PRIMERS

for

Small Arms Cartridges

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By

M. J. ALBERT and H. F. OELBERG

H O W T O L O A D

PRIMERS

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Formulas - Suggestions - Theory

for

Handloaders and Experimenters

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Note: To the extent possible, this text conversion is faithful to the original format of the book. Editing was done in Microsoft Word using "Courier New" font to closely match the original typewritten document. Obvious misspellings were corrected when found, and the manual corrections the authors made to the original text (as is common in typewritten documents) were implemented directly in the text. In MS Word, underlined text is formatted in a continuous line rather than each individual word as is found in the original manuscript. Finally, tables, graphs, and images were recreated and inserted as objects in the MS Word document.

P R I M E R S

I N T R O D U C T I O N

This book is designed to provide you with the information necessary to manufacture your own primers and to reload your own fired primers. It specifically presumes that you are an American - not just an American citizen - and that you believe in the Constitution, in the first ten amendments - The Bill of Rights - and in America, with no reservations and no theories otherwise.

Since 1941 you have been unable to buy primers from the manufacturers. Your rifle practice has been curtailed, if not stopped entirely. Talk as we may about the practice the .22 affords - and it is not to be minimized - it gives little education for the .30 calibre long range work so essential to national defense and to the maintenance of a Democracy. This book provides the information to enable you to carry on with your heavy rifles, so far as primers are concerned. Also, this book opens to you a complete new field in hand loading -- ballistic efficiency from ignition adjustment.

This book presumes to stand in the way of stoppage in securing primers and to release any quantities of ammunition now tied up for want of primers.

We hope that this book will cause you to stop and think! We hope that it will cause you to reflect upon the research, the genius, the tireless effort, the driving will of the men in the ammunition companies and arms companies of this America - the men who produce for us the finest primers, ammunition, powders, and arms that the world affords, at a very small price for each. We hope you will note: Where but in America has this happened or can it happen? It happens here because this is an America of PRIVATE ENTERPRISE. If you can make a better mouse trap than now exists, and make it cheaper, or at the same price, you stand to profit personally; so you burn the midnight oil to invent not only the mousetrap but the machinery to make it, to secure the capital to buy the materials and to hire the labor, and to tell the world of your better mousetrap. The land of FREE ENTERPRISE! Our boys abroad tell us that Europe, Asia, China, and others are lands of poverty. Why? In all history can you find a time that these lands have been lands of PRIVATE ENTERPRISE and free markets? The answer is plain. The wealth of materials is in those lands just as it is here - but FREE AND PRIVATE ENTERPRISE is not there.

So: here are your primers: Some are good, some not so good, and some are excellent, dependable, and of superior performance.

Reload your primers now and keep firearms free from registration and restrictions so the ammunition companies will provide us with better primers and powders and arms than we have ever known. We will need them to defend our constitutional rights and practices of private enterprise, from those who have not and who envy.

THE AUTHORS

W A R N I N G

INASMUCH AS WE DO NOT FURNISH ANY OF THE CHEMICALS OR COMPONENTS SPECIFIED IN THESE CHAPTERS, AND INASMUCH AS WE HAVE NO CONTROL OVER THE METHOD OR MANNER OR WAY IN WHICH THESE DIRECTIONS MAY BE FOLLOWED OR USED, WE ACCEPT NO RESPONSIBILITY FOR, AND SPECIFICALLY DISCLAIM ANY REPERCUSSION FROM, ANY RESULTS WHICH MAY COME FROM THE USE OF THESE DIRECTIONS AND CHAPTERS. WE HAVE ASSEMBLED THESE DIRECTIONS AND SPECIFICATIONS WITH UTMOST CARE: WE HAVE TESTED THE PRESCRIPTIONS AND THE CHEMICALS LISTED UNDER AS MANY CONDITIONS AS SURROUND A HANDLOADER: WE HAVE TESTED THE PRIMERS WITH MANY DIFFERENT LOADS, IN THE SHOP AND IN THE BALLISTICS LABORATORY, AND ON THE TARGET RANGE, AND IN THE FIELD: WE HAVE TESTED THE DIRECTIONS TO THE BEST OF OUR ABILITY. WE BELIEVE THEY ARE ACCURATE AND ENTIRELY RELIABLE -- BUT WE ASSUME NO RESPONSIBILITY. THE AUTHORS.

W A R N I N G

FOR YOUR MEASURE OF PARTS USED IN THESE FORMULAS, USE A CUP TO HOLD AS MUCH AS, AND NO MORE THAN, AN EMPTY .22 LONG RIFLE SHELL.

A good measure may be made by soldering a handle to the side of an empty .22 long rifle shell. Use rosin solder, not acid.

Another type of measure may be made from a piece of steel round rod, 1/2" diameter by 8 inches long. Drill a 1/4" hole not quite through one end, at right angles to the length of the rod, near the end. Round off the corners near the hole; grind down for depth so that the cup will hold no more than an empty .22 long rifle shell.

ANY OF THESE FORMULAS SO MEASURED AS TO PARTS WILL, WHEN COMPLETED, LOAD ABOUT 20 PRIMERS. IF YOU WILL STAY STRICTLY AT THE AMOUNTS GIVEN BY THESE MEASURES OF PARTS, YOU WILL NEVER HAVE A SERIOUS ACCIDENT.

WEAR GLASSES WHEN YOU MIX, WEAR GLASSES WHEN YOU LOAD, WEAR GLASSES WHEN YOU SEAT YOUR PRIMERS.

IN LOADING SHOTGUN SHELLS, IT IS PRIMER SEATING THAT CAUSES ALL THE TROUBLE. YOU WILL UNDOUBTEDLY FIRE PRIMERS IN THE SEATING OPERATION BEFORE YOU LEARN JUST HOW TO SEAT THE PRIMER. AS WILL BE NOTED, REMINGTON SHELLS MUST NOT BE SEATED AS CLOSELY AS WESTERN OR WINCHESTER: YET ALL SHELLS MUST BE SEATED CLOSELY ENOUGH TO CLEAR WHEN THEY ARE LOADED INTO THE GUN: AND THEY MUST BE SEATED CLOSELY ENOUGH TO FIRE WHEN THE FIRING PIN FALLS.

YOU ARE DEALING WITH A PAPER HEAD SHELL, NOT A BRASS SOLID HEAD.

WE DO NOT RECOMMEND THE RELOADING OF PRIMERS FOR PAPER SHOT SHELLS NOR DO WE RECOMMEND THE RELOADING OF PAPER SHOT SHELLS AT ALL IF YOU CAN POSSIBLY BUY FACTORY LOADED SHELLS.

P R E R E Q U I S I T E S

1. If you do not now possess one, be sure to secure Federal Explosives License for Purchase and Use, from your County Clerk of the Court. The fee is 25 cents.

2. Secure from your druggist, or other source known to you, as many of the following listed chemicals as you will need for the Chapters mixtures you select. Always purchase in original manufacturers' packages.

   POTASSIUM CHLORATE (KClO3) -- a white powder
   Merck specified. It comes in one pound and smaller packages and is not expensive.

   SULFUR (S) -- a yellow powder
   Grade C sulfur is correct. Other grades may be used.

   LEAD NITRATE (Pb(NO3)2) -- colorless crystals
   Merck specified. It comes in one pound bottles and smaller and is not expensive.

   ANTIMONY SULFIDE (Sb2S3) -- the grayish black mineral form powder
   Merck specified. It comes in one pound packages and smaller and is not expensive.

   BARIUM NITRATE (Ba(NO3)2) -- a white powder
   Merck specified. It comes in one pound packages and smaller and is not at all expensive.

   PHOSPHORUS (RED)(P)-- amorphous
   Merck specified. It comes in one pound and in one-fourth pound cans. Order the one pound and you will get the one-fourth pound can. Merck is limiting the orders, the druggist says. It is not expensive. Until recently there were only two manufacturers of phosphorus in the U.S. Order this as one of your first chemicals purchased. Get it now!

   ALUMINUM (Al) -- powdered, a silvery, fluffy powder
   Get the best you can, one-fourth pound or less. Try your druggist. If he cannot supply you, try the paint store. If worst comes to worst, get a piece of good quality metal from the kitchen or the garage and start whittling with your finest file. It is the metal you want. Grind the fillings to powder with a hammer head on a clean piece of steel. Never use a stone in any chemical grinding or powdering.

   POTASSIUM SULFATE (K2SO4) -- a white powder
   Merck specified. It comes in one pound packages and smaller and is not expensive.

   POTASSIUM PERMANGANATE (KMnO4) -- purple crystals
   Merck specified. It comes in one pound packages or smaller and is not expensive.

   The above listed nine chemicals are all available to you. They are common in the regular commercial channels. Order through your local druggist, dealer or chemist. Specify Merck and get them in original packages. See later revision of this book for use of other chemicals in primers.

3. Three or four tin lids. We mean tinned lids. Get them off the gallon and one-half gallon syrup buckets, cocoa cans or any can whose lid has a rim around it. Tinned lid - not iron or paper. No stone - no mortar - tinned lids.

4. A reloading laboratory where you will work ALONE - away from your family and away from the neighbors - and which you can lock up or shut off when you are not in it. This is merely good sense with any exacting work.

5. Tin Containers: Keep your chemicals in original packages; store packages in airtight tin containers. The gallon syrup buckets with tight-fitting lids do very well. They may be sealed with tape around the rim of the lid for long-time storage. None of these chemicals are explosive or dangerous (although some are marked "poison" if taken internally) until properly mixed, except possibly the Phosphorus. Phosphorus is shipped in tin. Keep it so and store the tin container inside a second tin and exclusively to itself.

BE SURE TO POSSESS FEDERAL EXPLOSIVE LICENSE FOR PURCHASE AND USE. THE LAW REQUIRES IT!

CHAPTER I

PRIMERS FOR IGNITING HIGH PRESSURE RIFLE POWDERS IN SMALL ARMS CARTRIDGES

Non-Corrosive

1. FEDERAL EXPLOSIVE LICENSE FOR PURCHASE AND USE MUST BE SECURED.

2. CHEMICALS: BARIUM NITRATE $Ba(NO_3)_2$
   LEAD NITRATE $Pb(NO_3)_2$
   PHOSPHORUS (red) P
   ALUMINUM (powdered) Al

3. Powder the LEAD NITRATE to a very fine flour, on a separate tin lid, and of this flour measure out one part on your tin mixing lid. Measure out on your tin mixing lid one part ALUMINUM, POWDERED, and do not use flakes or hunks. Be sure it is powdered.

   MIX the two CHEMICALS WITH THE GREATEST OF CARE, GET EVERY LITTLE LUMP. TO FLOUR. There is no real explosive danger in this mixture so far, so powder well.

   CLEAN YOUR MEASURE WITH FINE STEEL WOOL. WIPE IT CLEAN WITH TISSUE. BE SURE THERE ARE NO SPECKS OF ANY CHEMICAL CLINGING IN THE CUP.

   MEASURE OUT ON YOUR TIN LID ONE PART PHOSPHORUS (red) AND PUT THE TOP BACK ON YOUR PHOSPHORUS CAN NOW.

   MIX THE PHOSPHORUS THOROUGHLY WITH THE PREVIOUS MIXTURE until all of the lumps and flakes are gone and the whole mixture takes on a dull pink color, uniform, without lumps or particles. Stir and mix again and again.

   MEASURE OUT TWO PARTS BARIUM NITRATE ON A CLEAN TIN LID. Crush all little lumps to flour and dump the white powder over the mixture on your tin mixing lid. Mix carefully, thoroughly, again and again!

   You now have an explosive mixture that explodes from shock, friction, and heat. Get a wide mouthed glass jar, pint size or smaller, clean and dry inside. NO LID. Place your mixture into the jar and with the jar mouth upward so that mixture does not spill out. Rock the mixture slowly across the bottom of the jar so that the pile tumbles over and over itself. Mix thoroughly. NO LID ON YOUR JAR.

   This is a dry mechanical mixture. You do not want some element of the mixture running around over the primer space trying to find another element with which to unite. You want them close together when the firing pin falls.

   TEST YOUR MIXTURE: Place a small pile - about the size of a match head - on the cement floor. Hit the pile squarely with a hammer. If the explosion is not instantaneous, mix again.

4. Punch out the old fired primer and don't lose the anvil. Restore the shape of the soft primer cup by mechanical means, after you remove the anvil. Dump the mixture back upon your tin mixing lid and stir it. Set your clean restored primer cup on your tin mixing lid. Use a tooth pick or small wood paddle to dip the mixture into the cup. Wipe the straight edge of your toothpick across

and carefully scrape the edge of the cup to get a level measure cup full. Set the primer cup - you need tweezers - out of your tin lid upon the table.

Press the mixture down into the cup very firmly. Use the round. end of a punch for this, a punch to just fit the inside of your primer cup. Be sure the mixture is pressed hard. Set the cup back on the lid again and fill level. Wipe straight edge of toothpick across the cup. Set the cup so filled out on your table and press the mixture down into the cup very firmly. Your cup will then be about 3/4 full.

Upon this load place a round piece of newsprint paper - one thickness only - a round piece to just fit inside the primer cup. Use good newsprint paper. Press down firmly with your punch. By firmly we mean about 20 pounds pressure.

Upon this paper place your anvil, point down, or toward the firing pin point. Press this anvil down upon the paper disc and the load beneath until the outer edges of the anvil near within 1/32" to 1/64" the edges of the primer cup. This operation can be done with a drill press - or if you are one who does not have such a machine use the face of your hammer pressing the anvil downward. Don't twist your hammer face. Set the primer cup on the vice or a smooth piece of steel for this operation.

If you are a little squeamish about this operation or have accidental explosions, or are not feeling at your best, omit the operation completely, place the anvil upon the paper in the cup in the middle, and without pressing down, and without upsetting the anvil, take the shell from which you removed the primer and press it, primer pocket down, over the primer. KEEP THE SHELL MOUTH UP AND PRIMER DOWN AND FINISH SEATING THE PRIMER INTO THE POCKET IN THE USUAL WAY YOU HAVE AWAYS DONE WITH YOUR HAND TOOL.

If you seat the primer cup too deeply into the shell you will make contact and an explosion. Keep the shell mouth up, but away from your face. If you do not seat the primer cup deeply enough to clear the head of the shell the loaded cartridge may explode before the gun is closed and locked. Use a straight edge to see that primer clears. You will find the operation simple.

