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Kitchen Improvised Blasting Caps
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HOW BLASTING CAPS WORK

I know you have seen before, on T.V., the western where the good guy sticks a fuse in a stick of dynamite and presto he has a fuse detonation device? If you have used explosives in the military or otherwise you know that this is a bunch of huey! While there are explosive compositions that can be made to detonate this easily, this same trait gives them a dangerous nature that requires very special precautions, if they can be used at all.

Detonation is in essence a chemical reaction brought about by a high velocity shock wave at speeds as low as 1100 M/sec. and going up to 9300 M/sec. for "Medina" explosives. This shock wave is initially produced by the blasting cap and is continued throughout the explosive charge as the detonation progresses. These waves have the appearance, in high speed photos, similar to ripples in a smooth pond of water as a pebble is thrown in. These detonation waves must meet or exceed certain strength and rate requirements to detonate a particular charge or explosive. Each explosive

has a different requirement for detonation from the blasting cap standpoint. A good rule of thumb for any explosive is to use more blasting cap than is needed. This is a good idea as most explosives can be overdriven with a larger than needed detonator. By overdriven, I mean that an abnormally high detonation rate can be achieved as the high speed detonation from the cap will carry over in the explosive.

Many people with whom I have conversed, have mentioned pipe bombs that are made by filling a pipe with either black powder or smokeless powder. These pipe bombs are poor for fragmentation due to the actual deflagration nature of this type ordinance. Deflagration is the simple burning of a propellant or explosive. This will generate pressure great enough to rupture the container (pipe) and no more. 2" schedule 40 pipe will rupture at approximately 7144 P.S.I. If black powder or smokeless powder is being used, this is the maximum pressure a pipe bomb would generate. If this same pipe were filled with powdered ammonium nitrate-fuel oil explosive and detonated with a blasting cap with an approximate pressure of detonation of 600,000 P.S.I. plus. This same set up (cap initiated) with "Bullseye" brand smokeless powder from Hercules Inc. Wilmington Delaware as a pipe filler with a blasting cap will generate approximately 2,000,000 P.S.I. plus detonation pressure. This amounts to an 8300% and 2800% increase over deflagration respectively. As these figures prove, true detonation is awesome and an unbelievable increase over simple propellant deflagration explosive fillers. Most of the high CHNO explosive groups will make the transition from deflagration to detonation. Usually this transition will require the build up of a good deal of pressure. The ammonium nitrate cargos of the High Flyer and Grandcamp are said to possibly have undergone this type of deflagration to detonation transition. This transitions, caused the detonation of their cargos of thousands of tons of fertilizer grade ammonium nitrate. This detonation in Texas City, Texas Harbor, in 1947 generated 50 million dollars damage and jiggled seismograph needles in Denver, Colorado. This was the largest nonnuclear explosion in U.S. history.

As mentioned earlier we have explained that detonation is a shock wave introduced chemical reaction. This detonation wave, and what happens, is perhaps explained easier in the drawing below. In this drawing the zone in front of the shock wave is the unreacted zone. Behind this zone, the shock wave is seen. This area of the shock wave is called the "Shock zone." This is the mechanical shock wave that originated at the detonator. This shock zone is usually 0.00001 cm long. The "chemical reaction zone" immediately follows the shock zone. The shock zone is the point of the highest pressure of the detonation. The "chemical reaction zone" is the part of the detonation zone that has the highest temperature and velocity. This chemical reaction zone is where the actual chemical reactions of the detonation, and the subsequent detonation byproducts are produced. This zone does not actually include the detonation byproducts because the reactions are not complete. This chemical reaction zone is usually 0.1 to 1.0 cm long. One of the characteristic differences of deflagration and detonation is the flow of the byproducts. In deflagration the products flow from the combustion zone. In detonation the products flow toward the shock zone.

At times the detonation zone in an explosive can progress through the explosive at a much slower than normal rate. This is called low order detonation. Nitroglycerin, one of the most powerful explosives known, still has this undesirable trait. "Nitro" can detonate with high order detonation rates of over 8000 M/sec. while low order detonation can be as low at 1500 M/sec..

Density of explosives have a great bearing on the rate of the

detonation zone than the explosive mass. Every explosive has a greater detonation velocity with respect to the density. These are fixed and unchangeable under ideal conditions. Usually, the greater the density, the higher the detonation rate. Also, the higher the density, the lower the sensitivity. These statements, of course, are generalizations and will not hold true always. In a classic sense they give somewhat of an idea as to the way explosives perform.

As this is a field of explosive that can become a lifelong study, we won't attempt to give course in these theories. It is good, however, to understand why explosives perform the way they do so that maximum use could be had from them. The theory above is the hydrodynamic theory of detonation. This is the most generally accepted of the explosive detonation theories. For further reading here are two good books:

DETONATION AND TWO-PHASE FLOW

Vol. 6 of "Progress in Astronautics and Rocketry"
by S.S. Penner & B.P. Mullins Academic Press (NY NY)

SCIENCE OF HIGH EXPLOSIVES

by M.A. Cook
Available from Information Publishing

For the purpose of this book we will cover two different types of explosives. Primary and base explosives, with respect to blasting cap manufacture and the manufacture of these explosives.

Primary explosives are usually sensitive to shock, friction, and heat. They are used to detonate the base charge in blasting caps. These explosives are used due to the ability of the primary explosive to make an easy and quick transition to detonation. As a general rule, these explosives require very little confinement to make the deflagration to detonation transition.

The detonation wave set up by the primary explosive is the beginning of the detonation process. This primary shock wave will detonate the base charge in the caps. The base charge of the cap is normally R.D.X. or some other high explosive. The base charge needs to be powerful and stable, but still sensitive to the primary detonation wave.

The 6700 M/sec. plus base charge detonation velocity, will set off the main charge and with lower velocity explosive will overdrive them by sending such a high velocity shock wave through the explosive.

FUSE CAP MANUFACTURE

Being totally realistic one cannot hope to produce a blasting cap comparable to commercial products. The precision of modern manufacturing can produce caps cheaply and safely. The actual loading process is a dangerous one, but can be made relatively safe by taking the precautions outlined in the processes below. The home producer, can however, manufacture a cap that will work 99% of the time. These "homemade" caps will detonate most of the high explosives that their commercial counterparts will.

Fuse caps are blasting caps that are fired by the flame from a safety fuse. This flame ignites the flash charge of loose black powder. This, in turn, ignites the primary explosive. This primary explosive makes the transition from burning (deflagration) to detonation. These caps can be loaded as a simple cap or a compound cap. The simple cap has only the flash

charge and the primary explosive. The compound caps have both these ingredients plus a high explosive base charge. The compound caps are usually a good deal stronger due to the high explosive base charge. To manufacture these caps the explosives are simply pressed into the cap container. This container should be 1/4 inch in diameter (or larger) copper or aluminum tubing 1.25" long or a 5.56 mm N.A.T.O. spent cartridge. The tubing can have one end sealed with a wooden plug or simply be crimped closed with a pair of pliers. The burr should be removed from the open end of the tubing. After removing this burr, these tubes would be ready to load with the explosive charges. When using a 5.56 mm N.A.T.O. spent case the primer would need to be removed. After this has been done the flash hole would need to be enlarged enough to accept the fuse. This could be accomplished with a hand drill or by using a nail. The cap case would then be ready to insert the fuse and load with the explosive charges. The copper or aluminum tubes would need the base charge to be pressed in first. This pressing should be done with a close fitting wooden dowel. This should also be done with the tube supported rigidly from underneath and surrounded with bags of sand to absorb the explosion, if necessary. Find in this section a drawing of a loading apparatus. This apparatus would be safe as the operator would be remote. This press would be simple to make and would be highly recommended. Next the primary charge should be pressed into the tube.

CAUTION: Primary explosives are very sensitive to friction and impact ! Extreme care should be taken in this step of the procedure. A foul up here could be very dangerous !

After this primary charge is pressed a very small amount of black powder is placed on top of the primary charge. This will ensure the ignition of the primary charge. The fuse is then placed in the mouth of the filled tube so that the end contacts the black powder ignition charge.

NOTE: Use only good quality safety fuse available from: Westech Corp. P.O.B. 593, Logan UT. 84321, Zeller Enterprises, P. O. Drawer W 2, WickenburgA Z. 85358. Goodfuse can be made by soaking cotton twine in a saturated solution of potassium chlorate. This, however, will not be as reliable and therefore not as safe.

A small wad of cotton is then pressed on top of the fuse and igniter charge so that the fuse can exit the tube on one side. This is then crimped with pliers. Care should be taken to ensure the primary explosive is not present in the area of the tube to be crimped, as this crimping with this primary in between the tube walls could very well cause the premature detonation of the cap. This cap would then be ready to use.

Simple caps can be loaded similarly with the deletion of the base charge in the loading. They can also be loaded into a .22 magnum spent cartridge case in a manner similar to the method above. These small caps will not be as powerful as the larger caps. Some of the primaries would not be suitable and all of the others would need their primary charge doubled for maximum performance.

