can damage your lungs).
- Turn the box (not the plate) through 90° and repeat.

Wait about an hour before picking up the plate. Everything is now ready for display or archiving.

11 TROUBLESHOOTING

I can't possibly cover everything you will come across during your journey, however I have included below, some of the more common issues you will encounter. Be aware you will probably try and overuse your chemicals, long after their useful life has expired. Whilst making plates is still possible with tired solutions, your first step should always be – make fresh chemicals!

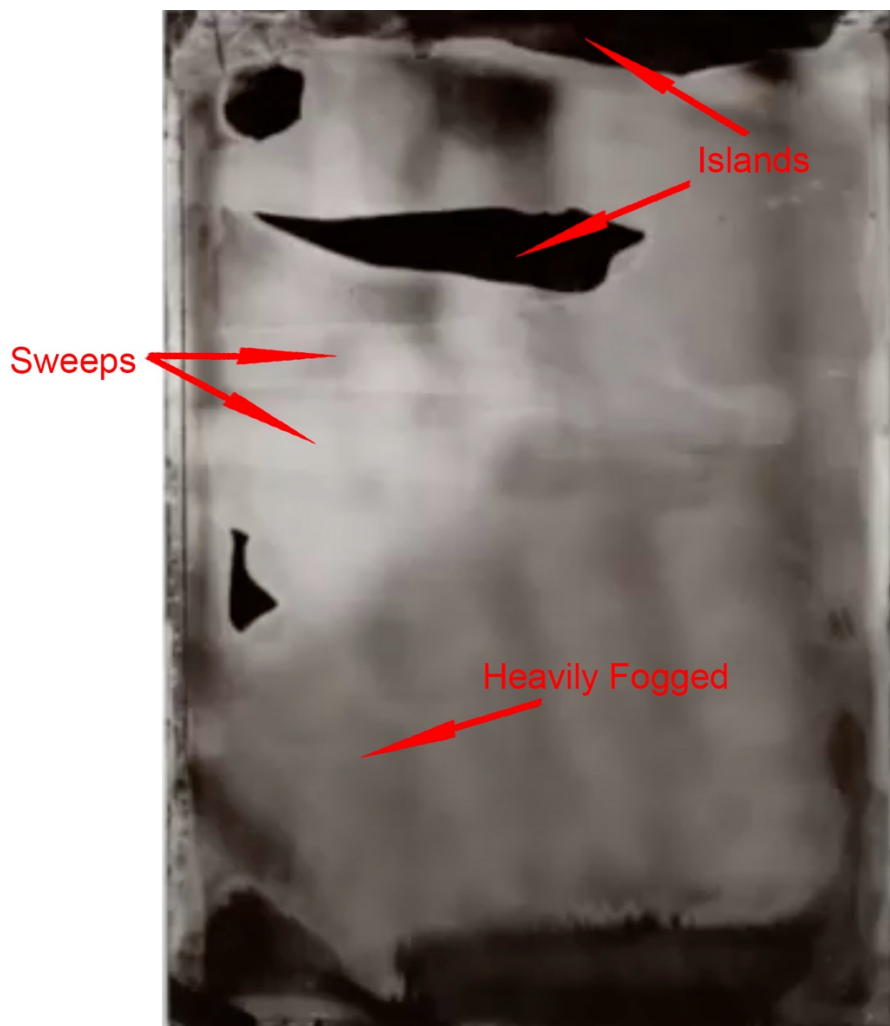
11.1 ISLANDS, OYSTERS and SWEEPS

Islands, are created when the developer stops and starts flowing irregularly over the plate creating 'black holes'. This is usually caused by insufficient alcohol in the developer to allow a good flow over the surface. It can also be caused by contaminants on the surface of the plate forcing the developer to take a 'detour' around its intended direction.

Solution – add (a small amount of) alcohol to your developer, clean your plates better, make fresh developer.



Typical Islands

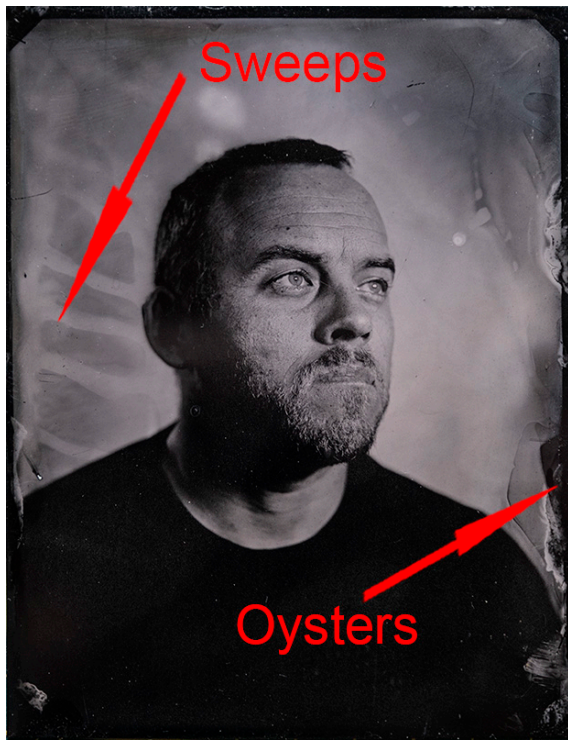


Oysters, usually occur at the edge of the plates and is caused by artefacts or contaminates in your plate holder or dirty plates. Can be worse in wooden plate holders which tend to absorb the chemicals off the wet plates.