ADVANTAGES OF THIS MIXTURE:

1. It is comparatively safe to load and mix, sensitive, but not too sensitive.

2. It is a heat igniting mixture, rather more than an explosive mixture, although the explosion is sufficient to start the powder up the barrel and prevent burning too much in the chamber. It is an excellent, consistent, and dependable mixture.

3. For some reason this mixture leaves the brass cases FAIRLY CLEAN, and very easy to clean by wiping out dry. It is the cleanest of all the mixtures given in this book and cleaner than most commercial primers.

4. It is non-corrosive. If you are one who from hearsay or tradition objects to POTASSIUM CHLORATE - here is your primer mixture of excellence. The residue tests NEUTRAL and can be classed non-corrosive. There will be a chapter later on this.

CHAPTER II

PRIMERS FOR IGNITING HIGH PRESSURE RIFLE POWDERS IN SMALL ARMS CARTRIDGES

1. FEDERAL EXPLOSIVE LICENSE FOR PURCHASE AND USE MUST BE SECURED.

2. CHEMICALS: POTASSIUM CHLORATE KClO3
   SULFUR S
   LEAD NITRATE Pb(NO3)2
   ANTIMONY SULFIDE Sb2S3

3. Measure out upon a tin lid two parts POTASSIUM CHLORATE - whitepowder. Crush the lumps so that all is finely powdered. Beside the small pile measure out two parts SULFUR, yellow powder, and crush all lumps so that it is finely powdered. Beside the two piles measure out one part LEAD NITRATE, previously finely powdered.

   MIX WELL AND THOROUGHLY AND SEE THAT NO LUMPS EXIST IN YOUR MIXTURES. THESE THREE CHEMICALS ONLY.

   And to this mixture add one part of previous finely powdered. ANTIMONY SULFIDE.

   MIX THOROUGHLY, again and again. THIS IS A DRY MECHANICAL MIXTURE. Mix again thoroughly. Use your wide mouth small glass jar and rock the mixture across the bottom until the whole is a thoroughly intimate mixture.

   AND REMEMBER: From the time you mix the first three chemicals you have an EXPLOSIVE MIXTURE. IT IS SENSITIVE TO FRICTION BUT NOT TOO SENSITIVE. So far in our experience with the mixture we have had no explosions when mixing on tin lids, or in powdering with a hammer face. BUT IT COULD HAPPEN, SO

   FOR YOUR MEASURE OF PARTS MAKE A MEASURE TO HOLD ABOUT AS MUCH AS AN EMPTY .22 LONG RIFLE SHELL WILL HOLD. AND DON'T INDULGE IN AMOUNTS GREATER THAN THIS, TO BE REASONABLY SAFE.

   AND NOTE: IF YOU HAVE NO USED PRIMERS TO RELOAD - IT IS AN EASY MATTER TO MAKE YOUR OWN PRIMER CUPS AND ANVILS. See Chapter on this item in VOLUME II.

   THESE PRIMERS SO RELOADED, WITH THE ABOVE MIXTURE AS DESCRIBED ARE TERMED CORROSIVE PRIMERS. CHAPTER I GAVE A NON-CORROSIVE PRIMER, that is, containing no chemicals the residue from which is corrosive. BUT AT THE END OF A DAY OF FIRING WITH ANY AMMUNITION, CLEAN YOUR HIGH POWER RIFLES WITH WINCHESTER CRYSTAL CLEANER, and your shotguns with Remington or Winchester new oils.

   ONE THING ABOUT THE ABOVE PRIMERS IS SUPERIOR TO MANY COMMERCIAL PRIMERS - THIS RELOADING FORMULA DOES NOT USE GROUND GLASS, AND SOME COMMERCIAL FORMULAS DO USE GROUND GLASS.

DEFICIENCIES AND OBJECTIONS TO THIS PRIMER MIXTURE:

First: This is a corrosive primer. Test the residue for acid and convince yourself.

Second: This is A DETONATING PRIMER MIXTURE. In a sense ALL PRIMER MIXTURES are detonating, high velocity EXPLODING. But some are very high velocity, and some are not so high. This mixture ignites the powder by detonation, and does not generate much heat in the process.

Smokeless and black powders, all propellants, BURN. They do not DETONATE. Some are progressive burning, some burn fast with low pressures - the shotgun and pistol powders - while others burn slower, by rapidly accelerating high pressures and high velocities - the I. M. R. powders and others, particularly for high pressure and high velocity rifles. HOWEVER, UNDER CERTAIN CIRCUMSTANCES, PARTICULARLY THE DOUBLE-BASE POWDERS - IT IS THEORETICALLY POSSIBLE TO DETONATE PROPELLANT CHARGES.

THIS PRIMER MIXTURE, above described, UNDER CERTAIN CONDITIONS OF THE POWDERS USED, COULD CONCEIVABLY DETONATE A CHARGE. We have never had it happen in experiments. However, go slowly, use light loads. If you detonate a charge of powder in your gun - THE GUN SHOWS UP IN PIECES.

THIS DETONATION COULD HAPPEN AS WELL WITH ANY PRIMER UNDER CERTAIN POWDER CONDITIONS, and HAS HAPPENED IN OUR EXPERIENCE WITH A FACTORY LOADED CARTRIDGE.

REASONABLE USE OF THE ABOVE PRIMING MIXTURE WILL PRODUCE REASONABLE RESULTS: AND IT HAS THE GREAT ADVANTAGE OF AVAILABILITY OF MATERIALS IN THESE TIMES.

Third: The mixture MUST BE KEPT STIRRED AND MIXED BEFORE LOADING EACH PRIMER CUP.

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With all primers, commercial or otherwise, at the end of a day's firing, clean your high power rifles with Winchester Crystal Cleaner, wipe dry, and oil with Winchester or Remington's new oil. Avoid all grease. Wipe every barrel dry of oil before firing again.

Don't scrub a barrel inside. Use few trips through the barrel and don't touch the muzzle rifling with the rod.

Use a good gun oil to go over your guns inside and out after they are cleaned. Most good gun oils have a sperm oil base.

CHAPTER III

PRIMERS FOR IGNITING HIGH PRESSURE RIFLE POWDERS, SHOTGUN OR PISTOL POWDERS, IN SMALL ARMS CARTRIDGES

1. FEDERAL EXPLOSIVE LICENSE FOR PURCHASE AND USE SHOULD BE SECURED.

2. CHEMICALS: BARIUM NITRATE $Ba(NO_3)_2$,
   ANTIMONY SULFIDE Sb_2S_3
   PHOSPHORUS (red) P
   ALUMINUM (powdered) Al

3. Measure out upon a tin lid two parts BARIUM NITRATE, a white powder. Crush any lumps and all to a fine flowered powder. Beside this small pile on your tin lid measure out one-half part powdered ALUMINUM. MIX THESE TWO CHEMICALS BY CRUSHING LIGHTLY, ****** AND BE SURE THAT THEY ARE THROUGHLY MIXED.

   Measure out one part previously finely powdered ANTIMONY SULFIDE, and MIX THE POWDERED ANTIMONY SULFIDE with the other two chemicals completely.

   THE SUCCESS OF YOUR PRIMER UNDERTAKING DEPENDS HEAVILY UPON THE THOROUGHNESS OF YOUR MIXING WORK. THIS IS A MECHANICAL MIXTURE AND THE CHEMICALS MUST BE AS CLOSE TOGETHER AS POSSIBLE TO GET THEM.

   Clean your measure carefully and measure out one part PHOSPHORUS and sprinkle lightly over the previous mixture on your tin lid.

   Mix the PHOSPHORUS into your mixture of the other three chemicals carefully (as you would lard into wheat flour). AGAIN AND AGAIN and again until all PHOSPHORUS, lumps or flakes blend into the fluffy powder and the whole is a maroon tinted fluffly powdery mixture with no lumps, no particles showing.

   Dump the whole mixture into a wide mouth glass jar -- pint size or smaller - NO LID. Tip the mixture across the floor of the jar slowly so that it falls and tumbles and mixes.

   IT MUST BE AN INTIMATE MIXTURE.

   TEST: Place a small pile of the mixture, size of a match head, on the cement floor. Strike the pile squarely with a hammer. If explosion is not instantaneous, mix again.

   Dump back on your tin lid and let the mixture set, spread out over the tin lid thinly, while you get your fired cases and remove the primers, restore the shape of the primers, and clean up. Put the lids back on the chemicals you dipped into. Especially the Red Phosphorus should be closed tightly, JUST AS SOON AS YOU HAVE DIPPED OUT THE ONE PART. CLEAN UP.

   > DID YOU GET ALL THE FLAKES OF THAT ALUMINUM POWDERED? YOU DON'T WANT A FLAKE OF ALUMINUM IN ONE PRIMER CUP AND NONE IN ANOTHER. You will find why later. ALUMINUM BURNS IN THIS MIXTURE WITH INTENSE EXPLOSIVE HEAT.

   Take your time to reload primers. Wear glasses.

4. Go ahead with your primer loading as DESCRIBED IN CHAPTER I, but be sure to stir and mix your mixture before each cup is filled. Press the mixture firmly in the primer cup as described in Chapter I. Measure accurately.

ADVANTAGES OF THIS PRIMER MIXTURE:

1. It is advertised as NON-CORROSIVE. In fact one chemical, ANTIMONY SULFIDE IS USED AS A RUST INHIBITOR IN SMOKELESS POWDER under U. S. Patent 2,131,061, Sept. 27, 1938, owned by Hercules Powder Co. So you are supposed to have a non-corrosive mixture with one element of which is a rust inhibitor, at least with certain propellant powders. However, the residue with many powders tests corrosive.

2. It is non-mercuric. Mercury Fulminate was for nearly a century the universally used primer ingredient. Chemically mercury attacks brass; and it is NOT STABLE, and it is VERY SENSITIVE - must be kept moist until loaded - becomes dead pressed - AND ISN'T AVAILABLE NOW ANYWAY. But it would not be surprising if some of it was still in existence in some commercial primers.

3. This priming mixture described above CONTAINS NO GROUND GLASS. When you look over the patents issued during the last five years for all types of priming mixtures, you are surprised at how many of them - most of them - contain around 20% ground glass.

4. This priming mixture fires the powder charge more from HEAT THAN FROM DETONATION. It is a safer priming mixture to use.

DISADVANTAGES OF THIS PRIMING MIXTURE:

It is possible to get too much heat into this mixture, and so make the explosion of the primer fire the powder too near the base of the cartridge instead of blowing some of the powder up the bore to burn on the way out. The percentage of misfires is too large.

CAUTIONS ON ALL OF THESE PRIMING MIXTURES

START WITH A LIGHT LOAD OF POWDER. WATCH YOUR RESULTS ON THE TARGET. USE THE LIGHTER BULLETS AT THE START TO EASE THE PRESSURES. WORK UP VERY SLOWLY. COMPARE YOUR RESULTS AND PRIMER APPEARANCES WITH STANDARD FACTORY LOADS ALL ALONG THE LINE.

IT IS ENTIRELY POSSIBLE THAT YOU CAN VARY THE AMOUNTS OF ONE OR THE OTHER OF THESE CHEMICALS IN THIS FORMULA AND PRODUCE A REALLY REMARKABLE PRIMER. IF YOU GET ONE - and it is probable - STANDARDIZE ON IT, THEN W0RK OUT YOUR POWDER LOADS AND WEIGHTS TO GO WITH THE PRIMER - AND, BOY, YOU HAVE SOMETHING THERE.

THAT IS THE WAY THE AMMUNITION COMPANIES WITH FINELY CONTROLLED EXPERIMENTS PRODUCE FOR US THE REMARKABLE AMMUNITION THEY SELL TO US SO REASONABLY PRICED.

CHAPTER IV

PRIMERS FOR IGNITING HIGH PRESSURE RIFLE POWDERS, SHOTGUN OR PISTOL POWDERS, IN SMALL ARMS CARTRIDGES

1. GET EXPLOSIVE LICENSE FOR PURCHASE AND USE

2. CHEMICALS: POTASSIUM CHLORATE KClO3
   LEAD NITRATE Pb(NO3)2
   SULFUR, powdered S
   ALUMINUM, powdered Al

3. Measure out upon a tin lid 1 part LEAD NITRATE, after the white crystals have been ground to the finest flour on a separate tin lid. Beside this small pile measure out one part ALUMINUM, powdered to the finest flour you can get it. DO NOT USE FLAKES.

   Measure out on a vacant spot on your tin lid two parts of SULFUR, the yellow powder, and crush the little lumps thereon.

   MIX ALL THREE CHEMICALS TOGETHER, again and again. TAKE YOUR TIME: DON'T SPILL. AND MIX AGAIN AND AGAIN. WATCH FOR LUMPS. CRUSH EVERY PARTICLE.

   Measure out on your tin lid two parts of POTASSIUM CHLORATE AND CRUSH ALL THE LITTLE LUMPS. Then mix thoroughly with the previous mixture of three chemicals.

   SEE THAT EVERY LITTLE LUMP AND GRAIN IS REDUCED TO POWDER AND THOROUGHLY MIXED.

   <u>If you detect lumps and particles remove them from the mixing lid to a clean lid, crush them to powder and restore to the mixing lid</u>.

   Then use your wide mouth glass jar to mix thoroughly. Now test your mixture by placing a small sample on the cement floor and striking with the hammer.

4. Punch out your fired primers from their cases, clean them up, restore their shape from the last firing pin imprint. While you stir your mixture and keep it stirred, load your primers as directed in Chapter I. LOAD THE CUPS 3/4 FULL, PRESSED SOLIDLY, AS WELL AS YOU CAN.

We have been telling you all along to USE A TIN LID. WE MEAN A TINNED LID. Get them off the cocoa cans, syrup buckets, or anywhere. But get a TINNED LID, not an iron lid. AND KEEP THEM CLEAN.

This chapter and others have stated "SHOTGUN OR PISTOL POWDERS." BOTH OF THESE POWDERS ARE QUICKER THAN THE I. M. R. POWDERS, or PYRO. MUCH QUICKER. So WATCH YOUR STEP UNTIL YOU KNOW THE POWER OF THIS PRIMER MIXTURE WHEN HOOKED UP WITH DIFFERENT POWDERS, PARTICULARLY THE PISTOL POWDERS. And <u>do not load</u> shotgun or pistol powders into rifle cartridges with any primer under any circumstances.