The 5.56 mm cartridge case would be load is the exact opposite of the copper or aluminum tube caps. The fuse would be inserted into the case through the flash hole. The black powder ignition charge would then be place in the bottom of the case. The primary would then be placed in the bottom of the case. The primary would then be pressed into the case

carefully and of course on top of that would be the base charge. After these were pressed into the case a small ball of cotton or paper would be pressed into the case to fill the remaining portion. Then the end of the case would be crimped with pliers to close the cap. This cap would then be ready to use.

1/4" aluminum or copper tube.
Igniter: Black Powder .20 G.

PRIMARY:

HMTD	.75 G.
DDNP	.50 G.
Mercury Fulminate	.75 G.
Double Salts	.75 G.
Nitromannite	.50 G.

BASE:

RDX	1.0 G.
PETN	1.0 G.
Picric Acid	1.0 G.
TeNN	1.0 G.
Nitromannite	1.0 G.
MMAN (3/8" tubing)	3.0 G.
Nitroguanidine	2.0 G.
Tetryl	1.5 G.

As you can see by the above chart the nitromannite is listed as both a primary and a base charge. The reason for this is, that while it is not actually a primary explosive, it tends to function as one. Nitromannite's use as a base charge makes use of the 8000+ M/sec. detonation velocity. This nitromannite is a very touchy substance with sensitivity approaching that of nitroglycerin. It would be best used as a last resort.

5.56 mm Empty cartridge case:

Igniter:
Black powder 2.0 G. 3 grains

PRIMARY:

HMTD	
DDNP	.50 G
Mercury Fulminate	.75 G
TACC	1.0 G
Double Salts	.75 G
Lead Picrate	3.0 G
Nitromannite	.50 G
TACN	4.5 G

BASE:

PETN	1.0 G
RDX	1.0 G
TeNN	1.0 G
Nitromannite	1.0 G
Picric Acid	1.0 G
Nitroguanidine	2.0 G
MMAN (7.62case)	3.0 G

Tetryl

1.5 G

TACN is listed here as a primary. This is given due to the ease of manufacture. This primary is stated in literature to detonate T.N.T.. The need for a heavy wall thickness detonator capsule would limit this to 5.56 mm shell detonators or larger empty shells. The use of MMAN would require waterproofing the finished cap by dipping in molten wax or paraffin.

ELECTRIC BLASTING CAP MANUFACTURE

Electric blasting caps offer a good deal more versatility to the blaster. This allows better and more remote blasting operations and the possibility for timed blasting applications are great but cannot offer the versatility of application. The electric blasting cap (EBC) can.

EBC's are very simple in their function. Current is passed through the two wires leading from the cap. This current, due to resistance, heats a small "bridge wire" which in turn fires an ignition mixture. This, in turn, fires the primary explosive and base charge respectively. The problem with improvisation is finding a suitable performing bridge wire which will give reliable performance. Earlier literature has stated that the "guts" from light bulbs will work. They will work but cannot be expected to resist corrosion produced by some situations and could not be expected to give stable reliable detonation instigation.

Take a spent 7.62 mm N.A.T.O. case. with a small pin punch, nail or other small slender rigid object, reach into the case and knock out the fired primer. Enlarge the flash hole with a 1/8 inch diameter drill. Deburr this enlarged hole so that the wires passing through will not have their insulation cut by these burrs, and thus causing a dud. Pass two sections of 22 gauge insulated wire, twelve inches long, through the 1/8 inch hole so that they go completely through the case, and their ends are free of the case mouth. Strip 1/8 inch of the insulation off the wires protruding from the case mouth. Cut a 3/8 inch section of .01 inch "nichrome wire", which is available at any hobby store or from nearly any electronics supplier. Nichrome wire is the wire inside toasters and other appliances that gets hot when current is passed through it. Discarded appliances could be another source of this wire. This piece of nichrome wire is spliced into both of the wires at the case mouth. Splice the 22 gauge wires to both ends of the nichrome wire bridge. This splice can be formed by twisting the nichrome wire around the upper part of the stripped 22 gauge wire and the lower part of the 22 gauge wire bent up to form a loop. A drop of solder is placed on these splices to ensure a good circuit. Outside dimensions of this improvised "bridge wire" should not be greater than .28 inches. A small wooden support should then be placed above the junction of the bridge wire. This will help the improvised bridge resist deformation and breaks from loading the cap. This wooden support could be made of a wooden match stick cut to length. This support should be 1/4 inch or less in length, with the ends notched out for the 22 gauge wire. These wires should be glued on the support stick. This whole bridge wire unit should be narrow enough to allow it to be pulled inside the 7.62 mm case even with the priming mixture on it. The wires should be twisted together on the other side of the wooden support after the glue on the ends of the support stick have dried, securing the wires in place. These bridge wire units are now ready to have their igniter composition placed on them. We will give three different compositions for this.

#1

Match heads (ground damp with acetone)	50%
Smokeless powder	50%

#2

Black powder (improvised will work)	50%
Smokeless powder	50%

#3

Potassium Perchlorate	60%
Sulfur	38%
White glue (Elmer's) enough to form a pasty mass	

The first two of these compositions should be used by mixing and slightly dampened with acetone. This will form a putty type mixture. This is pressed very gently around the bridge wire assembly. Remember, you have to get this back into the case, and when dry this priming mixture will be as hard as rock. It should also be said that great care should be taken to ensure the continuity of the circuit. This can and should be checked by using a ohm meter. Let these dry, and they are almost ready to load with explosives. You may want to test one of these before loading to see how they work. In tests, these bridge wires when used in ignition squibs, where 98% reliable. They are also sensitive to 2 "C" batteries or larger.

Gently pull the bridge assembly into the case with the wires extended from the other side: When firmly in the case as far as possible, put several drops of "model airplane glue" in the recess where the spent primer was. This is allowed to dry. When dry, these are ready to load.

These are loaded with the same amounts of explosives as the fused caps so use the table in that section of this book to find the quantity to load. The only difference is the amount of black powder igniter used. Use 1/8 to 1/4 gram of black powder for the igniter charge. This is done to cushion the bridge wire when the primary and base explosives are pressed in. After the addition of the black powder igniter, tap the case to settle this charge. The primary explosive charge is very carefully pressed on top of the igniter charge with a wooden dowel and remotely if possible. Best results will be obtained with the press apparatus. See the drawing. The base charge is then pressed on on top of the primary charge. Check the circuits, one at a time, with a OHM meter from behind a barricade. Press cotton in the remaining part of the case, a crimp with cotton, in the part of the case that is being crimped. These can be water proofed by dipping the completed cap in hot wax for just long enough to immerse them completely. These caps are ready to use and will equal a #8 or #10 blasting cap.

HMTD (Hexamethylenetriperoxidediamine)

DETINATION VELOCITY 4511 M/sec. @ 0.88 G/cc
5100 M/sec. @ 1.10 G/cc

FRICTION SENSITIVITY Very Sensitive!!!

BEHAVIOR TO FLAME Small quantities flash like guncotton

Large accumulations will detonate.

HMTD is a high performance initiating explosive. It is one of the better initiating explosives but has some definite drawbacks. HMTD is not stable at even slightly elevated temperatures. Room temperature will even cause a decrease in performance with storage time. As one would imagine, due to the extreme excess of oxygen, the corrosion of metals in contact with the peroxide is a problem. The metals that will cause problems are aluminum, zinc, antimony, brass, copper, lead and iron. These metals in contact with the HMTD even when dry, will cause corrosion. With water present, in the HMTD, the corrosion would more quickly disable an improvised blasting cap that could be made with this material. Spraying the inside of your copper tubing with urethane plastic would most likely reduce greatly, if not completely stop, this corrosion problem. To manufacture HMTD, use one of the processes below.

Process #1

Obtain 6% hair bleaching peroxide which is available from any beauty salon or beauty supply store. This is a 20 volume hydrogen peroxide. Place 9 teaspoons of this. 6% peroxide in a one pint canning jar or 500 ml beaker. In three portions dissolve by stirring 2-1/2 teaspoons of powdered hexamine (Crushed U.S. Army ration heating tablets, See "Kitchen Improvised Plastic Explosives" chapter 2, "Urirtropine" etc.). This is stirred until all the hexamine dissolves. The solution should then be chilled in a ice water bath for 1/2 hour. To this chilled solution add, in four portions, 4-1/2 teaspoons of powdered citric acid. Citric acid is readily available and should be found with canning supplies or in a pharmacy. With each addition the solution should be stirred until the citric acid dissolves in the liquid before another addition is made. When all the additions have been made continue stirring the liquid. The beaker or jar containing the solution should remain in the ice bath. The solution will become cloudy. With the completion of the 1/2 hour stirring the liquid is placed in a refrigerator. This will speed the process. If a refrigerator is not available let the solution stand for 24 hours. Filter the solution through a paper towel or coffee filter. The white substance is the explosive.

CAUTION: HMTD is sensitive to shock, impact, friction, heat and open flame. Extreme care should be exercised. HMTD will detonate from any of these stimuli even when soaked with water.