Solution – make sure the plates and holders are as clean as they can be. With wooden holders, try varnishing the rebates with polyurethane which makes them easier to clean.

Sweeps, look like tide marks across the plate indicating a poor developer technique. You may be hesitant, too slow or too fast with your developing 'throw'. Caused by the developer staying too long on one area of the plate concentrating the developer on one spot for longer than desired.

Solution – practice your techniques on a blank sheet of glass with tap water. Practice, practice, practice. It will get better with time and experience.



Oysters and Sweeps



Oysters

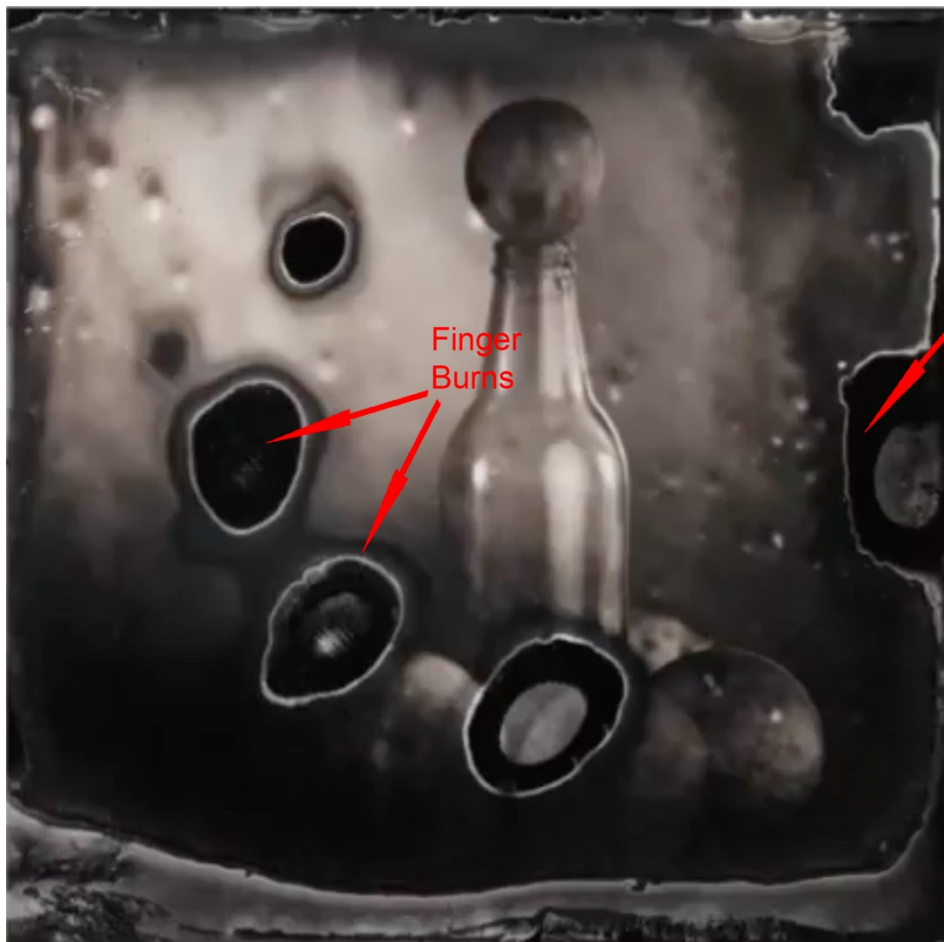
11.2 FINGER BURNS and DRYING OUT

Finger Burns, are less common but can occur when a cold plate comes into contact with warm fingers on the underside. Normally we wear nitrile gloves to protect fingers from staining, however some practitioners still insist on doing this process bare handed! In cold weather.

Solution - heat the plate over an alcohol lamp for a few seconds before flowing the plate and wear protective gloves.

Drying Out, is a situation where the flowed collodion has 'set' for too long before immersing into the silver sensitising bath. Mostly happens when humidity is low or in hot weather. You can wait too long before immersion in silver, it goes a bit like the skin on custard when it cools down.

Solution – don't wait too long before immersion into the silver bath and prepare your camera (focus) prior to flowing the plate.



11.3 PEELING and LIFTING

This will only happen with Ambrotypes (glass plates). When the glass is not spotlessly clean (particularly at the edges), the collodion will lift and peel away from the surface of the glass. This usually occurs when the fixing and washing cycles begin. The fluid gets between the emulsion and the glass peeling it back and folding it over from the edges of the plate. The collodion will also shrink slightly when drying, also reducing adhesion.

Solution – take extra care when cleaning the glass and use the Albumen technique described in Section 7.6. Use the glass plates as soon as possible after cleaning to prevent dust settling on the surface. Warm up cold plates over an alcohol lamp for a few seconds to remove moisture during cold weather.



Peeling on edges of an Ambrotype

11.4 STRIATIONS

Striations, are solvent streaks caused by a silver bath that needs maintenance. The effect looks like rain on a window and is caused by the bath being loaded with solvents from numerous plates being immersed without refreshing the chemicals.

Solution – You can rescue the plates in the current session by agitating the plate in the silver bath (under safelight conditions) to ‘mix’ the solution slightly, but beware the bath will probably be loaded with artefacts and partially developed silver and will damage plates. At the earliest opportunity, the bath should be maintained as in Section 7.2.1, or a fresh solution used.



Typical Striations