Also, THE LOADING OF SHOTGUN PRIMERS is something else again, AND NOT DONE LIKE THE RIFLE AND PISTOL PRIMERS ARE DONE. THE PISTOL PRIMERS LOAD JUST AS THE CENTER FIRE RIFLE PRIMERS LOAD - BUT NOT SO THE SHOTGUN PRIMERS, See Chapter VII on this.

MERITS AND ADVANTAGES OF THIS PRIMER MIXTURE:

1. This is a fast and EXPLODING MIXTURE: IT HAS VELOCITY. Also, THIS IS A HEAT IGNITING MIXTURE: IT HAS MERIT IN ITS OWN RIGHT.

2. Apparently it is NOT TOO CORROSIVE. BUT CLEAN YOUR RIFLE AFTER EACH DAY'S FIRING - WINCHESTER CRYSTAL CLEANER - NO MATTER WHAT PRIMER YOU USE.

3. ONLY TWO CHEMICALS must be ordered by your druggist: the LEAD NITRATE AND THE POTASSIUM CHLORATE. In any case of SHORTAGES, REAL OR BY EDICT, these two chemicals should be LAST TO GET STOPPED OR RATIONED. Almost every druggist has SULFUR IN STOCK. And if you can't get POWDERED ALUMINUM at the drug store or the paint store get a piece of the metal and start whittling with your finest file. You MUST HAVE THE ALUMINUM IN THE MIXTURE, AND YOU MUST HAVE THE LEAD NITRATE.

4. This is a positive, smooth, and quick mixture. It will fire your light loads - right now.

5. This mixture is not hygroscopic.

OBJECTIONS AND DISADVANTAGES: In this, as in other mixtures, the mixture must be stirred before you fill the cups, to insure every PRIMER firing.

P R I M E R S

CHAPTER V

WARNING: THIS CHAPTER IS NOT FOR BEGINNERS!

This chapter is omitted from the book and may be sold later. This is a very sensitive, fast, and hot primer mixture. The price will be 25¢ for the chapter, postage paid. Sold in the U. S. only.

CHAPTER VI

1. GET FEDERAL EXPLOSIVES LICENSE FOR PURCHASE AND USE.

2. CHEMICALS:
   BARIUM NITRATE $Ba(NO_3)_2$
   POTASSIUM CHLORATE $KClO_3$
   LEAD NITRATE $Pb(NO_3)_2$
   PHOSPHORUS (red) P
   ALUMINUM (powdered) Al

PREREQUISITE: THIS CHAPTER IS NOT FOR BEGINNERS. It is a Senior Grade Mixture.

3. Reduce the LEAD NITRATE to an extremely fine flour. Of this flour measure out 1 part one your tin mixing lid. Add to this one part ALUMINUM finely powdered. Mix the two chemicals thoroughly again and again.

   Clean your measure thoroughly with steel wool and tissue, and measure out one part PHOSPHORUS and work it into your mixture with great care. IT IS NOT SENSITIVE, so really mix the three chemicals until every lump is gone, every flake is flour, and the whole is a fluffy pink tinted mixture.

   On a clean separate lid mix one part POTASSIUM CHLORATE and one part BARIUM NITRATE. Mix intimately, powder finely, mix again. Add to your previous mixture of three chemicals. Then mix the two mixtures together CAREFULLY AND SLOWLY WITHOUT FRICTION. You have an explosive mixture now. Now use your glass mixing jar.

4. Dump the mixture back on your mixing lid. Test on cement floor, small sample. Keep the mixture stirred while you load your primer cups. Fill the cups 3/4 full.

   51% of all your accidents will come when you seat the anvil in the cup, or when you press the primer into the case pocket. Don't seat the anvil TOO DEEPLY or seat your primer too deeply into the pocket. You will make contact and an explosion. Seat the PRIMER INTO THE PRIMER POCKET of the case so that the rifle or gun mechanism will not be hammering the primer or squeezing it before the bolt or mechanism is LOCKED. Use a straight edge.

MERITS OF THIS MIXTURE: This is a very fast, exploding, and heat producing mixture. Probably the best of all these chapters. Like Chapter V, it should be used for extra results, extreme velocities, and positive unfailing ignition.

As it stands it is not so corrosive. However - CLEAN YOUR RIFLE OR YOUR PISTOL OR YOUR GUN, and DON'T WEAR OUT THE RIFLING DOING IT. MORE GUNS ARE WORN OUT IN THE CLEANING THAN IN THE SHOOTING. Internal rust ruins more rifles and guns than all other causes together.

OBJECTIONS TO THIS MIXTURE: It is too sensitive for careless loading. When you have had a good night's rest, are in perfect trim physically, and in full possession of all your powers and senses - USE THIS MIXTURE. IT IS SUPERIOR.

* * *

The substitution of POTASSIUM SULFATE K_2SO_4 for POTASSIUM CHLORATE $KClO_3$ in this formula is possible.

The results of using POTASSIUM CHLORATE are somewhat different from using POTASSIUM SULFATE and with different powders will vary. There seems to be a larger volume of gas from the CHLORATE than from the SULFATE; and with some I. M. R. powders the pressures seem higher and more prolonged.

You should check your results on long range targets - 300 yards or over for .30 caliber - by using the same weight bullet, the same charge of the same powder from the same can, and all components and conditions the same - except the PRIMER mixture. You can secure reliable results with few shots - 5 identical loads for each mixture should tell you the story, provided they are fired at the same sitting and under identical conditions.

To secure uniform test results: After you have assumed your firing position at rest, and after you have loaded, closed and locked your gun bolt or mechanism securely, raise the muzzle of your rifle straight up overhead so that the barrel will arrive at full perpendicular to the earth plane. Then lower Your rifle very carefully to the horizontal firing position, and, without jarring the rifle, fire your shot.

CHAPTER VII

SHOTGUN PRIMERS

WE DO NOT RECOMMEND THE LOADING OR RELOADING OF SHOTGUN PRIMERS. It is not particularly necessary; it is difficult, and it is dangerous. BUT IF YOU CAN'T BE SATISFIED UNTIL YOU DO, FOLLOW THE DIRECTIONS CAREFULLY.

PREREQUISITE, SAME AS FOR CHAPTER V.

1. IF YOU DO NOT NOW POSSESS ONE, BE SURE TO SECURE FEDERAL EXPLOSIVES LICENSE FOR PURCHASE AND USE, FROM YOUR COUNTY CLERK OF THE COURT.

2. Required chemicals same as for Chapter I, IV, V, or VI.

3. MIXTURE SAME AS CHAPTER I, IV, V, or VI.

4. From your fired shotgun shell punch out the primer cup only. BE SURE TO LEAVE IN THE FIRED SHELL THE BATTERY CUP, AND INSIDE THIS BATTERY CUP RESEAT THE ANVIL exactly as it was before you punched out the primer cup, that is, clear to the forward end of the battery cup full distance. The sharp point of the ANVIL SHOULD THEN BE LOOKING AT YOU FROM THE REAR END OF THE SHELL, AND EXACTLY IN THE CENTER OF THE BATTERY CUP ROUND OPENING. THE SHARP POINT TELL BE BELOW, OR FORWARD FROM THE OUTER EDGE OF THE BATTERY CUP PROBABLY 1/32 to 1/16 of an inch. LEAVE THE ANVIL RIGHT IN THE CUP WHERE YOU PLACED IT, and lay the shell down.

   REMINGTON SHELLS have this point nearer to the outer edge of the battery cup than do WESTERN or WINCHESTER, and the primer cups are slightly smaller diameter. This is important to remember when you reload the primers.

   Restore the original shape of the PRIMER CUP by mechanical means, and clear out the ashes from the inside.

   Fill the primer cup with MIXTURE CHAPTER I, IV, V, or VI: TAMP IT TIGHTLY AND CAREFULLY. You should use a punch same diameter as inside the primer cup and press your load of mixture in very firmly, almost solid. WEAR SAFETY GLASSES ALL THE TIME. THESE ARE SENSITIVE MIXTURES. HOWEVER, WE HAVE NEVER HAD A CUP EXPLODE DURING THIS PROCESS.

   Then the cup is full to 5/8 of its capacity, place a round piece of bond paper, medium weight, over the charge, and to just fit inside the primer cup, like you would place the top wad over a shot charge in a loaded shell.

   Set the primer cup, thus loaded, on the vice or a smooth piece of steel and place your shell -- prepared as afore described, down over the primer so that the primer cup seats evenly in the battery cup, and with the sharp point of the anvil PRESSING THE CENTER OF THE PAPER THAT RETAINS YOUR LOAD. PRESS THE SHELL DOWN SLOWLY, STRAIGHT AND EVEN, AS FAR AS YOU CAN WITH YOUR FINGERS. The primer cup should enter the battery cup about half way, enough to be well started.

   NOW - IF YOU HAVE A HAND TOOL FOR CAPPING, USE IT. BUT ALL THE TIME KEEP THE MOUTH OF THE SHELL UP AND THE HEAD DOWN. SEAT THE PRIMER - BUT NOT SO TIGHTLY AS YOU WOULD A BRASS SHELL. BE SURE PRIMER IS SLIGHTLY BELOW SURFACE OF SHELL HEAD. EXAMINE FACTORY LOADED SHELL.

CHAPTER VIII

MATERIALS - WET LOADING - TOOLS

IT IS PROBABLE that a primer cup which has been fired and reloaded several times, will become hard. That is, the copper or brass in the primer cup will stiffen from the cold working done by the firing and reloading. TO SOFTEN BRASS AND COPPER PRIMING CUPS - HEAT THEM TO CHERRY RED HEAT OVER A GAS FLAME AND DROP THEM INTO A GALLON OR MORE OF ICE WATER. Soft copper or brass priming cups fire easier, but also require greater care when pressed into the shell pocket to prevent deforming.

TO SOFTEN A BRASS CASE WHICH MAY BECOME HARD FROM COLD WORKING, HEAT TO A CHERRY RED OVER A GAS FLAME AND DROP INTO ICE WATER. But remember that brass cases must have considerable stiffness to function properly. You will probably never need to use this on cases. AND WE SPECIFICALLY WARN AGAINST IT. SOFT BRASS CASES MAY LET GO, and are pretty sure to stick, difficult to extract.

IN ALL CHEMICALS SPECIFIED IN THESE CHAPTERS FOR RELOADING PRIMERS - USE A MEASURE. SOME CHEMICALS ARE MUCH HEAVIER THAN OTHERS. HENCE OUR CAUTION - KEEP STIRRED AND MIXED. USE A MEASURE, AND TRY TO GET THE SAME DENSITY IN EACH MEASURE FULL.

WET MIXING AND WET LOADING: Chapters II, IV, V, AND VI all lend themselves well to wet mixing and wet loading. Chapter I may also be wet worked, but with less success.

Measure out upon your tin mixing lid each of the parts, previously finely powdered, as for dry loading, except the Aluminum and the POTASSIUM CHLORATE. Place all parts in one pile and do not dry mix. On the top of your pile of other chemicals dump the part of POTASSIUM CHLORATE. Upon this POTASSIUM CHLORATE, on top of your pile, pour two measured ports of HOT WATER. The water may be boiling or near to it. In dry climates or rooms use three parts of hot water. Be sure that the water sinks through and to the bottom of your pile. MIX AND STIR WELL AND THOROUGHLY, again and again.

When your mixture is smooth, sprinkle over it the ALUMINUM part. Stir and mix the Aluminum well into the whole. It is difficult to get Aluminum mixed evenly, so use patience and care.

Be careful to prevent some of the mixture from crawling up the rim of your lid and there getting dry and hard. KEEP THE WHOLE MOIST ALL THE TIME, even if you have to add another part of HOT WATER. Any little piece that may dry on the edges is touchy and sensitive, and the least friction will explode it.

AS LONG AS THE MIXTURE IS MOIST THERE IS NO DANGER OF AN EXPLOSION. But the instant it is dry IT IS EXTREMELY SENSITIVE. Wet mixing PRODUCES A MIXTURE WHICH, WHEN DRY, IS ABOUT 100% MORE SENSITIVE THAN THE SAME FORMULA MIXED DRY. The reason for this is the more thorough mixing; this is due to the fact that the POTASSIUM CHLORATE is soluble in hot water.

While the mixture is still moist and plastic: LOAD YOUR CUPS 5/8 full, as near as you can gauge, with your toothpick or wood paddle. Press the load down with your round end punch just as though it were dry. THIS PRESSING WILL FORCE OUT MUCH OF THE WATER IN THE MIXTURE. Wipe off the water from the cup and punch. Place your news print round over the load, and again press down. SEAT YOUR ANVIL, AND PRESS IT INTO PLACE EVENLY. As long as mixture is moist there is positively no danger

of explosion, but beware of dry particles. You may use a loading plate and wet pellets if you like, but the time is not greatly less for the work.

WET LOADING has advantages - such as greater sensitiveness, and the longer process is worth the trouble. Place the primers SO LOADED IN A DRY AND VENTILATED AND WARM PLACE, AWAY FROM DIRECT HEAT, AND NOT IN THE SUNLIGHT. You will have to be the judge as to WHEN THEY ARE DRY. You may care to load them into the cases before they are dry and let them finish drying in the case, but it is not practical.

WET LOADING and WET MIXING is used in at least some of our Government arsenals and we believe most loading plants outside the United States. It has advantages for machine loading. But we note in some patent literature that heavy emphasis is LAID UPON THE GREAT ADVANTAGES TO BE SECURED WHEN A MIXTURE LENDS ITSELF TO DRY LOADING. FOR YOUR WORK WE RECOMMEND THAT YOU STAY BY THE DRY LOADING. ALL MIXTURES IN THIS BOOK CAN WELL BE DRY LOADED, per the instructions under each mixture.

For your information we here state that commercial companies have used GUM ARABIC, GUM TRAGCANTH, and other materials, such as MOLO-OIL, an explosive in itself, as plasticizers in primer mixtures. APPARENTLY IT IS DESIRABLE TO GET AWAY FROM THE WET PROCESS. Remington Arms Co. owns a patent on STARCH ACETATE to be used as such a plasticizer.

HENCE WE BELIEVE IT ADVANTAGEOUS TO BE ABLE TO LOAD A PRIMER DRY.

TOOLS: Get a pair of tweezers. Make yourself a dipper from 1/2 inch steel rod, 8 inches long. Drill a transverse hole in one end, very near the end, to form a dipper: round off the corners close to the edge of the transverse hole, or solder a handle on the side of an empty 22 long rifle shell. Tin lids: WE MEAN TINNED LIDS. Right size punch; get one. Tools for restoring the original shape of the primer cup: SEE CHAPTER ON THIS IN VOLUME II.