These white crystals are washed with 45 ml of distilled water. Tap water can be used if necessary, but will yield a compound of lesser purity. They are then washed with 75 ml methanol alcohol. These crystals are allowed to dry in a cool dry place. If a 30% technical grade ("Superoxol") of hydrogen peroxide is available it should be used instead of the 6%. If 30% is used the proportions are as follows to use in the same process as above are:

HYDROGEN PEROXIDE.	"Superoxol" (30% d. 1.11 G/cc)-	185 G
HEXAMINE	(Crushed ration heating tablets)	56 G
CITRIC ACID	(tech. grade or food grade)	84 G

These are used in the procedure given above. Simply "plug in" the amount immediately above for the spoon wise proportions given in the 6% hydrogen peroxide process and the washing would be done with 150 ml cold water. Of

course in the procedure if 35% or 40% is the only type hydrogen peroxide available, then simply calculate the actual weight of hydrogen peroxide. We know that 185 G. of peroxide are used above. This is 30% hydrogen peroxide. $185 \text{ G.} \times .30 = 55.5 \text{ G.}$ We know that we need 55.5 G. hydrogen peroxide. Suppose we have some 40% peroxide. We take our 55.5 and divide by .40 thus $55.5 / 0.40 = 138.75$. Simply use 139.0 G. of this 40% hydrogen peroxide in the procedure above. The yield of this process with 30% hydrogen peroxide is much greater than that of the use of 6% hydrogen peroxide. But with the 6% being the easier of the two to obtain it still would hold possibilities.

PROCESS #2

This second process is one of very easy acquisition of the main ingredients. Yield is not as high as the procedure above with either strength peroxide. This process makes use of the easy formation of hexamine and the parallel formation of a slightly acid solution. This acid is liberated from the ammonium sulfate salt. It is, of course, sulfuric acid. This acid performs the function of the citric acid in the procedure above. This is after the free ammonia and the formaldehyde form hexamine. Yield will be relatively low with this procedure but the materials are readily available and cheap. Since this procedure takes place at a elevated temperature there will be some loss of product to this subsequent heat and the decomposition that will accompany it. This process will work and could be used if necessary.

Five hundred grams of 3% hydrogen peroxide are placed in a quart jar or 1000 ml beaker. Three percent hydrogen peroxide is available as an antiseptic solution in grocery stores, etc... To this is added fifty grams ammonium sulfate. Ammonium sulfate is available as common fertilizer. This is stirred until dissolved. This liquid should be heated in a water bath to 55 degrees C. (131 degrees F.). Immediately when the temperature reaches this temperature add 5.3 grams of 37% formaldehyde solution. Stir this solution well and take off water bath. Let this liquid cool to room temperature and set for 24 hours. A white product will be seen in the liquid at this time.

CAUTION: This white product is dangerous and sensitive to FRICTION, SHOCK, HEAT OR FLAME. Handle with great care !! Even wet H.M.T.D. is dangerous and will detonate with ease.

This is filtered out and washed with one washing of 50 ml distilled water and then with 75 ml of 100% methanol. The methanol will speed the drying process. This white fluffy powder will be H.M.T.D. This powder will be sensitive to friction and small quantities should be handled.

DDNP (Diazodinitrophenol)--

DETINATION VELOCITY-4400 M/sec. @ 0.9 G/cc
6600 M/sec. @ 1.5 G/cc
6900 M/sec. @ 1.6 G/cc

FRICTION SENSITIVITY - Less sensitive than mercury fulminate and the same as lead azid.

BEHAVIOR TO FLAME - Small quantities flash like guncotton. Large 6 grams and larger would likely detonate.

DDNP is one of the highest in performance of nearly all the homemade primary explosive. It is stable and compatible with other explosives, but, lead azide. This is a good choice for manufacture as the precursor to this DDNP primary explosive is picric acid. Picric acid is more powerful than T.N.T. with a detonation rate of 7200 M/sec. it becomes the base charge for your homemade caps. It is prepared by a diazotization reaction on picramic acid. This is produced from picric acid, sodium hydroxide (lye) and sulfur. See picric acid for it's manufacture instructions.

MANUFACTURE:

In a pint glass jar place 90 ml warm water and 1.5 grams of lye (sodium hydroxide). Mix these with a "teflon" stirrer until all the lye had dissolved. Dissolve 9 grams of picric acid crystals in the lye-water solution by stirring. Label this jar solution #1. In a 500 ml beaker 3 ml of water is placed. Dissolve 7.5 grams of sulfur and 7.5 grams of lye (sodium hydroxide) by stirring the solution. Boil this solution over a heat source. When the solution turns dark red remove and allow the liquid to cool. Label this solution #2. Add this cooled solution #2 in three portions, to solution #1. Stir with a teflon rod while the liquid is being added. Again allow the solution mixture cool. Filter this mixture through filter papers (coffee filter, paper towels). Small red particles will gather on the paper. Discard the liquid. Dissolve these red particle in 180 ml of boiling water. Remove and filter this hot liquid through a filter paper (coffee filter, paper towels). Discard the particles left on the paper and label the liquid left #3. To Solution t#3 with an eyedropper slowly add sulfuric acid (Janitor supply, boiled battery acid) to the filtered solution until it turns orange brown. Add an additional 7.5 grams of acid to the liquid. In a separate pintjar, dissolve 5.4 grams of potassium or sodium nitrite in 240 ml of water. Label this solution #4. In one portion solution #4 is added with stirring to solution #3. Allow the solution to stand for 10 minutes. The mixture will turn light brown.

CAUTION: At this point the brown color is the DDNP that has formed. Keep away from flame, avoid friction and keep from shock.

Filter the light brown solution through a filter paper (paper towel, coffee filter). Wash the particles left on the paper with 60 ml of water. Allow to completely dry for 24 hours. Drying time can be reduced to 2 hours if crystals are placed in a shallow pyrex dish and this placed in a hot (not boiling) water bath.

CAUTION: DDNP is sensitive to shock, friction and flame. Expose to any of these will very likely detonate the compound prematurely.

This powder should be stored in small quantities in stoppered glass containers. More safety in storage leave 25% water in the powder and dry immediately prior to use.

ACETONE PEROXIDE- (Acetonetriperoxide)

DETINATION VELOCITY-3750 M/sec @ 0.92 G/cc
5300 M/sec @ 1.18 G/cc

FRICTION SENSITIVITY - Very sensitive. One of the more sensitive in this book.

BEHAVIOR TO FLAME - Burns violently and sometimes detonates even in small quantities.

Acetone peroxide is a powerful primary explosive. It, as with other explosive peroxides, seems to be very volatile. In standing 10 days at room temperature, 50% of the sample will completely volatilize. It is a powerful, brisant explosive. Its vaporizable nature makes it a explosive that would have to be used immediately after manufacture. However, this explosive is compatible with metals and will not cause their corrosion and the subsequent dangers involved. It is also compatible with picric acid, R.D.X., T.N.T., P.E.T.N., Tetryl, potassium chlorate and antimony sulfide.

It is highly friction sensitive and extreme care should be taken to avoid this. Acetone peroxide is one of the most sensitive explosive known to man. Great care would be needed to handle this explosive carefully. It is a powerful primary base charge in the cap. Also mixtures of R.D.X. and Picric acid with acetone peroxide are reported to be used between primary explosive and the base charge.

CAUTION: Acetone peroxide one of the most sensitive explosive known to man. this composition is dangerous and would need to be handled by someone with a lot of common sense. Mixtures such as picric acid/acetone peroxide (40/60) or similar mixtures with R.D.X. and P.E.T.N. will give explosives greatly increased resistance to impact without losing much initiation performance.

Great care would be needed to ensure the safety of the manufacturer due to the high sensitivity of the acetone peroxide. These dried crystals would be ready to load into detonators for immediate use as the storage stability is not very good.

MANUFACTURE:

Acetone peroxide is formed when hydrogen peroxide 30% acts on acetone. The introduction of dilute sulfuric acid causes the reaction to go into completion. Procedure is as follows. 50 ml acetone is placed in a one pint jar or 500 ml beaker. To this is added 30 ml hydrogen peroxide (30%). This liquid is placed in an ice water bath and cooled to 5 degrees centigrade. To this cooled mixture is added 3 ml of sulfuric acid (20%). This addition is done at 5 degrees centigrade and done in a dropwise fashion. When the temperature begins to rise (10 degrees C.), slow the addition until the temperature falls again. With the completion of the addition stir the mixture. A flocculent precipitate will form. This is filtered out after the mixture stands for one hour. Wash the white product three times with water (distilled preferably). Let the material filtered out of the reaction liquids and washed and dry this solid. By spreading out the acetone peroxide this drying process can be speeded up. These dry crystals are now ready for loading into the caps as a primary explosives.

DOUBLE SALTS

DETINATION VELOCITY-3600 M/sec. @ 3.96 G/cc

FRICITION SENSITIVITY - This primary explosive is on the same order of sensitivity as is lead azide.

BEHAVIOR TO FLAME - Burns violently and sometimes detonates even in small quantities.