To remove a bullet from a case without firing: Hold the neck of the case that grips the bullet on an anvil or vice and tap the neck with a small hammer as you turn the case. This stretches the brass and so releases the grip on the bullet.

CHAPTER IX

CORROSIVE - OTHER CHEMICALS - NON-CORROSIVE - POWDERS

You will note that we have confined these chapters strictly to those chemicals commonly available. We have checked the makers and the jobbers and the retailers to be sure of our list.

You will also note that we have written chapters to take advantage of different combinations in case some of these chemicals now available to you become non-available.

Chapters I, II, IV, V and VI are excellent, dependable mixtures; and I, in addition to being a safe and highly dependable mixture is the cleanest of primers, and is non-corrosive. Chapter IV is the most available of all, as far as material is concerned.

However, in the use of these priming mixtures, as well as in the use of commercial and F. A. primers, we strongly recommend the use of Winchester Crystal Cleaner in center fire rifles, and the use of Remington and Winchester new oils in the cleaning of shotguns. It is to be noted that when the inside of the barrel is soaked with either of the above oils, without cleaning the barrel, that any tendency toward corrosion is arrested. AVOID THE GREASES and BE SURE TO WIPE THE BARREL DRY OF OIL BEFORE FIRING.

A discussion of the chemistry of the chemicals available would serve no useful purpose here; but let it be said in passing that it is NOT PURELY THE POTASSIUM CHLORATE, as popularly supposed that makes PRIMERS CORROSIVE. And, while AMMONIUM NITRATE, an excellent explosive in itself, IS AVAILABLE, it does not solve the problem of securing high alkalinity, and at the same time it brings to the mixture high hygroscopicity. Also, all forms of SODIUM, although available, are high moisture attractors. They drag into the mixture water from the air - high hygroscopicity. DON'T HAVE THEM AROUND. CALCIUM SILICIDE is simply NOT AVAILABLE. The addition of common CALCIUM CARBONATE OR OTHER FORMS OF LIME MERELY SERVE TO DILUTE THE POTENCY AND SENSITIVENESS OF THE PRIMING MIXTURE WITHOUT doing anything for the problem. We do not recommend mixing any chemical or metal with propellant powder charges -- all patents to the contrary notwithstanding. With the chemicals available, THESE PRIMING MIXTURES, given in detail in this book, HAVE SOME GREAT ADVANTAGES:

THESE MIXTURES ARE NON-MERCURIC, NON-COROSIVE, NON-HYGROSCOPIC, and. Chapter I is non-corrosive. Your problem of securing primers is solved.

You may be curious to know that there are not many chemicals that are EXPLOSIVE INITIATORS.

IN EVERY PRIMER THERE SHOULD BE SOME ONE OF

1. The Sensitizers: BARIUM NITRATE
   POTASSIUM CHLORATE
   POTASSIUM SULFATE
   and there are a few others, one of much merit:

   For a century MERCURY FULMINATE was the one sensitizer used. It has plenty of disadvantages, should be avoided and is NOT AVAILABLE to you now anyway. There are others not available to you and we may tell you about them in a revision of this book.

2. The Fuels: SULFUR
PHOSPHORUS
ANTIMONY SULFIDE
ALUMINUM
and there are a few others, mostly not available.

3. The Oxygen Producers: LEAD NITRATE
POTASSIUM PERMANGANATE
and there are some others; also, most of the initiators are oxygen producers.

4. In certain primers and detonators there should be Nitrogen Producers, and someday we'll take the afternoon off and tell you about some of them.

Some mixtures fire the propellant powder charge, more by heat than by explosive velocity. All primer mixtures do and should explode - they do not burn. However, some primers fire the charge chiefly by explosive velocity and little heat. Still others combine heat and velocity of explosion.

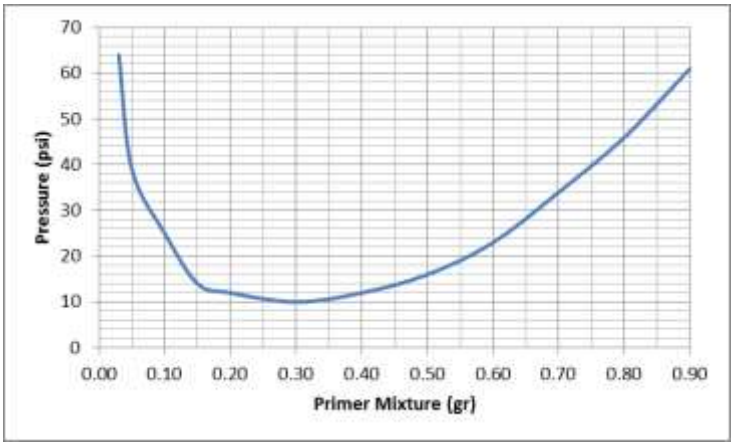
Herein lies your secret: Be careful of a primer that ignites the powder and does not start the bullet out of the crimp. There is too much breech pressure and not enough bullet movement. Some powders burn under too sudden a pressure. Bad back-end pressures result, along with poor velocity. NOTE: - The Chart. Also, see ballistic figures, Chapter XI.

Be careful of explosive primers that blow the bullet into the rifling before the powder starts to burn. Inefficiency in velocity and utilization of power in the powder results, although pressures do not as a rule mount.

The ideal is a primer that ignites the charge of propellant powder and at the same instant starts the bullet out of the crimp. This applies to all primers, the commercial as well as your hand loaded.

Chapters I, II, IV, V and VI are all in the middle range, although they do vary from heat to velocity and combined heat-velocity, as noted on each.

How will you know? How do we know? You won't know exactly - and we have not seen the movement. But refer to results shown in Chapter XI. Also, this chart illustrative results purely of quantity in the primer charge is quite illuminating.



Note the rise in pressures with small primer loads as well as with heavy primer loads.

This chart is not from actual cartridges but is illustrative of average results of many firings.

Grains of Primer Mixture in each Primer
Powder loads and all components except Primers identical.

BALLISTIC EFFICIENCY comes from complete and smoothly accelerating progressive speed in the combustion of the propellant powder. The primer that gives the highest velocity, and the cleanest barrel after firing, and no bad primer appearances of pressure, with a given and identical propellant charge, IS YOUR BEST PRIMER.

HOW CAN YOU MEASURE THE VELOCITY? That isn't too difficult. Use long ranges to fire over. On a 300 yard range the bullet that lands the nearest to your aiming spot - with the rifle zero at 100 yards - gets there in the fastest time; and the bullet that lands the lowest below your aiming spot, the longest time to get there. HOWEVER, USE AT LEAST FIVE IDENTICAL LOADS, PRIMERS IDENTICAL, TO TEST EACH VELOCITY. We are talking of .30 calibre; use other lengths of range for other calibres, but all of them should be at least MORE THAN 100 YARDS; AND MEASURE YOUR RANGE, don't guess.

Merely pouring in MORE POWDER is NOT the way to higher BALLISTIC EFFICIENCY, and sometimes it is dangerous.

POWDERS: You cannot buy powders with high nitro-glycerine content. It is a high content of this material that makes double base powders; and this is the chief of the chemicals that burns throats in barrels. MOST OF THE POWDERS SOLD TO YOU TODAY ARE SINGLE BASE POWDERS. The U. S. Army and Navy uses SINGLE BASE POWDERS in all small arms - it is the STANDARD POWDER. And from single base powders there is no heat danger.

CORDITE is a double base powder containing about 30 to 40, percent nitro-glycerine. For years it was the standard powder of the British Army. Some of the English boys tell me THAT ORDINARY USE OF THIS POWDER BURNS THE RIFLING OUT OF THE THROAT OF THE BARREL at the rate of about one inch per 500 shots. It is not available anyway, so forget it.

We could go on for pages to state facts concerning powders, and may go farther, if there is any reason for it, in revisions of this book.

HYGROSCOPICITY - the ability of a chemical to attract moisture from its surroundings, Particularly from the air.

EVERY KIND OF MATERIAL, to greater or lesser extent, is affected by moisture in the air - humidity. WE HAVE STATED THAT THESE PRIMING MIXTURES ARE NOT HYGROSCOPIC: They are not any more than, if as much as, chalk or graphite or carbon is. Sodiums DRAW MOISTURE AND HOLD IT.

EVERY KIND OF POWDER AND WOOD AND CHEMICAL AND PAPER - about everything except oil and grease, and even they are to a limited extent, affected by moisture in the air. AIR VARIES IN MOISTURE CONTENT WITH THE SEASONS, WITH ARTIFICIAL HEAT, WITH FREEZING TEMPERATURE, WITH GEOGRAPHIC LOCATION, WITH ALTITUDE, etc.

BLACK POWDER is the lowest of the sporting powders in affinity for moisture. The I. M. R. powders are not entirely free from moisture at any time, and MAY COLLECT ENOUGH IN CERTAIN CLIMATES AND SEASONS to affect their performances very adversely. (DuPONT DOES MAKE a cannon powder which they label N. H., and they moan it.) REFER TO CHAPTER XII CONCERNING AIR-TIGHT TIN STORAGE.

HENCE WE CAUTION: IT IS NOT GOOD SENSE TO RELOAD PRIMERS OR POWDERS WHEN THE AIR IS HEAVY WITH MOISTURE, THE BAROMETER IS DOWN, AND THE DOORS IN YOUR HOUSE ARE STICKING because they are swelled. USE SENSE IN THE WAY YOU HANDLE POWDERS OR CHEMICALS - WITH RESPECT TO HUMIDITY.

FOR THOSE WHO MAY HAVE NEED OF QUANTITIES, PARTICULARLY CLUBS AND RANGES:

Secure a drill bit, size 1/1000 larger than the outside diameter of your primer cups. Drill 20 holes through a plate, of wood or aluminum the thickness of the length of your primer cups. Drill the holes in an accurate drill press. Drill the holes 1/2 inch apart, on a square, size 4 holes by 5 holes. Smooth off any burrs and see that plate is smooth on both sides and a true plane surface, both sides.

Lay your plate - now called a loading plate - upon another true plane surface, Place your cups, open end up, one in each hole. Be sure they are clean and that the plates are clean.

Empty your well stirred and mixed mixture over the holes and cups in your loading plate. Be sure that the mixture fills each hole. Wipe off the plate with a wood straight edge. Be sure the plate is clean. Save the excess mixture.

PRESS the loads down FIRMLY in each cup, using the punch just the size of the inside of the primer cups.

PLACE your newsprint paper disc over each load in each cup. One thickness of paper only. PRESS down firmly. Lift your plate off the primer cups. PLACE YOUR ANVILS, point downward, in each cup. AND WITHOUT PRESSING THE ANVILS DOWN, press the primer pocket of your shell (cartridge case) down over the primer as far as you can with your fingers - enough to get the primer started well into the pocket. KEEP THE MOUTH OF THE SHELL UP AND FINISH SEATING THE PRIMER INTO THE POCKET OF THE SHELL OR CASE WITH YOUR HAND TOOL.

If you merely place the anvil in the cup, point down and in the center, THE ANVIL WILL SEAT ITSELF AND IN THE RIGHT PLACE IN RELATION TO THE CUP AND TO THE PRIMER POCKET, with this procedure.

We think 20 holes is large enough. A loading plate is much handier than doing the filling by hand. IT IS POSSIBLE TO VARY THE LOAD OF YOUR CUP from 1/2 full to 5/8 or 3/4 by getting the loading plate thicker than the length of your primer cup.

CHAPTER X

PRIMERS FOR MUZZLE LOADING SHOTGUNS AND RIFLES

1. IF YOU DO NOT NOW POSSESS ONE, BE SURE TO SECURE FEDERAL EXPLOSIVES LICENSE FOR PURCHASE AND USE, FROM YOUR COUNTY CLERK OF THE COURTS.

2. Necessary chemicals: Same as for Chapters I, III, IV and VI.

3. Mixture same as for either Chapter I, III, IV or VI. The same precautions as to finely powdered chemicals, thorough mixing, and safety precautions apply here in the same ways.

4. Very likely when you force the CAP down upon the tube, or NIPPLE, of your gun you split the skirt of the CAP, or primer cup. It is possible that when you fire the gun the cap skirt, or the sides of the cup split still further. IN CASE THE SKIRT OF THE CAP IS NOT SPLIT TOO FAR TO SALVAGE, restore the shape of the cap by mechanical means. See later chapter on this procedure which is simple.

   IN CASE THE brass or copper of the CAP IS TOO FAR WRECKED TO SALVAGE, MAKE YOURSELF NEW CAPS. Refer to Vol. II of this book for full details on making NEW MUZZLE LOADING CAPS.

   Whether the cap is salvaged or is new, load as follows: First make for yourself a punch, the round punch end of which will just fit inside the BOTTOM of your CAP. HOLLOW OUT THE ROUND PUNCH END SO THAT THE EDGE OF THE ROUND PUNCH END IS ALL THAT TOUCHES THE BOTTOM OF YOUR PRIMER CAP. Back from the hollowed out punch end reduce the diameter of your punch as far as the skirt of your primer cap reaches, or farther, so that the punch end is just the size to fit into the bottom of your primer cap, and from that back toward the punch shank the diameter gets smaller at least as far as the cap will extend. This punch should be made on a lathe, and of good steel, and hardened, If you have no lathe, as we do not, grind out your punch on the emery stone, by turning the punch as you grind.

   From the newspaper on your table, cut some round pieces of paper, just large enough to fit the inside bottom of your primer caps. Do this with the punch you just made, and don't use the hammer.

   Load your MIXTURE into the primer cap - BE SURE TO KEEP THE MIXTURE STIRRED BEFORE YOU LOAD EACH CAP. Fill the cap about 1/2 full of the loose mixture. Use the punch you just made to press it down firmly, so firmly that it will be HARD. DO NOT USE THE HAMMER. PRESS AS FIRMLY AS YOU CAN WITH YOUR HANDS. OVER THIS LOAD IN YOUR PRIMER CUP, PLACE ONE OF THE ROUND PIECES OF NEWSPRINT PAPER THAT YOU JUST CUT. PRESS IT FIRMLY INTO PLACE, JUST AS YOU WOULD PRESS A THIN DISC OF PAPER DOWN OVER A POWDER CHARGE IN A SHELL. In case your paper disc over the load should loosen, or not remain, the disc is too small in diameter. Cut them slightly larger. If you intend to fire the cap immediately, or out on the range, use it as now completed. If you will carry the cap for hunting, or store any time, cement your round paper disc in place with a thin film of New Skin, collodion, or even thin shellac, and let dry thoroughly. You will have a CAP that is sensitive, and powerful, and fast.