These double salts are a basic acetylide group primary explosive. This explosive has good sensitivity, powder and performance. It is readily made from silver (coin), nitric acid and calcium carbide/ water or acetylene. This is an easy compound to make. What I found interesting is the fact that this primary is not photo active. Most silver salts are light sensitive. This would be a good choice due to the wide availability to the main ingredients. DDNP, HMTD and mercury fulminate, are better primary explosives but this one has many possibilities. With this primary explosive suitable caps could be made and would be very usable and storage stable as some others in this publication could not.

MANUFACTURE

Dilute 10.1 ml of nitric acid (red fuming) with 6.75 ml of water. If reagent or technical grade acid is available (70% strength) this will not need any water mixed with it to reduce the strength. Simply use 17.5 ml of this 70% nitric acid. Place a silver dime or equivalent amount of silver metal in the acid. It will dissolve leaving a green solution.

CAUTION: Avoid the brown gas (nitrogen dioxide) produced when dissolving the silver metal in the acid. This gas is a deadly poison and the immediate exposure to the gas and its subsequent damage will not show up for hours or even days! This should be done with good ventilation!

It may be necessary to heat the liquid to get the coin or metal to completely dissolve. Pour this green solution into a tall slender glass jar such as an olive jar. Place this jar with the green solution in it in a hot water bath and heat. Crystals will form. The heating is continued until these crystals dissolve again. In another flask or even a "Coke" bottle, place ten teaspoons of calcium carbide into this flask with a cork with a hose passing through a hole in the cork. Place the other end of the hose in the tall jar with the solution in it. Remove the stopper from the flask or bottle and add one teaspoon of water.

CAUTION: Acetylene gas is highly flammable and an explosion hazard. Keep away from heat and flame as much as possible.

The gas should begin generating. Add one more teaspoon and place the stopper back into the container. The acetylene gas generated by the calcium carbide and water should be going through the hose and bubbling through the solution in the tall glass. Bubble this gas through the solution for 5-8 minutes. Brown vapor will be given off by the liquid as it absorbs acetylene and white flakes will begin to be formed in the silver solution. Remove the solution from the heat source and allow it to cool. Filter the liquid through a filter paper (paper towel, coffee filter) into a glass container. Green crystals will be caught on the filter paper. These green crystals would then be washed with 45 ml alcohol. The crystals will change from green to white in color and the methanol wash will turn green. Place these white crystals on a paper towel and allow to air dry.

CAUTION: Handle this dry explosive with great care. Do not scrape or handle roughly. Keep away from flame or spark source or heat and store in a cool dry place.

These salts will perform well and are easy to make. Their stability is good, which is very important. A good choice of primary explosives.

TACC (Tetraminecopper (II) Chlorate)

DETINATION VELOCITY - Not given

FRICITION SENSITIVITY - This primary explosive is as sensitive as is lead azide

BEHAVIOR TO FLAME - Deflagrates with a green flame. Requires confinement to detonate.

Tetramine copper chlorate is a very interesting primary explosive. While it has these good properties it is also easily made. It's drawbacks are the tendency to "deadpress" or become so packed that it will not detonate the base charge in the cap and water contamination problems. For this primary explosive to detonate it must be loose in the detonator shell. It would be best used in caps where the base charge is pressed in first. Rifle shell improvised blasting caps would not work well with this explosive due to this property. In this reaction the sodium chlorate and the copper sulfate are heated together with methanol. This reaction produced copper chlorate. This copper chlorate dissolved in methanol. It then has ammonia gas bubbled thru the solution. The tetramine group is added in this step. So the main actors in this chemical play are copper sulfate other wise known as "blue vitriol". Copper sulfate is available from feed stores or electroplating chemical supplier. Sodium chlorate is also a chemical required and would be available from matches, dyes, textiles manufacture and as a weed killer. "Kitchen Improvised Plastic Explosives" has a section on chlorate manufacture in chapters four five and six. Ammonia is the last building block. This can be generated in one of two ways which will be explained in the manufacture section. The methanol used is just a reaction liquid and a carrier, as it does not actually enter into the reaction. One problem with this process is the contamination of the methanol with water. This allows the sodium sulfate to become soluble in the first reaction and will remove the ability to separate the products of the reaction. The process is longer than others but is simple and produced a good purity, stable product. This primary explosive should be kept dry, as it could begin to decompose in the presence of moisture.

MANUFACTURE-

Measure 15 grams of sodium chlorate into a large mouth pint bottle. Sodium chlorate is the oxidizer in matches. It is also available as a weed killer. Add 360 ml of methanol or ethanol to the sodium chlorate in the pint jar. To this add 24 grams of copper sulfate. Place this liquid in a hot water bath. Heat at the boiling point for 30 minutes with occasionally stirring the liquid during the reaction.

CAUTION: Remember methanol is very flammable and great care should be taken to ensure the lack of open flame in its proximity. Avoid

breathing the vapors of methanol.

Keep the volume constant by continually adding alcohol to replace what is being boiled away. After 30 minutes remove the jar from the water bath. The color of the solution should change from blue to light green. Filter the solution into a jar through a paper towel or drip coffee filter. The filtrate (liquid) should be caught in a jar similar to the one used in the first step. Label this liquid #1. In a narrow necked gallonjar or flask and a stopper (one hole) place 1500 ml clear ammonia water in the solution. This is available from the grocery store in a clear non-soapy form. In the mouth of this is placed a stopper with one hole and a plastic or rubber hose. This is placed into a hot water bath. Ammonia will begin to generate out of the gallon jug. A better ammonia generator could be made by filling a long necked bottle or flask with 250 grams lye (sodium hydroxide). 500 grams of dry ammonium nitrate fertilizer or ammonium sulfate fertilizer is added. Addition of small quantities of water and closing with a stopper hose set up could generate greater quantities of ammonia and it would be drier ammonia due to the nature of its generation. Generation would be maintained by the addition of more water. But with either method the hose should be placed in the liquid in the liquid #1. The ammonia gas should be bubbled through the liquid. It will begin to absorb ammonia turn light blue. Continue bubbling for 10 minutes.

CAUTION: The ammonia gas generated will kill or cause grave damage if exposure is severe. Use with good ventilation.

The solution will turn dark blue. Bubble the ammonia gas through solution #1 for ten more minutes and remove the hose from the solution. Reduce the volume of the liquid by pouring into a shallow pyrex dish. Set this dish under a fan and allow 1/2 the alcohol to evaporate. Filter (paper towel or drip coffee filters) the crystals that remain in the liquid and wash them with 50 ml very cold methanol. Set these aside to dry for 16-24 hours.

CAUTION: Explosive is shock and flame sensitive and great care should be exercised during handling.

MERCURY FULMINATE

DETINATION VELOCITY - 3500 M/sec. @2.0 G/cc.
4250 M/sec. @3.0 G/cc.
5000 M/sec. @4.0 G/cc.

FRICTION SENSITIVITY - Sensitive to friction and shocks

BEHAVIOR TO FLAME - Deflagrates when one crystal is ignited. Layers several crystals deep detonate violently.

Mercury fulminate had it's industrial beginnings in 1867. Alfred Nobel took out a British patent on the blasting cap, its use and makeup. His first blasting caps were simple ones very similar in many ways to the one in this book. Mercury fulminate was chosen out of a field of explosive fulminating compositions. This was mainly due to the stability that could be obtained and the ability to lend it's self to commercial manufacture at that time. Of course, the primary explosives used today are much superior to mercury fulminate. Mercury fulminate is not good for storage at elevated temperatures over 6-12 months. Five years in the magazine could disable caps. It is a good choice for clandestine manufacture. It would also be a

very good choice for electric cap manufacture. The drawbacks would be the poor elevated temperature storage and the toxic nature of mercury and subsequent problems in loading.

MANUFACTURE

In a pint large mouth fruit jar or 500 ml beaker place either 2 ml water and 10 ml 90% nitric acid. Water first of course. If 70% nitric acid is available then place 11.5 ml of it instead of the 90% in the pintjar. Add 1 1/4 gram of mercury. Mercury should be available in thermometers, mercury switches and in old radio tubes.

CAUTION: Mercury fulminate manufacture generates fumes that are poisonous and this whole procedure should be done with very good ventilation.

The metal in the bottom of the jar should begin to bubble. If not add water dropwise to the solution until it does. A vigorous effervescent reaction takes place and red fumes are produced. They should be avoided as they are very poisonous. The mercury will all dissolve in the solution. If not heat gently but from a remote position until it does. After it is dissolved let it cool somewhat. Warm 90 cc of ethanol (90%, "Everclear") in a quartjar. Add the metal/acid to this ethyl alcohol. The reaction should start within 5 minutes. The fumes put off by this mixture should be avoided. When the reaction is complete the fumes will have subsided and a grey powder will have settled to the bottom.

CAUTION: The fumes produced are poisonous and flammable and they should be avoided as well as flame should be kept away as fumes are highly flammable too!

Filter the grey powder out of the liquid.

CAUTION: The grey powder is the explosive and shock, friction and flame or heat should be avoided! Contact with the crystals should be avoided as the free mercury still poses a health problem!

These grey mercury fulminate crystals should be washed with 60 ml ethyl alcohol. Allow the crystals to dry by spreading them out gently. These dry mercury fulminate crystals are then ready to use. This explosive can safely be stored under water and these crystals could be mixed with 200 ml distilled water and stored until needed.