   You whose use muzzle loading RIFLES FOR FINE TARGET WORK: It is possible that your tubes are large diameter bores, small jet hole bores, or a jet hole at the

outer end and a large bore inside, or the reverse. There seems to be a great variety of tubes. If your tube bore is LARGE, you may have to reduce the amount of YOUR PRIMER LOAD; IF SMALL AND JET LIKE YOU MAY HAVE TO USE AS ABOVE DIRECTED, 1/2 cup full. YOU MAY EVEN GET TO THE PLACE WHERE YOU WILL NEED TO WEIGH THE PRIMER CHARGE. USE GREAT CAUTION IN LOADING BLACK POWDER WITH THESE PRIMERS. Ordinary black powder will give you remarkable results with these primers; the combustion is more complete and steadier throughout the length of the bore, BUT OLD, MUCH HANDLED, AND DRIED OUT BLACK POWDER THAT IS DUST, OR CONTAINS A LARGE AMOUNT OF FINE DUST, OR EVEN SOME DUST, CAN DETONATE WITH ANY PRIMER, and because of the greater efficiency of these primers is pretty sure to produce bursting pressures. SIFT THE FINE DUST OUT OF BLACK POWDER. BEGIN WITH LIGHT LOADS AND WORK UP.

ADVANTAGES OF THESE PRIMER MIXTURES: Chapter I is not corrosive; it is somewhat less sensitive to load than Chapter VI. But we have never had a muzzle-loader misfire with either mixture. All of these mixtures are free from Mercury Fulminate; they are not hygroscopic; and they contain no ground glass.

THE LOADING OF MUZZLE LOADING PRIMERS AND CAPS IS MUCH SIMPLER THAN THE LOADING OF ANY OTHER KIND OF PRIMER CUP. IT IS ENTIRELY PROBABLE THAT SOME OF YOU TARGET EXPERTS WILL WORK OUT SOME VERY EFFICIENT RIFLE LOADS WITH CERTAIN VARIATIONS IN THE WEIGHTS OF THE PRIMER CHARGE AS WELL AS IN THE POWDER PROPELLANT CHARGE.

CAUTION

Most muzzle guns are old and are not made of modern steels. They do not possess the strength necessary for smokeless powder. Do not use it. Use only black or semi-smokeless. If the powder you have is old, sift it and throw the fine dust away. Very fine black powder will detonate with terrific pressure.

CHAPTER XI

BALLISTICS

The Science of Physical Laws Governing the Motion of Projectiles

In writing this book we have drawn all conclusions and stated all directions to you purely from results obtained. Subjective conclusions and theory are bases for experimentation only, not for directions to you. Below are the results from TWO TESTS. We have made many and various tests to verify conclusions and results. These two tests are given because they show vividly some reasons for our sometimes tiresome CAUTIONS and repetitions of dangers, and because these two tests were made in a Ballistics Laboratory nationally recognized as an authority, not in our laboratory, and because they illustrate well efficient ignition results.

Ballistics Laboratory Pressure and Velocity Test of .30 Calibre Ammunition:

All new F. A. cases, 1938; all new bullets, F. A. 1938, 150 grain flat base; powder from newly opened canister of I, M. R. 4320, from air tight storage. Load was exactly 50 grains in each of the first 19 cartridges. There were 19 cartridges identical as to cases, bullets, powder, and weight of powder load, and all loaded at the same sitting. But the primers in all cartridges were different - no two of the primers alike. Cartridge 20 was a straight issue F. A. 1939, 150 grain bullet, no alterations whatever, and from air tight storage.

Aberdeen Chronograph used. The gun was first warmed up and the chronograph tested with ammunition of known velocities and pressures. All 20 cartridges were fired consecutively, with a cooling period for the gun between each shot. The velocities were taken over a bullet travel of 150 feet.

Cartridge No.	Velocity	Pressure	Primer
1.	2829	474	Chapter 6 Primer Mixture FULL
2.	2806	344	" " " " 1/2
3.	2815	447	" " " " 3/4
4.	2753	381	" " " " 1/4
5.	2748	390	Commercial, A Company
6.	2719	377	Chapter 5 Primer Mixture FULL
7.	2696	353	" " " " 1/2
8.	2780	428	" " " " 3/4
9.	2684	363	" " " " 1/4
10.	2705	368	F. A. 1916, .45 grain non-fulminate
11.	Missed Fire		Chapter 1 Primer Mixture FULL
12.	2712	377	" " " " 1/2
13.	2821	470	" " " " 3/4
14.	2752	399	" " " " 1/4
15.	2437	381	Commercial, B Company
16.	Missed Fire		Chapter 3 Primer Mixture 3/4
17.	2783	428	" 4 " " 3/4
18.	2703	372	" 2 " " 3/4
19.	2703	372	Commercial, A Company Lot 2
20.	2696	363	F. A. Issue Cartridge Complete, no Alterations whatsoever.

You note that Cartridges 11 and 16 missed fire. The cause of those misfires was

definitely determined to be SHORT CASES. THESE CARTRIDGES MISSED FIRE BECAUSE THESE TWO F. A. NEW CASES WERE NOT MIXED OR MEASURED AND THROWN OUT BEFORE LOADING. The fault was not with the primers or the mixtures. We PRESUMED that new cases would be right. They were not. THIS IS AN EXCELLENT EXAMPLE OF CARELESS LOADING - NOTHING SHOULD BE TAKEN FOR GRANTED, IF IT CAN BE MEASURED. THESE CASES SHOULD HAVE BEEN MIKED BEFORE LOADING. DON'T PRESUME. ON ALL OTHER CLEARANCES AND ESPECIALLY ON THE WEIGHT OF THE POWDER CHARGES, THEY WERE CHECKED AND DOUBLE CHECKED. Used cases, fired in a standard chamber and head space, would have eliminated these two misfires.

The chamber and head space of the testing gun were NORMAL - that is in the middle range of tolerances allowed for these measurements.

Note the velocity and pressure of number 15 cartridge, and compare with velocity and pressure of number 4. You note that the pressures are identical - but the velocities far different. Number 15 you note is a commercial primer, and you might like to know that it was made by one of our most prominent cartridge and arms companies.

All commercial primers were from air tight storage, in which they had reposed since their purchase direct from the ammunition companies - not from dealers' shelves – in 1938.

Note: The primers from fired cases number 4, 9, 10, 14, and 15 all have the firing pin dent blown back into the firing pin hole. THESE WERE ALL EITHER LIGHT PRIMER LOADS OR WEAK PRIMERS, as you can see by the pressure and velocity figures. WHAT IS THE REASON? We do not conclude; but we do theorize that because of the weak ignition the bullets were not started out of the cases by the primer impact, that the slow and weak ignition gave the firing pin time to lose its forward momentum BEFORE THE PROPELLANT POWDER GOT GOING, and that when the powder DID GET GOING the rear end pressure was high and blew the primer DENT, firing pin and all, back into the firing pin hole in the bolt face.

Note the superior performance of the 3/4 primer loads. Note the superior performance of Chapter 6 primer mixture. Note that cartridges number 18 and 19 have identical velocities and pressures, while one used chapter number 2 mixture and the other a commercial primer. I might add that this particular commercial primer was from a company noted for its excellent center fire cartridges with superior velocities.

In conclusion on the first test described: We will state that at least ONE of the ammunition companies IS PARTICULAR TO MATCH THE PRIMER WITH LOAD to secure superior performances. That company's ammunition leaves the barrel as bright and clean after each shot as though the shot had not been fired. COMPLETE COMBUSTION OF PROPELLANT POWDERS TAKES PLACE IN THAT COMPANY’S AMMUNITION.

> THAT MATCHING OF PRIMER WITH LOAD FOR EFFICIENCY WAS COMPLETELY DENIED TO YOU - EVEN THOUGH YOU COULD CHANGE FROM ONE COMFANY'S PRIMERS TO ANOTHER - BEFORE YOU WE ABLE TO CONSTRUCT YOUR OWN PRIMERS AS DESCRIBED IN THIS BOOK. This fact alone is valuable to you, war or no war.

The above ballistic results bear out our own conclusions on these loads and primers. However, these figures are given you not as evidence of the velocities obtainable with these primer mixtures, but as a warning that dangerous pressures can result from either too weak or too violent a primer. Otherwise we would not place so much emphasis on a single cartridge test. On each of the single cartridge figures above we have fired many cartridges.

THE SECOND TEST:

REPORT OF TESTS OF SHOT SHELLS

This cartridge is a special type of shot shell and a special gun was used; the powder load was exactly 40 grains of Dupont Oval (regular gauges and loads use much less powder than 40 grains); the shot load was 1.58 ounces of copper coated hard shot, number 5, a regular production article of one of our arms companies. The primers were as noted below.

The five cartridges were fired as the third string - there were 23 cartridges fired consecutively, so the firing of these five came about the middle of the heat. A certain amount of time was allowed between each shot, but not enough to cool the gun down to atmosphere temperature. Velocities only were taken. Pressures were taken from other, although identical, cartridges.

The cases were brass, of special design which we are not at liberty to describe. The COMMERCIAL PRIMERS were all from the same lot and these were large rifle primers- same as the .30-06 case uses.

THE AVERAGE, or rather MEAN VELOCITY OF THE FIVE CARTRIDGES PRIMED WITH COMMERCIAL PRIMERS, over a range from muzzle to target of 40 yards, 864 f. s., with the minimum 841 and the maximum 884 f. s.

THE AVERAGE VELOCITY OF TWO CARTRIDGES IDENTICAL IN EVERY WAY WITH THE ABOVE FIVE, EXCEPT THE PRIMERS which were Chapter 6 mixture 3/4 load, was 913 f. s. over the 40 yard range. THE PATTERN OF THESE TWO CARTRIDGES AVERAGED 70.1%, with a high of 78.5% and a low of 61.7%.

The pattern of the five cartridges primer with commercial primers was a mean of 62.0%, with a high of 81.2% and a low of 51.8%.

None of these are HIGH shotgun velocities, nor are they so low. But the response of the identical load to the Chapter 6 primer mixture is apparent and significant. THE SHELL HEADS OF THE PRIMERS SHOWED NO SIGNS OF HIGH CHAMBER PRESSURES, with either primer.

HOWEVER, the addition of 2 more grains of powder, and the use of a full cup of Chapter 6 primer mixture - the primer cup was full completely to the rim, pressed very hard - GAVE EXCESSIVE CHAMBER PRESSURE in the BALLISTICS LABORATORY PRESSURE GUN. We would say that the chamber pressure WAS DANGEROUS and that it would certainly rupture any ordinary barrel chamber. SO - AGAIN, WE SAY WATCH YOUR QUANTITIES.

STAY AT OR BELOW A PRIMER CHARGE OF 3/4 CUP, AND STAY ABOVE A PRIMER CHARGE OF 1/4 CUP. Stick to the 1/2 and 3/4. If you are super-scientific you may care to weigh the charge in your primer. AND IN ALL CASES OF UNKNOWN COMBINATIONS, START WITH A REASONABLE LOAD OF PROPELLANT POWDER, A LITTLE UNDER NORMAL TO LOW.

HOW TO MEASURE PRIMER CUP CHARGES:

FOR 3/4.: Fill the clean cup just overflowing with the loose powdery mixture. Wipe off level with the cup, using your loading toothpick or paddle - use the straight edge across the rim; set the cup out on your table and press the charge down FIRMLY. Set your cup back on your mixing lid and AGAIN FILL TO JUST OVERFLOWING with the loose powdery mixture, and wipe off level with the straight edge. Set the cup out on your table, press the charge down FIRMLY, cover with the paper disc, and again press down firmly. Keep your MIXTURE STIRRED before loading each cup.

FOR 1/2: Fill the cup just overflowing; wipe off even with the straight edge of your loading toothpick; set out on the table and press down FIRMLY; cover with the paper disc, and press down FIRLLY AGAIN.

FOR 1/4: Fill the cup ONE-HALF FULL, as near as you can judge, of the loose mixture; set out on the table and press down FIRMLY, cover with paper disc and press down FIRMLY again. You can vary the 1/4 load by intentionally or accidently filling the cup from one-half to three-quarters or almost full. Hence, this is not a very accurate and consistent load. The 1/2 and 3/4 are more uniform and consistent.

From the above tables and results you can conclude that

IGNITION EFFICIENCY is BALLISTIC EFFICIENCY

YOU MAY CONCLUDE, and you will do so without evidence, THAT SOME OF THESE PRIMER MIXTURES, or some of these mixtures in combination with some powders, ARE TOO HOT FOR YOUR RIFLE BORE, THAT THEY WILL BURN THE THROAT OR BURN THE BORE OF YOUR RIFLE, AND SOME OF YOUR FRIENDS OR ACQUAINTANCES WHO CALL THEMSELVES EXPERTS, or even admit that they are EXPERTS, MAY TELL YOU THAT SAME THING. NOTHING IS FARTHER FROM THE TRUTH!:

FIRST, THESE PRIMERS AND COMMERCIAL PRIMERS NOW AVAILABLE ARE NOT SO HOT. You will note that the PAPER YOU PLACED UNDER THE ANVIL DID NOT BURN; it merely blew out where it was not held down by the anvil.

WE HAVE HAD THESE PRIMERS EXPLODE IN OUR FINGERS - reasons for some of our many CAUTIONS. The effect is a SLAP, a stinging sensation like we had been struck with a whip, and hard, too. We have had those shotgun primers explode through the shell and into our hands and fingers, and the result is PAIN FROM IMPACT. THERE IS NO BURN, NO SCORCH, NO HEAT, from the explosion. The time is too short. If some chemicals are burned in the open, about like smokeless powder burns, there is some heat, BUT NEVER ANY FROM DETONATION OF THE PRIMER.

But you say, in combination with powders? You cannot buy Cordite and FROM NO COMMERCIAL POWDERS NOW AVAILABLE TO YOU CAN YOU SECURE ENOUGH HEAT TO BURN THE INSIDE OF A RIFLE BARREL. The time element is to be considered. But, you say, a barrel gets warm, and then hot from continued firing. That is very true of all ammunition. The heat we are talking about is comparative temperatures. We told you that Chapter V and VI were hot and efficient primers. They are hot - hotter than some others; but DO NOT GENERATE ANY TEMPERATURE NEAR TO THE POINT OF AFFECTING THE STEEL, with or without any available powders, IN THE INSTANT OF FIRING. We have used the dry, soft, white tissue to wad over powder, both rifle and shotgun, and the paper has never scorched or colored.