LEAD PICRATE

DETTONATION VELOCITY - 4400 M/sec.

SENSITIVITY - This primary is very sensitive to shock friction and heat or flame. This sensitivity is high and care should be used in handling.

BEHAVIOR TO FLAME - Burns violently and sometimes detonates even in small quantities.

This is a good choice. The precursors to lead picrate and picric acid, lead monoxide and methanol. PA can be used as the base charge in the caps therefore reducing problems and simplification of production. It is not nearly as good a primary explosive as H.M.T.D. or D.D.N.P. but will

work and is simple to make. Litharge, picric acid and methanol is all that is needed to make this one. This is a very dense heavy primary due to the lead in it's makeup. So from a cap volume use it is in the same class as all the other primaries in this publication.

MANUFACTURE

In a shallow glass dish, dissolve two grams of picric acid (see PA section) in ten ml of methanol. All stirring should be done with a teflon or wooden stirrer. Slowly while stirring add two grams of litharge (lead monoxide, white lead litharge-plumbing supply stores) to the methanol/PA solution.

CAUTION: At this point this is a primary explosive. Keep away from flame. Continue stirring mixture until all the alcohol has evaporated. When this happens the mixture will suddenly thicken. Stir the mixture occasionally to stop any lumps from forming.

CAUTION: Beware of drying material forming on the inside of the container. This material will be shock, flame and friction sensitive.

Spread this lead picrate in a flat shallow pan to dry. If possible dry the mixture on a hot water bath for two hours. This will ultimately give a better product with more stability.

NITROGEN SULFIDE

FRICITION SENSITIVITY - Very sensitive to friction great care would be needed to produce this compound.

BEHAVIOR TO FLAME - Small quantities (less than one gram) deflagrate with a puff and larger sizes will detonate.

CHARGE WEIGHT - 2.0 Grams in 3/8 copper tubing only.

Nitrogen sulfide is a dangerous compound to make. It is sensitive to friction and heat. Mercury fulminate is much safer to use from the friction aspect. This compound is more powerful than mercury fulminate but with slightly less brisance. Storage stability is good for "straight" nitrogen sulfide. In the proper mixture with potassium chlorate the primary explosive is not stable @50 degrees C. for long periods of time. Heat can and will cause detonations. It is however despite these problems, easily prepared from common ingredients. This preparation is a simple one, with a variety of raw materials. As good a primary explosive as lead picrate. The recommended filler with this primary explosive is nitrogen sulfide 80% and completely dry potassium chlorate 20%. This is mixed and 2 grams are loaded over the charge and pressed on top the base charge. Better primary explosives can be had but this one is easy and expedient.

MANUFACTURE

Place 100 grams of finely powdered sulfur (brimstone: garden supply store, pharmacy, industrial chemical supply) is placed in a tall narrow flask or narrow necked bottle equipped with a two hole stopper and placed in a frying pan filled with oil and heated until the sulfur melts (215 degrees C., 420 degrees F.). In this place a hose from the chlorine gas generator. This generator is a gallon jar with either liquid laundry bleach

(5.25% Sodium hypochlorite aqueous solution) or 31% hydrochloric (Muriatic acid, swimming pool supply). to the bleach (total 1.2 gallons) is added in small portions sodium bisulfite ("Saniflush": bathroom cleaners, sodium acid sulfite, swimming pool additive). This generation with the bleach/bisulfite generator should have the bleach split into three equal amounts and reacted with the bisulfite one at a time. The second and third. 4 gallon refill should be done only after the green gas is no longer generated by new sodium bisulfite additions. The spent bleach is poured out of the gallon jug. The second or third fill are poured into the jug the process repeated until all three 2/5 gallon bleach solutions are reacted and the chlorine bubbled through the molten sulfur. To 255 grams hydrochloric acid is added 53 grams manganese dioxide (black manganese oxide: dry cell battery mfg., phosphating solutions, steel mfg.) in small portions. This is done in small additions until all the manganese dioxide is dissolved and the chlorine has stopped it's bubbling.

CAUTION: Chlorine gas is toxic avoid contact and used with very good ventilation. Used as a war gas in WWI.

Immediately after the addition and beginning chlorine generation place a one hole stopper to which some stainless steel or plastic (heat resistant) tubing has been inserted in the hole. The other end of this hose directs the chlorine gas generated through the two hole stopper into the bottom of the now molten sulfur. The other hole of the two hole stopper has a hose inserted just through the stopper. The end of this hose is placed into a flask or narrow necked bottle cooled by a salted ice bath. This sulfur will begin to absorb the chlorine generated. This reaction forming sulfur dichloride. A total of 42 grams of chlorine need to be absorbed by the sulfur. As this chlorine is dissolved sulfur dichloride will begin to form. Sulfur is very soluble in sulfur chlorides and will begin to be dissolved in the chloride already formed. This sulfur chloride will vaporize and collect in the bottle chilled by the salted ice bath. This is done until the temperature drops and begins to boil. Continue to pass the chlorine gas through the liquid. After all the chlorine has gone through the sulfur heat until the sulfur liquid no longer boils. Heat for another ten minutes and allow to cool. The last flask should have caught most of the sulfur dichloride liquid. Take the mixture off the heat and allow to cool. Dissolve 212 gram of this liquid in 1700 grams benzene (common industrial solvent).

CAUTION: Sulfur dichloride (Sulfur chloride) is a pungent oily liquid. All contact should be avoided! All steps of this process should be carried out with good ventilation. Benzene is a very dangerous liquid. Contact with the skin, breathing of the vapors are dangerous and should be avoided. Great care should be used when handling this known carcinogen. It is also highly flammable.

Filter this solution through a paper coffee filter. This filtering should remove nearly all the sulfur. The remaining liquid should have no solids in it. Then ammonia gas generator is set up and ammonia gas is bubbled through the solution. The ammonia generator (ammonium nitrate/lye) is described in TACC section of the primary explosive section of this book. A dark brown powdery powder will collect in the bottom as the ammonia bubbles through the liquid. Keep bubbling the ammonia gas through the solution. Until this brown powder dissolves in the solution and a orange-yellow color is observed. Flocculent ammonia chloride crystals are seen in the liquid. Warm the benzene until it boils. Filter immediately through a

filter with 200 grams fresh benzene. Add this benzene wash to the liquid just filtered (filtrate). Let this liquid evap~~o~~rate until a mushy crystalline mass remains and filter. Let these crystals dry. These golden yellow to orange-red are nitrogen sulfide.

CAUTION: This explosive is friction, flame and shock sensitive. Handle with the greatest care.

This powder must be pressed into the cap using the apparatus shown in the cap manufacture section for proper performance and moisture should be avoided. Contamination with sulfur in mixtures with potassium chlorate could very well cause an explosion!

SILVER FULMINATE

FRICITION SENSITIVITY - Extremely friction sensitive! Should not be used if other primary explosives can be made.

BEHAVIOR TO FLAME - Single crystals explode violently. Larger amounts than given in the process below should not be made.

CHARGE WEIGHT - 1.0 G. compound cap

Silver fulminate (SF) is an extremely dangerous compound. Friction flame and sometimes contact with the dried product will cause it's detonation. It's performance is fair and the acquisition of the raw ingredients is simple. Never used due to the extremely unstable nature of SF. If other primary explosive options existed they would be better choice than this one. To use this primary explosive it must be mixed with tapioca starch (flour) to reduce this explosive extreme sensitivity. It is easily obtained due to the abundance of silver (coins, powder, ingots). Small batches of SF should be made with protective barricades between the operator and the reaction vessel. Again this explosive is dangerous and should be avoided if at all possible.

MANUFACTURE

Place 6 ml nitric acid (1.42 G/cc common technical grade acid or "watered" down stronger acid) in a 100 ml pyrex beaker containing 1.2 ml water and heated to 95-100 degrees F.. Place one gram of silver, (coins, bars, powder) in this acid solution.

CAUTION: This addition should be done with excellent ventilation as the nitrogen dioxide fumes generated are very toxic even in small quantities!

This will begin to bubble as the silver is dissolved. This will form silver nitrate in a very acid solution. When the silver dissolves (gentle heating may be necessary to get all the mercury to dissolve). In a 500 ml beaker surrounded by an ice bath place 15 ml 95% + ethyl alcohol ("Everclear" or redistilled concentrate whiskey etc.) and add the silver/acid solution to the liquid not allowing the temperature to rise above 65 degrees C.

CAUTION: This addition will cause the generation of poison gases and should be done with good ventilation.

A vigorous reaction will take place with this addition. Dense white

poisonous fumes are given off. As time lapses, the density of these fumes will diminish. The reaction will subside in 20-25 minutes. When the foaming reaction ceases, pour this solution into 200 ml water. The white crystals are then allowed to settle and the clear liquid on top poured off. Add 0.25 gram tapioca starch to the white crystals and filter the solution. The crystals filtered out through a paper towel or drip coffee filter. They are then washed with 30 cc ethanol. These crystals are then used in an area away from sunlight.