SO, REST EASY: EVERY PRIMER MIXTURE HEREIN DESCRIBED IS PERFECTLY SAFE IN THE FINEST STEEL BARREL; BUT CLEAN YOUR RIFLE AFTER A DAY'S SHOOTING, REGARDLESS OF WHAT KIND OF AMMUNITION YOU USE. Rust inside is the greatest barrel enemy; careless use of the cleaning rod is the barrel's next worst enemy.

CHAPTER XII

FOR YOUR COMFORT - FROM OUR EXPERIENCE

1. Use only Factory Loaded Complete Cartridges if you hunt big game - moose, bear, deer, antelope, etc. - on a once-per-year, or once-in-a-lifetime trip. Insist that your dealer order these cartridges direct from the Western, Remington, Winchester, or Peters Companies (when the war is over).

   Store your DRY factory loaded ammunition now (and when the emergency is over) in AIR-TIGHT, SEALED CONTAINERS. The gallon and half-gallon syrup buckets, clean and dry, closed tightly and lid sealed around the rim with adhesive tape will do well. Keep your tin containers on the main floor, not in the basements or in the attic. Carry your tin containers sealed to the hunting field camp. We know – all argument and expert opinion to the contrary notwithstanding.

   First: You cannot secure the efficient propellant powders that the ammunition companies have used, now use, and will use in loading their cartridges. Such powders burn with faster accelerating velocities - that is, they start slowly, and as the projectile moves out of the case into the rifling they step up their combustion rate at a very swiftly increasing velocity and pressure, and they are not sold to the public.

   Second: The Big Buck That Got Away. The pure cussedness of inanimate things would see to it that the reloaded cartridge you carried in your rifle would have just one of the dozen close tolerances, not right, and the biggest buck in the woods would snort and stay alive.

2. Use your fine hand loads, primed with your own primers, made from these mixtures, to train the boy who will be called next month or this year, and the father who may also be called, in the science and art of .30 caliber marksmanship.

3. Use your fine hand loads with these primer mixtures carefully done, exactingly miked, critically weighed, powders and primers, weights and materials MATCHED, for rifles big and little, to take the wary woodchuck, the crow, the coyote, and the prairie dog.

4. Use your knowledge of primers to work out high performance with the powders you now have or can buy. You will be surprised at the higher velocities to be secured with the same powder, and same charge, at the same or lower pressures, when you use, let us say, Chapter VI primer mixture.

   START WITH LIGHT TO MEDIUM LOADS OF POWDER. DON'T GUESS.

5. Use every measuring device you have. There are too many variables in addition to the human, to GUESS. Weigh , Mike, Measure, everything possible. AND BE WIDE AWAKE. Start with low and medium charges. GO SLOWLY. Watch the primers from fired cases. And this applies to all hand loading, regardless of primers used, whether commercial, F. A., or your own loading.

CHAPTER XIII

STANDARD PRACTICE - ADVANCED WET LOADING

You may be interested to know that the sensitivity of primers is of first consideration in all ammunition plants, both commercial and Federal. You will also be interested to know that these same plants have their troubles with misfires and hangfires. Once reliable sensitivity of primers is attained, power of the primer is next in importance.

Ammunition plants, both commercial and Federal, work constantly on experiments to improve primers. In addition, they keep constant tests running to check each batch of primers produced; and behind that, the materials - chemicals and metals - are tested for each batch. In spite of these experiments and constant tests, with special machines and apparatus handled by graduate engineers and skilled scientists, ammunition plants have their ignition troubles and misfires and are constantly on the problem to reduce the failures to a minimum. Constant 100% production sensitivity in primers may be possible in some plants, but we have never heard of it.

SO, if you have loaded 100 primers from one of these mixtures without a single misfire, congratulate yourself. The 101st may misfire.

CAUSES OF PRIMER MISFIRES:

1. Quality of your chemicals - impurities, moisture, dirt, and crystal form not powdered and dried. REMEDY: If you can buy C. P., now called "reagent", do so. However, if you will keep "technical" and/or "commercial" grades clean and dry, and powder your crystal forms and dry them, you will have no trouble on this cause.

2. Incorrect measure of parts. REMEDY: Pack each measure full to the same density and stay by the formula.

3. Relative Humidity above 40%. This is bad atmosphere in which to reload either primers or powder, and above 59% is sure to cause you some troubles. If primers are wet loaded - at any humidity - and dried in dry warm air, they are still subject to misfires if exposed for half an hour to relative humidity of 60% or above. REMEDY: Load primers and cartridges in a dry atmosphere - or take a minimum amount of time to transfer primers and powders from correct air-tight storage into cases.

4. Still damp, when wet loaded. REMEDY: Expose primers to 48 hours of dry, worm, circulating atmosphere.

5. Primer cup too full: Misfires and hangfires can result. REMEDY: Stay at or below the 3/4 cup. A 5/8 or 1/2 cup is better if it is powerful enough for your load.

6. Primer charge too small: Bad pressure troubles, in addition to hangfires and misfires, can result. See Chapter XI, Ballistics. Stay above 1/4 cup charge.

7. Metal of cup too hard; cup reloaded too many times. Not only can you get misfires but the dent can crack out and let your pin strike the anvil and so chip it or deform it. Also, pressure and fire can come back into the action. REMEDY: After a primer has been reloaded twice, anneal the cup. See Chapter VIII

on this. HOWEVER, IF THE RIFLE OR GUN IS A SELF-LOADING, OR AUTOMATIC, BEWARE OF TOO SOFT A PRIMER. A cartridge may explode in the loading mechanism. The remedy is to reload an annealed primer once or twice for hand operated mechanism before using in an automatic. OR BEST, USE ONLY NEW PRIMER CUPS FOR LOADS IN AN AUTOMATIC. See VOLUME II of this book for NEW PRIMER CUPS AND HOW TO MAKE.

8. Anvil too flat, too soft, or misshaped, OR THE WRONG DESIGN OF ANVIL FOR THE MIXTURE YOU ARE USING. REMEDY: NEW ANVIL, or different design. See VOLUME II for making NEW ANVILS.

9. Cases too short. REMEDY: Discard and use others. If a case has been fired in a minimum head-space rifle, you may get this trouble when the case is used in a wide headspace rifle. And new F. A. case lots do contain frequent short cases.

10. Too short firing pin travel. Beware of "Speed locks" and suped-up mechanisms. Also, check the mainspring tensions. Clean the mechanisms of dirt and foreign matter, and oil the working parts. REMEDY is mechanical. The firing pin indent must be not less than .013", and not more than .023" in depth, when the headspace is right.

11. Headspace too large. REMEDY: mechanical.

12. Firing pin point misshaped, chipped, bent, or too short. REMEDY: mechanical. The pin point should be a true half-ball, and should protrude through the bolt face, when the hammer is down, 0.055" to 0.060".

13. One or several of the above causes in combination. REMEDY: eliminate by checking the causes one by one, never more than one at a time.

CAUSES OF CARTRIDGE MISFIRES AND HANGFIRES: The primer fires but the powder either does not fire or delays firing.

1. Relative Humidity when powder was loaded. REMEDY: Load only in dry atmosphere - or make your transfer from dry, air-tight, storage into the case in a minimum of time.

2. Damp cartridge. Federal loaded ammunition is varnish-sealed at the primer pocket, and at the shell mouth, and is tested for air and water tightness, under both pressure and in water, sometimes frozen solid. THEN, the ammunition is sealed in air-tight containers - tin - for shipment to the QMC. Commercial cartridges are not so sealed or so shipped, by some companies. Some companies varnish seal some of their cartridges, and others do not. SEE OUR CHAPTER XII on air-tight storage paragraph. Also, don't handle rifle cartridges; your hands perspire an acid, the skin is covered with it. And don't drop cartridges in the snow and mud and water. And don't set cartridges on window ledges; cartridges breathe with warm and cool temperatures, and windows sweat on the inside. (The British Government sought to overcome humidity trouble by using CORDITE powder, a high-nitroglycerine content powder. This withstands both temperature and moisture changes best of all powders - but scorches the throats of barrels.) (Also even with our double-base powders used today in some sporting cartridges, and if sold for reloading by hand, nitroglycerine content POWDERS CAN BECOME TOO DRY, IN ARID ATMOSPHERES, AND SIMPLY BLOW THE GUN APART, endangering the shooter. We had it happen with a factory loaded shot shell, a few years ago. We note that most companies now VARNISH THEIR SHOT SHELLS FOR BOTH OUTSIDE AND INSIDE PROTEC-TION.)

Hangfires, due to powder dampness, can be extremely dangerous, especially with automatic guns. Part of the powder may burn - near the primer - enough to unlock the mechanism, followed immediately by the rest of the charge letting go. The result is disastrous. The same is true of bolt action guns. The operator may open the gun just at the right time. Damp powders, and damp cartridges can be very dangerous. AIR-TIGHT STORAGE OF DRY POWDER AND CARTRIDGES PROTECTS AGAINST BOTH DAMPNESS FROM THE OUTSIDE AND EVAPORATION OF VOLATILES AND SUPER-DRYNESS OF THE POWDER FROM THE INSIDE.

3. Too light a powder load - or too weak a primer mixture load: REMEDY: Match your primer with your propellant powder charge.

4. Too weak or too cool a primer load and mixture: REMEDY: Refer to mixture chapters.

5. Bullet too light, or too lightly crimped bullet. REMEDY: There must be pressure to burn nitro-cellulose smokeless powder. A full charge of powder, with no bullet in the case, and with the best of primers behind the powder, will not burn, when the primer explodes.

HOW STRONG SHOULD A PRIMER BE? The answer is simple: Strong enough to completely ignite all of the powder charge at the identical instant that it moves the bullet out of the crimp, out of the case, and up the barrel, into the rifling, a distance from two to five inches from the shell mouth.

Completely ignite? Yes. Single-base nitro-cellulose powder grains burn from the outside in, and from the outer walls of the perforation out; the higher the pressure the faster they burn; the lower the pressure the slower they burn. And in the case of a shot out rifle - the rifling worn and getting smooth - much of the powder is blown out upon the ground ahead of the muzzle, without burning, because of lack of pressure. Double-base powder is different; it burns more readily, at lower pressures, and with faster accelerating rates. Know what kind of powder you are loading when you match your primers.

Your primer must have explosive pressure. Heat without explosive pressure will ignite the grains in the rear end of the case, and after they burn a while a pressure is built up: Results, slow ignition, sudden and bad rear-end pressures, poor velocities. SEE FIGURES IN CHAPTER XI, Ballistics. Heat alone will not fire modern smokeless powders of single base; and it is not safe to use with double-base powders, even those of lower nitration.

If you have reason to know - and the manufacturer will readily tell you if you will write him - THAT YOU ARE USING DOUBLE-BASE powders (compound propellant combining nitroglycerine probably around 15% with nitrocellulose, colloided guncotton, and/or pyrocotton, with or without certain nitrates) you should start with very moderate loads of powder, with any primer, moderate to strong primer mixture if you do your own primer, and expect safe results. From this safe and easy base increase your primer load and powder, and if still safe and easy, gradually increase your powder load until you reach the desired, or the top performance you deem safe and workable: THEN BACK OFF YOUR POWDER LOAD a gain or two or more for a working standard. Stay away from the highest performance, in powder load, but retain your highest performance primer load. Double-base powders have higher potential than single-base powders and a smaller load is required to produce a given velocity and pressure. So, do not work at maximum loads under any circumstances with double-base powders.

In all cases, and with all powders, be stingy with your powder, and get the highest performance out of the least you can use. For this, always use an efficient primer, and always weigh or measure powder charges accurately.

WET LOADING - WET MIXING

To include wet mixing and wet loading in a single chapter along with STANDARD PRACTICE is particularly appropriate, since many ammunition plants, commercial and Federal, wet mix and wet load their production primers.

ADVANTAGES:

1. In all mixtures using chlorate the sensitivity of the wet loaded primer, when dry, is about doubled what it would be if dry mixed and dry loaded. Chapters II, IV, V, VI, mixtures given in this book lend themselves excellently to wet mixing and wet loading. Not so for Chapters I and III.

2. There is no danger of accidental explosions in wet mixing, properly done; and the danger in loading is greatly reduced when wet loaded. This advantage is multiplied when you consider that you can wet mix two, three, four, or more times, the amount specified for dry mixing, with comparative safety. Also, the primer loading plate can be made to accommodate wet charging and loading. Wet mixing and loading has big advantages for quantity loaders and clubs.

DISADVANTAGES:

1. Drying. It is difficult to know when wet-loaded primers are 100% dry; AND, it is possible to fire many potassium chlorate primers wet loaded immediately after loading, but not all of them all the time, even from the same batch and mixture. AND, occasionally one primer will stay wet long after 1,000 others under the identical conditions are dry 100%.

   TO OVERCOME THIS DISADVANTAGE and difficulty we have introduced into wet loading something we have not seen done heretofore, and have not heard of in ammunition plant practice - although it may be done to more or less extent in full or modified form. We carried over from dry loading: Place 20 pounds pressure on the wet mixture in the primer cup, using your punch to just fit the inside of your primer cup, both when you press down the charge and when you place the newsprint paper round over the charge. Wipe the water off the cup and the punch each time BEFORE YOU WITHDRAW THE PUNCH FROM THE CUP.

   This compression of the wet load places the chemical particles close together, in intimate contact, and the potassium chlorate, in solution, surrounds each particle in intimate adherence. This compression eliminates water pockets and air bubbles and empty spaces. And the compression extracts much of the water in the load. Further: when the primer so loaded dries, the charge hardens in place, much as though we had used a cement element in our mixture. However, watch your step when you seat your anvil.

   A wet chlorate charge, when so compressed and so loaded, can be fired when you seat the anvil too deeply or twist the anvil too much in process. Seat deeply enough, but do not make contact. In tests, we have fired a batch of 20 wet primers, one after the other as they wore loaded, without a single miss. Also,

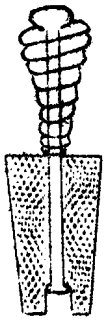
we have seated wet chlorate primers, so loaded, in the case and fired them in the rifle immediately after loading; but WITH ORDINARY CARE, and reasonable primer loads, you will not experience trouble here.