CAUTION: This white powder is extremely flame, friction and light sensitive. Friction and impacts should be avoided and the material should be expected to explode at any time. Again this explosive is dangerous even for someone with much laboratory experience. This composition should be avoided and it's manufacture undertaken only as a last resort.

NITROMANNITE (Mannite hexanitrate)

DETTONATION VELOCITY - 7000m/sec. @1.50 G/cc

FRICITION SENSITIVITY - As sensitive as nitroglycerin. The sensitivity is greater when between two hard surfaces.

BEHAVIOR TO FLAME - Will deflagrate under some conditions but local over-heating from a match will cause detonation.

Mannite is a simple sugar. It finds wide use as a baby laxative, in artificial resins and as a pharmaceutical dilutant. It can, through nitration, become a superb base charge for blasting caps. This explosive is attractive because of it's power and performance characteristics. It has a high detonation rate, good brisance and initiation properties. It has several bad points. It requires concentrated acid (90%) which is harder to prepare. It has elevated temperature storage problems with greatly increased sensitivity. This instability is brought on by storage at 75 degrees C. for two days. The mixture of tetracene and nitromannite (40/60) will give a powerful brisant primary explosive that detonates from moderate heat. Nitromannite is usually used straight as a base charge for blasting caps with 0.75 gram charge weights giving 100% reliability.

MANUFACTURE

One hundred grams of nitric acid (Specific Gravity 1.51 G/cc) is placed in a quart jar or 800-1000 ml beaker. This is cooled by surrounding with a salted ice bath. 20.2 G. mannite is added in very small portions with gentle stirring. The temperature should be kept below 0 degrees C. This is done by controlling the amount of time between the additions of the mannite. When the temperature approaches 0 degrees C. stop additions until the temperature has fallen some. After all the mannite has been added 200 G. 98% sulfuric acid is added dropwise to the solution. This is done while the mixture is stirred and with the temperature below 0 degrees C, temperature is again maintained by the speed of the addition. When the temperature rises close to 0 degrees stop the addition and allow the liquid reaction mass to cool before addition is resumed. Completing the addition of sulfuric acid the porridge-like mixture is stirred for 5 minutes and then filtered. This filtering can be done through hardened filter paper or 10 drip coffee filters (simultaneously). This product is washed with water and then washed with 5% sodium bicarbonate/water solution. Then the crystals are washed again with water. This crude product is then dissolved in

boiling alcohol with as much dissolved as possible. Place this container in a refrigerator and when chilled filter through one drip coffee filter. The liquid remaining is reheated and water is added until a turbidity is seen (churning of the solution). Allow to cool and filter the crystals out of this solution. Completely dry the material and it is ready to use. Could be kept under water for safety until ready to use.

R.D.X. (Cyclotrimethylenetrinitramine)

DETINATION VELOCITY - 5830 M/sec. @1.00 G/cc
8360 M/sec. @1.67 G/cc

FRICITION SENSITIVITY - Slightly less sensitive than T.N.T. but with 180% the actual power. Particle size reduction should be done while wet.

BEHAVIOR TO FLAME - Burns with a yellow flame. Very seldom if ever transforms into detonation.

R.D.X. is a powerful explosive. It is very stable and has good storage properties. It is widely used commercially as a base explosive charge in detonators and blasting caps. One gram of R.D.X. in a cap with a primary charge will detonate anything a #8 cap will detonate. For the process to make R.D.X. from camp stove fuel - see chapter 2 in "Kitchen Improvised Plastic Explosives" This process while not simple will produce a good product. This is a superb explosive and can find many uses. P.E.T.N. is the only explosive that really is close to being as good a base charge explosive as R.D.X. In "Kitchen Improvised Plastic Explosives II" there is a new process to manufacture R.D.X. Below is a process for extracting this explosive powder from "C-4" plastique explosive. The product will be as good as any for base charge use. C-4 could also be used as a base charge as is!

EXTRACTION - Take a 1/2 pound block of C-4 and place in a container impervious to gasoline. Add one liter of gasoline. Let this gasoline soak the block until the plasticizers are dissolved (just a powder is settled on the bottom of container) and filter the gasoline. Save the powder and discard the gasoline filtrate. Let this powder dry until it is free of gasoline. This should yield 206 grams of R.D.X.. This powder is ready to use as a base charge in a improvised blasting cap.

PETN (Pentaerythrite Tetranitrate)

DETINATION VELOCITY - 5830 M/sec. @ 1.09 G/cc.
7490 M/sec. @ 1.51 G/cc.
8300 M/sec. @ 1.77 G/cc.

FRICITION SENSITIVITY - Sensitive to friction between two hard surfaces

BEHAVIOR TO FLAME - Burns quietly after melting with a slightly luminous flame.

PETN is a powerful explosive. It's power is slightly greater than R.D.X. and it is slightly more sensitive to initiation. It is powerful, stable, safe and efficient for the manufacture of improvised blasting caps. PETN is found, in it's common form, as the filler in detonating cord (E-cord etc.). If a person had access to this detonating cord he could

salvage the PETN out of the cord by splitting it and simply scraping out the filler with a pocket knife or similar tool. The larger primer cord could yield as much as 1.7 lb. (771 grams) of the powder per hundred feet of cord. If access was available this method would be much better and easier than actual manufacture. This manufacture requires the acquisition of fuming nitric acid. This can be bought or made. For manufacture see chapter 2 of "Kitchen Improvised Plastic Explosives" Then the pentaerythrite must be obtained. It is available and is used in the paint and varnish industries as well as in the manufacture of synthetic resins. It is cheap, but could raise a few questions in it's acquisition. Sulfuric acid is available from cleaning supply houses and as some generic drain openers. This is one of the best choices for cap base charge explosives. It has great power and will, in a properly constructed cap, give super reliable detonation initiation.

MANUFACTURE-

In a quartjar or a 1000 ml beaker place 400 ml 99% strong white nitric acid. This acid can be bought from a laboratory supply or the fuming red acid produced in process in "Kitchen Improvised Plastic Explosives". This fuming red acid will need to have the excess nitrogen dioxide purged until it is clear. This is done by adding 2-3 grams urea (45-0-0 fertilizer will work) to the acid. The mixture should clear up and loose the red tint. If not, warm the acid in the beaker and bubble dry air through the mixture. With the clear, white acid in the beaker place this beaker in a salted ice bath. Let it cool to below 0 degrees C.. Add with stirring 100 grams of pentaerythrite in small portions to the acid. The addition is done as such a speed that the temperature of the solution does not rise to more than 5 degrees C. When the addition is complete stir the acid/pentaerythrite solution for 15 more minutes. The crystals of the product will probably already have formed somewhat in the liquid.

CAUTION: At this point the crystals are a high explosive and should be treated with respect.

This solution is then poured into a previously prepared gallonjar with 2 1/2 quarts of cracked ice and water. PETN will immediately form and should be filtered out of the solution through a paper towel or drip coffee filters. This should yield 220 grams. This product needs purification. Wash these crystals 3 times with water and then wash 1 time with a 5% sodium bicarbonate solution. Wash once more with water and then dissolve the crystals in hot acetone. Let this cool and the crystals will begin to fall out of solution. Add an equal volume of water to the acetone and the crystals will fall out of solution. Filter these crystals out and wash with methanol and let them dry. This PETN can be dried by either simply air drying for 24 hours or by drying in a hot water bath. These dried crystals are ready to use.

PICRIC ACID (trinitrophenol)

DETINATION VELOCITY - 4965 M/sec. @0.97 G/cc
6510 M/sec. @1.4 G/cc
7480 M/sec. @1.7 G/cc

FRICTION SENSITIVITY - More sensitive than T.N.T. but not substantially. Metals should be coated to ensure the formation of picrate salts. Coating copper tubing or rifle cases

with urethane plastic spray could prevent this from happening.

BEHAVIOR TO FLAME - Small quantities burn with a sooty flame after melting. Large quantities can transform the deflagration into detonation in some rare instances.

Picric acid is a good choice of explosive base charges in caps. Relative performance would be 120% (T.N.T.=100%). Nitrophenols have been with us for a while. Their creation from nitric acid and animal horn was the first of these discoveries. Nearly 100 years passed before researchers found out it could be made to explode. It is this relative insensitivity of the material and its good primary sensitivity yield many used for this explosive. It is very stable in storage with samples from late 1800's showing little signs of deterioration. The only reason that we do not use PA as an explosive in modern ordinance is mostly from a cost standpoint. PA can be reacted with ammonium hydroxide to form "Explosive D". This is a superb shaped charge explosive and does find some demolition and specialized munition loading. Brisance is very high for picric acid and it will detonate easily from the primary explosives in the primary section of the publication. Picric acid is poisonous and all contact should be avoided. This process uses the phenol byproduct used everyday as an analgesic. Aspirin (acetylsalicylic acid) in its purified form, sulfuric acid (98%) and sodium or potassium nitrate are the ingredients. Aspirin is available in any drug store or supermarket. Sulfuric acid is available at janitorial supply houses and plumbing suppliers. Battery acid that has been boiled until white fumes appear will also work. Sodium or potassium nitrate should be available from hobby stores and as stump remover in garden stores. The methanol carrier can be found at hardware stores and from janitorial supplies. Caution should be used in handling the product of the process below. Contact should be avoided. Contact includes breathing dust and exposure of the skin or any other part of the body. Liver and kidney failure could result. Use gloves and retire any utensil that will be used in the process.

MANUFACTURE

Crush 100 aspirin tablets. Powder these crushed aspirin tablets. To them add 500 ml alcohol (95%) This alcohol will dissolve the acetylsalicylic acid in the aspirin and leave all the pill fillers in solid form in the bottom. Stir this aspirin/alcohol liquid for five minutes while warming it gently. Filter the warm liquid and keep the filtrate (liquid) and discard the remainder. Evaporate this liquid in a shallow pan in a hot water or oil bath. Collect the dried acetylsalicylic acid crystals. Place 700 ml sulfuric acid in the bottom of a gallon jar. To this acid is added the acetylsalicylic acid crystals from above. This gallon jar is placed in an oil bath (electric frying pan would be easiest but flame heat will work). This is heated with stirring until all the crystals are dissolved in the hot acid. The crystals having dissolved will allow you to begin the addition of sodium or potassium nitrate. This addition is done in three portions, allowing the acid mixture to cool some between additions.

CAUTION: The addition of the nitrate to the hot acid will generate nitrogen dioxide which is a deadly poison. This step should be carried out with excellent ventilation!

This liquid will react vigorously, as the 75 grams of either of the

nitrates are added to the solution in this three part addition. The solution should turn red and then back to the yellow-orange color. After the additions let the solution cool to room temperature while stirring occasionally. Pour this room temperature solution into 1500 ml of cracked ice and water (1/4 ice). The product will precipitate out immediately as a brilliant yellow compound. Filter through a paper towel or 5 drip coffee filters in a funnel. Wash these crystals with 450 ml cold water. Discard the filtrate (liquid remaining after filtering). The yellow crystals are trinitrophenol. These crystals need to be dried for 3 hours on a boiling water bath or on a 105 degree C. oil bath. They are then ready to load into a detonator as a base explosive. Avoid contact with the yellow composition as it is highly poisonous. Wear gloves (viton) when working with this explosive.

M.M.A.N. (Monomethylamine nitrate)

DETINATION VELOCITY - 6100 M/sec. @ 1.2 G/cc
6600 M/sec. @ 1.4 G / cc

FRICITION SENSITIVITY - Very insensitive. Similar to T.N.T..

BEHAVIOR TO FLAME - Burns if heated to 370-390 degrees C. and will burn completely in 6-8 seconds.

M.M.A.N. is a powerful explosive with 112-120% the power of T.N.T. with a greater detonation rate. This explosive is not as sensitive as others in this publication to primary explosive requiring 2 G. mercury fulminate or 1.25 grams of H.M.T.D. Methylamine is a basic building block of modern chemistry. It is an intermediary for hundreds of more common chemicals. It is easily obtained or purchased cheaply. Nitric acid does not require highly concentrations with as low as 20% acid strength working perfectly. This is a good feature as requirements for explosives made with concentrated acids take time to produce and cannot be produced as fast or cheaply. This explosive is simple enough that it would require little experience and few setups in a lab. This explosive is very hygroscopic. It will absorb its weight in water at a relative humidity of 50% in 21 days. The other drawback of this explosive is the fact that it requires larger quantities of primary explosive as other base explosives. Both are acceptable and the hygroscopic nature of the salt can be controlled by loading caps on "dry days" of low humidity. These caps should also be dipped into molten wax to ensure their "waterproofness". This explosive is best used in a cap made with 3/8" tubing because 5 grams of this explosive are required. This will give a detonator 3/8" x 2-3/4". This cap should have the primary loaded first as the base explosive does not need the high density that the primary needs for maximum performance. Load this base charge explosive to a density of 1.2 G/cc. Higher densities will cause the explosive to become insensitive to the primary explosive. This cap should detonate most explosives and will be a great deal more powerful than a #10 blasting cap.

MANUFACTURE - Place 250 ml of 33% methylamine aqueous solution in a stainless bowl or beaker. Add in four portions either 832 G. 70% nitric acid, 971 G. 60% nitric acid or 583 G. 100% nitric acid + 250 ml water. A good deal of heat will be generated by this neutralization. The solution will boil due to the heat. Allow the heat from the previous additions to

subside before the next addition is made. After the additions have been made check the solution with PH paper (e. mark brand) from your lab supply store. If the PH is above 7 add acid 1/4 teaspoon at a time until the PH is between 6 and 7. If when checked the PH is 6 or below then add methylamine solution until the PH rises to between 6 and 7. This liquid is then put in a vacuum flask with a stopper. This will be placed in a hot oil bath (frying pan filled with good cooking oil). The oil bath should be 75 degrees C. (167 degrees F.). The flask is hooked up to a vacuum source and the vacuum applied. The vacuum will allow the waters removal in a much quicker amount of time. The vacuum source can be an aspirator type (cost around \$5.00). This is the ideal source of vacuum. A gauge is placed in the line and the vacuum drawn at first recorded. This vacuum will remain the same until the water is all evaporated. At this point the vacuum suddenly will increase greatly. This signifies the end point. The crystals in the flask are scraped out in a dry (atmospheric humidity) room. This is placed in a sealed container to keep moisture our of the solutions. This is the explosive. It could be toxic if eaten in large quantities but at worst, prolonged handling of this explosive will give only a rash. The only thing to remember is to keep away from moisture and keep in a sealed container. Load large 3/8" diameter caps with 4-6 grams of MMAN as a base charge with large charges of primary explosives. Seal the caps immediately by dipping in hot molten wax. These caps are powerful and will take most of a forearm off a foolish person.

TETRYL (2,4,6-trinitrophenylmethylnitramine)

DETINATION VELOCITY - 7260 M/sec. @ 1.6 G/cc

FRICITION SENSITIVITY - Comparable to T.N.T.

BEHAVIOR TO FLAME - Burns slowly very rarely exploding.

This is one of the better base charge explosives. This is still used in the military but R.D.X. and P.E.T.N. are replacing it. Generating 4.4 million P.S.I. upon detonation this is a good choice. The corrosiveness of the salt to brass limits it's use to copper tubing caps manufacture. It also is not made of the most common ingredients but these could be found if the desire was great enough. Very sensitive to primary explosives but not sensitive to normal handling. More powerful than picric acid. Could be an interesting possibility for improvised blasting caps.

MANUFACTURE-

Sixty grams of dimethylaniline is dissolved in 850 grams sulfuric acid (janitorial supply) in a quart jar or 600 ml beaker in cool water bath. The temperature of the liquid during this addition should be kept below 25 degrees C. This liquid (solution # 1) is added by pouring into a separatory funnel or similar container equipped with a valve. This is done so solution #1 can be metered out drop by drop. Solution #1 can be metered out drop by drop. Solution # 1 is added drop by drop into 515 grams of 70% nitric acid in a two liter beaker or pyrex equivalent heated in an oil bath to 55 to 60 degrees C. Solution #2 is stirred vigorously, while the temperature is kept at 65 to 70 degrees C.. This addition will require approximately one hour. After all solution #1 has been added to solution #2, the stirring is continued and the temperature is kept at between 65 and 70 degrees C. for an hour longer. The solution is allowed to cool and then filtered with an asbestos filter or fiberglass filter. The solid material

is boiled with water for one hour and filtered again on a paper filter. Water will need to be added from time to time to keep the water level constant. This is then ground while wet and dissolved in benzene (industrial solvent) and the solution filtered. The filtrate (liquid) is saved and the liquid allowed to evaporate. The resulting crystals are tetryl and will be yellow in color. These crystals should be of sufficient quality and particle size.

[Yes, the author does not specify solution #2 anywhere... and we probably know by now that solution #1 can be metered out drop by drop :)]

TETRANITRONAPTHALENE (TeNN)

DETTONATION VELOCITY - 7000 M/sec. @ 1.6 G/cc (In 1/4" aluminum Tube)

FRICITION SENSITIVITY - Similar to T.N.T.

BEHAVIOR TO FLAME - Rapid heating can cause detonations!

These yellow crystals are prepared by the nitration of napthalene flakes in a two stage nitration. The product of the first stage is the dinitronaphthalene. This "di" product is nitrated to the "tetra". This is done in two different nitration steps. This product can be considered the equivalent of T.N.T. in power with a slightly greater detonation rate. This tetra compound is stable even at elevated "magazine" temperatures and is an explosive of greater power and brisance than T.N.T.. Has been proposed an artillery shell filler. T.N.T. has been cheaper due to continuous manufacture processes. It is however a powerful explosive with detonator usage promise. It has the same impact properties as does Tetryl with the same potential. It is easily made from napthalene, nitric acid and sulfuric acid. These compounds are easy to come by and thus would make this a easily manufactured product. Napthalene flakes, balls or powder are used as insecticides and are familiarly known as "Moth balls". Sulfuric acid is easily obtained from plumbing and janitorial supplies. Nitric acid can be made see "Kitchen Improvised Plastic Explosives" Recovery of spent acids in both steps will reduce acid demand and can be done by heating the spent acid until white fumes are produced.