Wet loading does not do well with Chapters I and III, due perhaps to the longer drying time required, and the fact that the chemicals of these formulas will not cement together and dry hard.

A lot, and perhaps most, of your drying troubles are eliminated by the 20 pounds compression on the load when placed. We stated heretofore "dry in dry, warm, and well ventilated place." In our basements, during winter months of furnace heat, below freezing weather outside, the atmosphere is DRY. Primers dry quickly on the overhead beams, between the stringers (joists), and in from 10 to 20 hours are dependable for sensitivity. But in the wet spring and summer and fall months - the basements are out, too damp to even wet load. We suggest, in damp weather: Place your primers, anvil side UP, spread over the bottom of the largest dishpan or tin tub that you can find, and place your pan or tub in the warm and dry and ventilated attic of some building. Place your pan or tub in the center of a six-foot diameter spot which you have previously covered with asbestos paper, and visit the scene of your drying frequently. You will think of other drying devices, such as fans.

If you have too much drying trouble, you can dry-load.

For an accurate measure for a wet load, in case you do not use a loading plate: Make for yourself a dipper, right size for a single primer load, equipped with an ejection plunger. The below drawing may be of aid to you:



CONSISTENCY OF PERFORMANCE:

As you read through these chapters you may have had in mind, "What kind of group will cartridges primed with these mixtures shoot?" We will answer part of that question in this volume by pointing to the fact that Chapters II, IV, V, and VI are chlorate sensitized primers, and by stating that all Federal. Government specifications for small arms primers, to the best of our knowledge, and with the exception of one small-rifle cartridge primer, are CHLORATE PRIMERS TODAY. We will further state that in all of our own tests cartridges loaded with those mixtures described in this book HAVE SHOWN EXCELLENT CONSISTENCY.

In VOLUME II of this book, in which we hope to meet you again, we confidently expect to show you some .30 calibre groups that will meet the approval of the most discriminating set of shooters in existence -- THE AMERICAN RIFLEMEN.

Chapter XIV

PROPELLANT POWDER FORMULAS

1. THE VERY BEST FORMULA for excellent propellant powders: Send your order by mail to Hercules Powder Company Office, or to E. I. duPont de Nemours and Company office in your nearest city; or to Hercules Powders, 980 King Street, Wilmington 99, Del. or Dupont Powders, Wilmington 98, Delaware; or to any one of such dealers as Leslie Lindahl, Central City, Nebraska, or Belding and Mull, Phillipsburg, Pennsylvania. This is the very best way to obtain excellent propellant powders; and up to January 1, 1945, Hercules and Dupont powders are available from dealers' stocks in most sizes and types.

2. HOWEVER, SHOULD THESE SOURCES of supply be shut off by some decree, you can make safe and excellent propellant powders in semi-smokeless and smokeless types. You cannot make, safely, black powder.

GUNPOWDER, the correct name for black powder, is made today from

Potassium Nitrate	74.0%
Charcoal	15.6%
Sulfur	10.4%

and has been made from these same three chemicals - not always in the same proportion - since tradition reports that Berthold Schwarz, a monk in Freiburg, Germany, about 1250 A. D., started the "devilish black magic" and taught the Venetians how to use it in an iron barrel in the military art.

THE MANUFACTURE OF BLACK POWDER, even under rigid factory controls and safety precautions, is very dangerous work. You should not, under any circumstances, attempt to make black powder in your laboratory. You can compound a sensitive primer mixture like No. 6, and reload your primers as directed in this book, in safety, compared to an attempt to make black powder. Either making or storing of black powder is fraught with risk and danger.

BLACK POWDER GRAINS are hard and dense, not porous. The sulfur of the mixture seems to act as a colloiding agent, filling all of the pores. Black powder burns from the outside of the grains in. Hence the burning surfaces grow smaller as they burn. The pressure is highest at the ignition point, and decreases rapidly. Black powder burns at the same rate of speed without pressure in the open air as it burns under pressure in confinement. This is exactly the opposite behavior to that of cellulose smokeless powder. Black powder burns with much smoke and black fouling of the barrel bore when ordinary primers are used; it burns with little smoke and less fouling when No. 6 primer mixture is used for ignition.

BC PROPELLANT POWDER - SEMI-SMOKELESS is made from

Potassium Nitrate KNO_3	3 grams	(46.3 grains)
Lead Nitrate $Pb(NO_3)_2$	3 grams	(46.3 grains)
Barium Nitrate $Ba(NO_3)_2$	2 grams	(30.86 grains)
Liquid glue	0.250 grams	(20 drops)
Carbon (Willow Charcoal)	1.250 grams	(19.3 grains)

The quantities specified are for laboratory batches. The Carbon is thoroughly mixed with an equal measured volume of tap water, or well water. To this a dry mixture of all of the other chemicals except the glue, plus an equal volume of water, is added. The whole mixture is thoroughly stirred until all of the chemicals are dissolved and the carbon is completely mixed. Add the liquid glue to the solution - Le Pages is best - and stir in completely.

COOK THE WHOLE SOLUTION in a tinned or iron lid - a lid off a one-half gallon syrup bucket will do, but a small iron skillet, 4" to 6" diameter, is much better – to the required state of dehydration. Boil the mixture slowly over a gas flame, or a flame over which you have absolute control, and stir briskly and constantly until the mixture thickens. Turn your heat lower, as the thick mixture turns gummy, and keep stirring. Turn the heat very low, as low as a gas flame will go, and knead the doughy mixture with a flexible blade knife. Work rapidly, and constantly. Get all of the moisture out of the dough; continue kneading until the dough crumbles into pieces. Keep stirring the pieces and mashing them finer as they get drier. Get all of the water out BUT USE GREAT CAUTION ON THESE FINAL STAGES.

KEEP A GLASS OF WATER NEAR YOUR RIGHT HAND DURING ALL OF THIS PROCESS. IF THE MIX-TURE TAKES FIRE IN ANY SPOT QUENCH QUICKLY WITH WATER. You can likely save most of your batch, but only quenching with water will do it. BC mixture is the most likely to catch fire in final stages of cooking of any of these mixtures. A little experi-ence with laboratory batches will teach you the cooking technique. A fire in your cooking pan or skillet is not particularly dangerous, but usually surprising. The mixture burns rapidly but does not explode - so far as our experience with many, many batches goes.

AFTER COOKING, GRANULATE THE DRIED AND CRUMBLED PIECES mildly, and dump into a sieve (12 by 12 mesh to square inch) and shake sieve over a large bottomed tin pan, dry and clean. Dump back on your lid and granulate what remains in your sieve – not too fine - and repeat over the large drying pan until all of the powder passes the sieve. Place granulated powder, in your large drying pan, in a very warm – about 100°F is right - very dry and well ventilated place for about 48 hours.

RUN THE DRIED AND GRANULATED POWDER into a finer seive (23 x 23 per inch) to remove the very fine dust. Return this dust for the next batch or use to test for dryness. Use the large grain powder to load your rifle cartridge cases. Start with light loads and work up. Start with light bullets.

BC PROPELLANT POWDER is semi-smokeless, ignites with any primer although No. 6 primer mixture gives best results. This powder is low pressure, weight for weight, compared with nitrocellulose powders. It has about the same muzzle flash as nitro-cellulose powders. It burns with comparatively little residue. It generates about the same heat as nitrocellulose powders. It secures higher velocities than black powders, with less pressure, but somewhat lower velocities than nitrocellulose powders. It is not hygroscopic, but should be protected from moisture the same as all propellant powders. It may be made in any climate.

A14 PROPELLANT POWDER – SMOKELESS is made from

Ammonium Nitrate NH_4NO_3	7.5 grams	(115.74 grains)
Potassium Nitrate KNO_3	4.0 grams	(61.73 grains)
Lead Nitrate $Pb(NO_3)_2$	4.0 grams	(61.73 grains)
Hydrocellulose $C_{12}H_{22}O_{11}$	3.4 grams	(52.47 grains)

The quantities specified are laboratory batches. The Hydrocellulose is thoroughly mixed with an equal quantity of RAIN WATER. Tap water will do; soft water is better, if not softened by alkalis. From here on proceed exactly as you did in making BC powder.

COOK THE WHOLE SOLUTION exactly as you did in making BC powder, as directed above.

You will not have much trouble with this mixture taking fire in the final stages of cooking. Nevertheless, keep the glass of water handy. Also, keep the room in which you are cooking ventilated; the slight vapor from the Ammonium Nitrate is supposed to be explosive, although we have never had it happen in much experience. Cook the mixture until very crumbly and DRY.

GRANULATE, SEIVE, and DRY just as above directed for BC.

TO SECURE HYDROCELLULOSE: Into the bottom of a 2-quart glass jar place 300 sheets of NORTHERN TISSUE - about half the roll. Pour over this tissue enough pure comercial MURIATIC ACID to cover the paper and rise an inch above – about 1 1/2 pints. Jar somewhat over half full. Place the glass lid, with rubber scaling ring, on the jar loosely, but so that it will not fall off and so that it will prevent fumes climbing out. Boil the jar slowly for 30 minutes IN A KETTLE OF WATER. Keep jar off the bottom of the kettle by setting jar on pieces of coiled wire. Stir your acid and paper two or three times during the 30 minutes. And keep the lid on the jar, not tightly, but by its own weight to retain the fumes. Set kettle and all off the fire and let cool.

When cool, dump the whole tannish-gray colored thick soup into a cotton sack – a good 10 pound clean sugar sack - and flood and wash the contents of your sack UNDER RUNNING WATER. DO ALL OF THIS DUMPING AND WASHING OUT OF DOORS. The acid will not hurt your hands - remember we are talking of MURIATIC ACID. Don't lose any of your hydrocellulose out of your sack in the washing. Work the sack from the bottom with your left hand, holding the top shut with your right. After washing many times, drop into your sack 3/4 full of hydrocellulose and water, 2 teaspoonful of Bicarbonate of Soda - common baking soda. Shake the sack, and add water, and then wash many times. Wash until you can taste neither soda nor acid. Test with blue litmus paper if you like. If neutral, squeeze out all of the water possible, crumble the hydrocellulose finely, spread out on newspaper in a hot and dry place, clean and ventilated, and let dry 24 hours. It is then ready to weigh and use in powder mixtures.

A4 PROPELLANT POWDER is smokeless, ignites with good primers, does best with No. 6 primer mixture. This powder is lower pressure than nitrocellulose, is much cooler burning than nitrocellulose. A4 is progressive burning; the grains are porous. A4 leaves about the same residue as nitrocellulose powder, and has much less muzzle flash. A4 is hygroscopic - the Ammonium Nitrate will drag in water from the atmosphere and deteriorate the powder. In arid climates this feature is not a defect; and in ordinary climates, with the powder enclosed in cartridges, it is not a defect. It is also possible to coat the grains with vaseline and so avoid the defect in wet climates, but the coat must be very thin. Vaseline also produces complete flashlessness in this powder.

VARIATIONS POSSIBLE IN A4: 1. Substitute Powdered Willow Charcoal for Hydrocellulose and reduce amount to 2.4 grams, instead of 3.4 grams Hydrocellulose.

2. Reduce the Lead Nitrate to 1 gram, Increase Ammonium Nitrate to 8 grams: Flashless, smokeless, cool-burning powder results, but requires care in the making and requires strong primer - No. 6.

No. 7 SMOKELESS, FLASHLESS UNDER LOAD, PROPELLANT POWDER is made from

Potassium Nitrate KNO3	2.1 grams
Ammonium Nitrate NH4NO3	7.14 grams
Willow Charcoal C	2.10 grams
Lead Nitrate Pb(NO3)2	1.720 grams

The quantities specified are laboratory quantity batches.

Mix and cook exactly as specified for BC and A4.

No. 7 is a smokeless powder, flashless under working load, hygroscopic; and retains all of the cool burning, low pressure merits of all Ammonium Nitrate powders, as well as the one hygroscopic disadvantage.

GRAINING: If you can make for yourself a MACARONI MACHINE capable of producing the small, perforated, short tubes, such as are made from the colloided nitrocellulose, you can produce powders from these mixtures and their variations with ballistics equal to nitrocellulose powders, with reduced internal pressures, little or no muzzle flash, and which will burn cooler than nitrocellulose powders. The granulated form given in the formulas above do very well, inasmuch as the grains are porous from the evaporation of the water, and are to considerable extent progressive burning - but they cannot equal the tube-like grains for ballistic efficiency and complete progressive burning.

THE USE OF CHLORATES, AND PARTICULARILY POTASSIUM CHLORATE, IN PROPELLANT POWDERS IS SPECIFICALLY BAD. Chlorates have been tried, in every combination, particularly with sugar, and are always to be regarded as DETONATING EXPLOSIVES. Chlorate Explosives are generally known for their brisance. They are known for their sensitiveness to friction. Chlorates are essential and indispensable in primers: but have no place in propellants whatever.

SOME BALLISTIC RESULTS OF POWDERS:

Rifle: GEW 98, issue, 29½" barrel, 8 m/m. Primer No. 6, 3/4 load. Bench, all point, rest. Issue sights. Distance 115 measured yards.

Using	Dupont FFg Black Powder,	2.140	grams	(33	grains),	170	gr.	bullet,	3'	low
"	BC (Our Formula)	2.140	"	"	"	"	"	"	2'	low
"	Dupont I. M. R. 4320	2.140	"	"	"	"	"	"	2½"	low
"	A3 (Our Formula)	2.140	"	"	"	"	"	"	6½"	low
"	B3 " "	2.140	"	"	"	"	"	"	2'	low
"	Z3 " "	2.140	"	"	"	"	"	"	3½"	low
"	SG " "	2.140	"	"	"	"	"	"	7"	low
"	7 " "	2.140	"	"	"	"	"	"	1"	low

(low means below point of aim; " inches, ' feet.)

Rifle: Enfield, .30-06. Weaver 330 Scope sight. Bench rest, all points. Barrel 26". Distance 115 measured yards. Temperature 20 F. Primer No. 6.