CAUTION: Care should be taken to avoid all fumes from heated acid mixtures and that this spent acid being recovered is free of nitronaphthalene products. Failure to do this could result in a very violent explosion! Great care should be used to ensure the lack of remaining nitro compounds in the spent acid solutions. Caps should have a 1.5 G.+ charge of TeNN for best performance. This explosive should be loaded to a density of 1.6 G/cc. This explosive will melt around 200-210 C.

CAUTION: This meltalbe explosive should be used in its crystalline form. The melt loading should only be attempted by someone with chemistry lab experience. Rapid heating will most likely cause a high order detonation and fatalities! This heating would be done slowly as rapid heating could cause detonation. This melted compound could then be cast into the detonator case prior to loading the primary explosive. This could produce charges that required greater amounts of primary explosive to ensure detonation!

MANUFACTURE:

Tetranitronaphthalene is produced by nitration of naphthalene. Naphthalene is a coal tar or synthetic petrochemical. It is readily available in the form of moth balls, moth flakes or moth crystals. Place 64 grams in a 2 liter beaker of "pyrex" container. To this add 105 cc distilled water. Slowly add 287 grams (160 cc) concentrated sulfuric acid of a concentration of greater than 90% strength (Specific gravity 1.8).

CAUTION: Addition should always be acid to water and never water to acid. The acids used in this process are very dangerous and should be used with great care. Goggles and full protective gear should be worn. Fumes produced should be avoided at all costs. This whole process should be done under a vent hood or in a very well ventilated place!

The temperature of this acid mixture will rise immediately. To this is added 115 grams (81 cc) of 70% nitric acid. This mixed acid is allowed to cook to room temperature. 150 grams of naphthalene is added slowly with stirring in small portions over a three hour period while the temperature is allowed to rise to 50 degrees C. When all the naphthalene is added, the beaker or "Pyrex" container is heated to 55 degrees in a oil bath, which melts the crude mononitronaphthalene. The stirring is then stopped and the MNN allowed to solidify. This solid MNN is broken up off the top and placed in a second acid mixture. This acid mixture is prepared by placing 130 cc water in a 1000 cc beaker or "Pyrex" container. To it is slowly, carefully added 293 G. sulfuric acid (162 ml) density 1.8 G/ cc. (95% +). This mixture will heat up when mixed and should be cooled to 25 degrees C. by placing in an ice bath. When the acid mixture is at 25 degrees 152 grams of potassium nitrate is added. The mixture is stirred vigorously and the addition of the MNN from above is begun. It is added in small quantities keeping the temperature between 38-45 degrees C. by the speed of the addition. During this addition (1 hour +), the temperature is not allowed to rise to over 45 degrees C. After one hour, the temperature is allowed to rise to 55 degrees C. and the stirring is continued. This is continued until the emulsion is replaced by the formation of DNN crystals. These crystals are then filtered out by a glass fiber filter (fiberglass). These crystals are washed six times with cold water and allowed to dry. These are then dissolved in boiling acetone. Not all will dissolve. Filter this solution while hot and allow to cool. Chill this solution and crystals will form. Filter out the crystals that form. Reduce the volume of the acetone by 1/2 and chill again and filter. Add the crystals together from these acetone recrystallization steps and allow to dry. These crystals will be a good grade of 1.8 Dinitrotapthalene. These crystals will be nitrated, in the process below, to the tetro form.

Place 750 ml fuming nitric acid, of 90% or greater strength (See Kitchen Improvised Plastic Explosives), in a two liter "pyrex" container or a 2000 ml beaker. Add to this very slowly and carefully 750 ml concentrated sulfuric acid. This acid mixture is stirred and cooled in a ice bath until the temperature drops below 20 degrees C. The 1.8, DNN from above is added in small quantities while the temperature is not allowed to rise above 20 degrees C. When all the DNN has been added, the temperature is allowed to rise slowly. Heat will need to be applied. This heating should be done such that the temperature rises from 20 to 80 degrees C. for three hours and then allowed to cool. The solid formed is filtered out and the filtrate (liquid remaining after filtering) drowned in twice it's volume of ice water. This step will drop more crystals out of the filtrate. These are filtered out and added to the crystals filtered out of the reaction mixture. These are then washed three times with water and then dissolved in

hot from 95% ethanol. This alcohol is chilled and then the crystals formed are filtered out. This last step is not necessary, but highly desirable to give a very storage stable product.

These crystals are 1,3,6,8-tetranitronaphthalene. They should be dried by heating in a shallow pyrex dish by the way of a hot water bath.

NITROGUANIDINE

DETONATION VELOCITY - 5630 M/sec. @ 1.0 G/cc.
7650 M/sec. @ 1.5 G/cc.

FRICITION SENSITIVITY - Very insensitive

BEHAVIOR TO FLAME - Melts with sublimation and decomposition.

Nitroguanidine is a powerful explosive. First made from bat guano, by extraction and formation of guanidine nitrate and subsequent treatment of this nitrate with sulfuric acid (95% +) and filtration of the product. This explosive is similar in performance to picric acid and T.N.T.. While not being quite as brisant as these two explosives the ease of manufacture and lack of friction sensitivity make nitroguanidine an attractive choice for a blasting cap base charge explosive. It is a cool explosive and does not give a high temperature of detonation but gives a larger volume of gases upon detonation. This base charge explosive, should be loaded in the caps with the density not exceeding 1.35 G./cc. Excess loading densities will render the base charge undetonatable with 1.5 G. charges of H.M.T.D.. This explosive will work and work well and is very storage stable. Larger diameter cap containers (3/8" +) should be used to ensure propagation of the detonation through the entire cap. Given below is the manufacture techniques for production of nitroguanidine. This procedure will work well but is rather lengthy and labor intensive.

MANUFACTURE

Obtain two clay flower pots with a small hole in their bottoms. Fitted to one of these is stainless steel tubing. A refractory made from "firebrick" and fired by charcoal should be built. The flower pots will need to fit into this refractory and have ample room around them to pack the charcoal. An air blower (e.g. hairdryer, vacuum cleaner is hooked up to blow air through the coal to generate the heat needed. In the bottom flower-pot, a stainless steel screen will be needed to keep from clogging the stainless steel tubing from the ammonia inlet tube. Place 200 grams of calcium carbonate (Limestone, chalk) in the bottom flower pot, with the stainless tubing attached. Place the other flowerpot upside down directly on top of the bottom pot. Place this in the refractory furnace and place a pyrometer or high temperature thermometer into the hole in the top clay flower pot. Start the furnace and blow air through the burning

charcoal until the temperature inside the pots reaches 700 degrees C.. At this time begin to pass ammonia gas through the stainless tubing into the lime inside. The temperature should never go over 820 degrees C. as the lime will decompose. The ammonia generator the gas generator in the TACC section. The amounts needed in the generator are 170 G. ammonium nitrate fertilizer, 100 G. sodium hydroxide and adding 100 ml water to the mixture. This water addition would be done in small portions to ensure the absorption of the gas by the calcium carbonate. This gas needs to be generated slowly! When all the ammonium nitrate has been added and the gas ceases to generate from the generator deprive the charcoal of oxygen to extinguish the flame. Let the refractory furnace cool and remove the flowerpots from it. The black material in the bottom is calcium cyanamide.

Place 216 grams of urea in a stainless steel pan. Heat until it begins to melt. Add in small portions 1300 grams ammonium nitrate.

CAUTION: This is dangerous and extreme care should be used in this step. This mixture could explode if allowed to burn. Water should be used if a fire does break out by immediate dilution and quenching of the reaction mixture!!

Keep the temperature of the melt at 120 degrees centigrade. When the addition of the ammonium nitrate is complete and the mixture is liquid and at 120 degrees C. the calcium cyanamide from above is added in portions over a twenty minute period. This mixtures temperature is held at 120 degrees C. for two hours and then diluted with 720 ml water. This liquid is heated to 95 degrees C. and then filtered through several coffee filters or a "fast" filter paper. The liquid thus obtained is allowed to cool to 25 degrees C. and then the crystals formed are filtered out. The liquid is reduced to 1/2 its volume by boiling. It is cooled and filtered and the crystals obtained are added to those from the first filtration. These crystals are washed with 40 ml cold water. They are then dried in a shallow pyrex dish while heated in a hot oil bath at 110 degrees C. for two hours. These crystals are guanidine nitrate (90% purity).

Immerse a one liter flask, containing 500 ml. concentrated sulfuric acid, in cracked ice. This acid is stirred until the temperature drops to 10 degrees C. or less. In small portions, add 400 grams of dry guanidine nitrate to the acid with stirring to keep the temperature below 11 degrees C.. When all the guanidine nitrate is dissolved, pour the now milky liquid into three liters of cracked ice and water. Let this stand until the nitroguanidine is completely crystallized out of the liquid. Filter these crystals out and dissolve in four liters of boiling water (distilled if possible). Allow to cool by standing overnight and filter the crystals out. Dry these crystals by heating gently in a container placed in a pan of boiling water. This dried material is then ready to store in a plastic container or to load into finished caps.