Using	FA 1933 issue ammunition	172	grains	boattail	bullet.		0	on
"	A4 (Our Forumla)	2.7	grams	(41.66 | grains)	150	grain	blt.	12"	low
"	B4 " "	2.7	"	(" | ")	"	"	"	17"	low
"	Dupont II 4320	2.7	"	(" | ")	"	"	"	6"	low
"	Dupont IMR 3031	2.7	"	(" | ")	"	"	"	6"	low

(All primers except the FA issue ammunition were No. 6. All of powders burned with very little smoke - the A4 and B4 "exhaust" being only what appeared to be water vapor in the cold atmosphere. The pressures, as evidenced by the soft primer cups, showed A4 and B4 moderately low, the IMR 3031 very high, and 4320 about normal. (3031 is a very quick powder, not designed for .30-06). All above results are averages from 5-shot strings for each loading, after many shots of preliminary testings in most loads.)

H O W T O L O A D P R I M E R S

"Formulas, Suggestions, Theory for Handloaders and. Experimenters"

M. J. Albert and H. F. Oelberg

Non-technical

YES, you can load your own primers: You can re-load your own fired primers. You can produce primers that are highly dependable, efficient, and adapted to the type of powder you are using.

NO special skill, chemical knowledge, specialized training (beyond that skill and knowledge used in handloading cartridges) is required. If you are able to re-load your own cartridges, you can also re-load your own primers.

CHEMICALS! The book suggests that you purchase these chemicals from your own local druggist or dealer in chemicals. Then you order from your druggist, INSIST THAT HE SEND THE ORDER TO THE JOBBER BY MAIL AT ONCE. Retail merchants have the habit of writing your order on a piece of paper and then sticking that paper on a spindle to wait until a salesman from his jobber comes along. REMEMBER - the salesmen don't travel much nowadays. SO INSIST THAT THE LETTER BE MAILED TO THE JOBBER, AND STAND OVER YOUR DEALER UNTIL THE ORDER IS MAILED. None of the chemicals are expensive; they range from 15¢ to $1.25 per pound. A pound of each will pretty nearly last a lifetime; we advise quarter pounds quantities and you can buy quarter pounds in original packages, too. You will need from four to six chemicals, all common in commercial channels.

TOOLS! For re-loading your own primers, no tools outside of a few that you can make in your own place are required. FOR MAKING NEW ANVILS AND CUPS for primers, Vol. II of this book will give instructions on how to make the dies. You can re-load your fired primers many times.

NO! The process of loading or re-loading primers IS NOT PARTICULARLY DANGEROUS. If you can read simple English type, and are willing to follow directions as given in this book, THERE IS NO MORE DANGER IN RE-LOADING PRIMERS THAN THERE IS IN RE-LOADING CARTRIDGES when commercial primers are used. TRUE, YOU. DEAL WITH SENSITIVE MIXTURES BUT IN VERY LIMITED QUANTITIES. The directions and specifications HAVE ALL BEEN WRITTEN WITH YOU IN MIND. WE ASSUME THAT YOU ARE IN SIMILAR CIRCUMSTANCES TO THE AVERAGE HANDLOADER, not too many tools, not too much time, and not familiar with primer mixtures. WE HAVE WRITTEN THIS BOOK FOR YOU. AND WE HAVE TESTED EVERY DIRECTION in average circumstances. WE HAVE FIRED THOUSANDS OF LOADS PRIMED WITH THESE MIXTURES IN MANY AND VARIOUS TESTS.

YES! You can secure superior ballistics - higher velocities with the same chamber pressures - by matching the primer mixture and amount with the propellant powder load. YES, THESE PRIMER MIXTURES CORRECTLY IGNITE ANY POWDER, AND SOME OF THEM ARE DESIGNED PARTICULARLY FOR SINGLE-BASE, HARD-TO-IGNITE, HIGH-PRESSURE, SMOKELESS POWDER. Chapters V and VI mixtures will ignite heavier loads of high pressure powder than any other primers. This book gives FIVE FORMULAS IN THE BOOK YOU WILL ORDER. Then Chapter V, which is sold separately for 25¢ delivered, gives four more formulas.

TO RE-LOAD rifle primers is a simple operation. Pistol primers are also very easy to re-load. Shotgun primers for paper shot shells are somewhat more difficult to re-load; but not over-difficult. Chapter VII IS DEVOTED EXCLUSIVELY TO THE RE-LOADING OF SHOTSHELL PRIMERS. AND MUZZLE-LOADER CAPS AND PRIMERS ARE EASIEST OF ALL.

P R I M E R S

PACK FIRMLY, TO THE SAME DENSITY, EACH MEASURE FULL OF EACH CHEMICAL, except Aluminum. Merely dip the measure full of Aluminum. This rule applies to all formulas in the book PRIMERS, and in Chapter V.

RESTORE THE SHAPE OF YOUR ANVIL, as well as the shape of the cup. WHEN YOU PUNCHED OUT THE FIRED PRIMER FROM YOUR EMPTY SHELL, YOU DEFORMED THE ANVIL BY MAKING WE POINT HIGHER. RESTORE THE ANVIL BY FLATTENING THE POINT, with a light hammer blow, ABOUT 1/64 to 1/32 of an inch.

SAVE TIME BY NOT SEATING THE ANVIL IN THE CUP, after you load the cup. MERELY DROP THE RESTORED ANVIL INTO THE PRIMER POCKET OF THE SHELL, POINT UP, AND SEAT THE LOADED CUP DOWN OVER THE ANVIL, INTO THE PRIMER POCKET. BE SURE THAT THE PRIMER IS SEATED DEEPLY ENOUGH TO CLEAR THE HEAD OF THE SHELL BY 1/1000", AND NO DEEPER.

TO RESTORE THE CUP: USE A PUNCH THE CORRECT SIZE OF THE INSIDE DIAMETER OF THE CUP - A FLAT-FACED PUNCH WITH SLIGHTLY BEVELED EDGE - AND WHILE THE CUP IS STILL ON THE END OF THE PUNCH, DRIVE THE CUP, AND PUNCH, THROUGH A TAPERED HOLE DIE TO CORRECT THE O.D. OF THE PRIMER CUP. ANNEALED CUPS WORK BEST.

See Page 14, PRIMERS.

USE A 5-HOLE by 4-HOLE LOADING PLATE; HOLES EITHER 1" or 1½" APART IN BOTH DIRECTIONS, AND HOLES THE CORRECT DIAMETER AND DEPTH FOR YOUR PRIMER CUPS. DISCARD OR FILE OFF ANY CUPS TOO TALL FOR THE HOLES IN THE PLATE. See Page 19, PRIMERS. Cups from different manufacturers vary in dimensions and in thickness of the cup metal. Try to use cups all from one manufacturer. Anvils from Western and Winchester can be made to work best with those manufacturers' cups. Flat faced restoring punches, and flat faced primer seating tools work best with all primers.

EITHER DRY OR WET MIXTURES, WHEN PLACED IN THE CUPS UNDER 20 POUNDS PRESSURE, REMAIN FIRMLY IN PLACE AND WILL NOT COME OUT IN HANDLING OR STORING – WITH NO ANVIL IN THE CUP. BE SURE TO CAP EACH LOADED CUP WITH THE PAPER DISC.

S T A B I L I T Y

STABILITY; PRIMERS MADE FROM FORMULAS GIVEN IN CHAPTERS I, III, VI, V A, V C, V D, WILL REMAIN STABLE INDEFINITELY, whether loaded and mixed wet or dry, when handled and stored under conditions used for handling and storing commercial or Frankford Arsenal Primers. PRIMERS MADE FROM FORMULAS GIVEN IN CHAPTERS II, IV, V B, WILL WEAKEN IN TIME if mixed and loaded wet, OR IF MIXED DRY AND THEN EXPOSED TO MOISTURE. None of the formulas will produce primers which will GAIN IN EITHER SENSITIVENESS OR BRISANCE. NONE OF THE MIXTURES PRODUCED FROM THESE FORMULAS WILL CHANGE ITS CHARACTER IN CONTACT WITH ANY METAL -COPPER, BRASS, OR ANY OTHER - BECAUSE OF THE CONTACT WITH METAL.

ALL PRIMERS MADE FROM THE FORMULAS GIVEN IN THE BOOK PRIMERS ARE NON-MERCURIC NON-EROSIVE, AND NON-HYGROSCOPIC. THEY CONTAIN NO MERCURY, NO GROUND GLASS, AND NO CHEMICALS WHICH DRAW MOISTURE FROM THE ATMOSPHERE. AND SOME OF THE FORMULAS GIVEN IN THE BOOK ARE NON-CORROSIVE. ALSO, ALL FORMULAS CONTAIN NO LEAD AZIDE, OR ANY OTHER AZIDE.
ABOVE DIRECTIONS TAKE PRECEDENCE OVER PARALLEL DIRECTIONS IN THE BOOK PRIMERS

March 6, 1945

The Velocity and Pressure results given on the next page were secured by the use of most modern and completely equipped ballistics laboratories. The ballisticians, the gunners, the chronograph operators were all skilled and experienced people, and these tests were conducted with every care known to the science.

The Velocity and Pressure figures given below represent results which we have obtained with the powders and components listed, under the specific conditions prevailing during loading and firing of the ammunition. Many varieties of lots of powders of the same label and number vary more than is ordinarily supposed by many people. BECAUSE OF THE MANY VARIATIONS in the moisture content in smokeless powders, in the relative humidity, barometric pressure, temperature both at the time of loading and at the time of firing, in the sea level elevation, in the headspace and chamber dimensions, and in the bore, bore diameter, groove diameter, and age of the barrel in shots fired through it, in the gun mechanism, pin protrusion, and locking device, in the thickness of the brass cartridge case, in the thickness and temper of the metal in the primer cup and anvil, in the design of the primer anvil, in the grip and crimp of the case to the bullet, in the size and shape, temper of the surface metal of the bullet, in the very manner of simply loading the cartridge into the chamber – BECAUSE OF THESE AND OTHER VARIATIONS WE IN NO WAY GUARANTEE THAT RESULTS OF THESE PRIMERS WILL BE THE SAME WITH ALL COMPONENTS IN ALL GUNS AND UNDER ALL CONDITIONS. We do say that these are the results THAT WE HAVE OBTAINED with these specifications, under conditions prevailing when we loaded and fired the ammunition.

SMOKELESS POWDERS vary greatly in their propellant power per grain of weight. Velocities are lowered by moisture content, sometimes pressures are raised by dryness of the powder. The I. M. R. powders vary .7 of 1% in a range from 20 to 70% relative humidity at "normal temperature." All smokeless powders are more of less affected by atmospheric moisture. And, it appears to us that smokeless powders manufactured and sold to the public within the past two or three years are of lower potential than powders manufactured before 1940. Also, when we put the higher ignition velocity and heat on those powders we do not get the increase in velocity that we do when we increase the ignition on the powders of earlier manufacture. Storage conditions are considered in this estimation. When we put the higher ignition to these later powders WE GET INCREASED PRESSURE, but not a corresponding increase in velocity - AND THIS IS ABOUT WHAT YOU COULD EXPECT FROM BLACK POWDER. We contemplate further experiments BEFORE WE CONCLUDE THAT WE ARE RIGHT IN THIS THEORY ON THE LATE SMOKELESS POWDERS; other factors may be involved.

RESULTS OF TESTS OF .30 CALIBRE AMMUNITION
TO DETERMINE IGNITION EFFICIENCY OF VARIOUS PRIMERS

Velocity and Pressure figures are averages of results from firing
Strings of shots from cartridges loaded to each specification.

POWDER	BULLET	PRIMER	VELOCITY	PRESSURE
I. M. R 4320 Lot 3 - C 50 grains	150 grain Flat base	Commercial		
" "	" "	o B Company	2437	38100
" "	" "	o A Company	2748	39000
" "	" "	o C Company	2703	37200
" "	" "	- F. A. 42, 1916	2705	36800
" "	" "	+ No. 6, 3/4 cup	2815	44700
" "	" "	+ No. 6, 1/2 cup	2806	38400
" "	" "	+ No. 1, 3/4 cup	2821	47000
" "	" "	+ No. 1, 1/2 cup	2712	37700
" "	" "	+ No. 5, B, 3/4 cup	2780	42800
I. M. R. 4350 Lot 7 - C 50.92 grains	" "	+ No. 5, D, 5/8 cup	2424	46490
" "	" "	- F. A. 70	2243	26360
" "	" "	Comcl. D Co.	2393	29480
Army Lot 50.4 grains	" "	+ No. 5, D 5/8 cup	2764	40690
" "	" "	+ No. 5, C 5/8 cup	2763	40040
" "	" "	- F. A. 70	2762	40970
Army Lot 50.2 grains	" "	+ No. 6, 5/8 cup	2813	44270
" "	" "	- F. A. 70, new	2732	39980
I. M. R. 4320 Lot 7 - C 51.54 grains	" "	+ No. 6, 5/8 cup	2653	35840
" "	" "	+ No. 5, C, 5/8 cup	2599	31960
" "	" "	- F. A. 70, new	2602	33120
" "	" "	+ No. 1, 5/8 cup	2608	34650
" "	" "	O Comcl. A Co.	2608	34060
Check Ammunition 51 fired with this lot of IMR 4320 to check barrel and graph.	" "	- F. A. 70, new	2762	40650

From experience with these firings, and with many others of various powders and weights, we recommend Chapter V, Mixture C, for target accuracy, because of its constant uniformity of velocity results. For a fast and hot mixture we recommend Chapter VI for powder hard to ignite. For long and heavy columns of single-base nitrocellulose powder, above 60 grains, in abnormal and suped-up cases only, we recommend Chapter V, Mixture D, and Chapter VI. You may expect parallel results in velocity by using Chapter V, C, and F. A. 70, except that Chapter V, C, is very uniform. However, again we caution, THAT DUE TO THE MANY VARIABLES HERETOFORE MENTIONED WE IN NO WAY STATE THAT THESE RESULTS ARE ABSOLUTE WITH ALL COMPONENTS AND UNDER ALL CONDITIONS. The method, in the very nature of factors involved, is strictly empirical.

- Frankford Arsenal Primers
o Commercial Primers from 4 Companies
+ Reloaded Primers from Formulas in the book PRIMERS

P R I M E R S

If this book has been useful to you and you would like another volume by the same authors, fill in and mail the coupon below.

Volume II will contain chapters on:

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5. Cleaning and care of fired cartridges
6. Proper care of firearms
7. Suggestions on repair
8. Sources of material for the shooter
9. Loading and shooting a muzzle-loader
10. Looking toward the future

- -

To: M. J. Albert
1021 West Twelfth Street
Cedar Falls, Iowa

( ) Enclosed is 25¢ for which send me Chapter V of Volume I of "Primers."

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