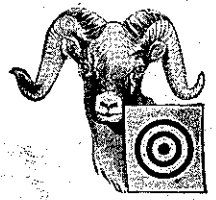


Ideal Hand Book No. 38

PUBLISHED BY

THE LYMAN GUN SIGHT CORPORATION

MIDDLEFIELD, CONNECTICUT, U. S. A.

ESTABLISHED 1878

Manufacturers of

LYMAN METALLIC SIGHTS
LYMAN TELESCOPIC SIGHTS
IDEAL RELOADING TOOLS
CUTTS COMPENSATORS

Ideal HAND BOOK

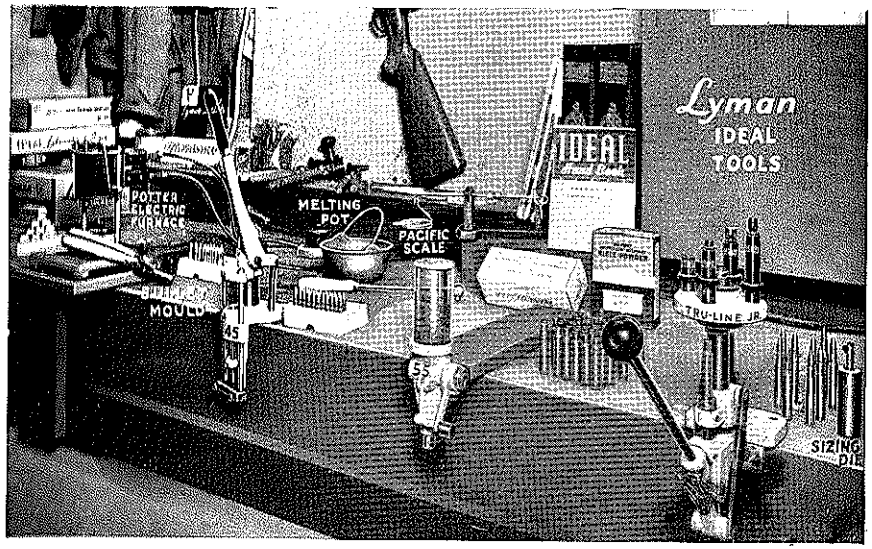
Reloading Ammunition

NUMBER 38

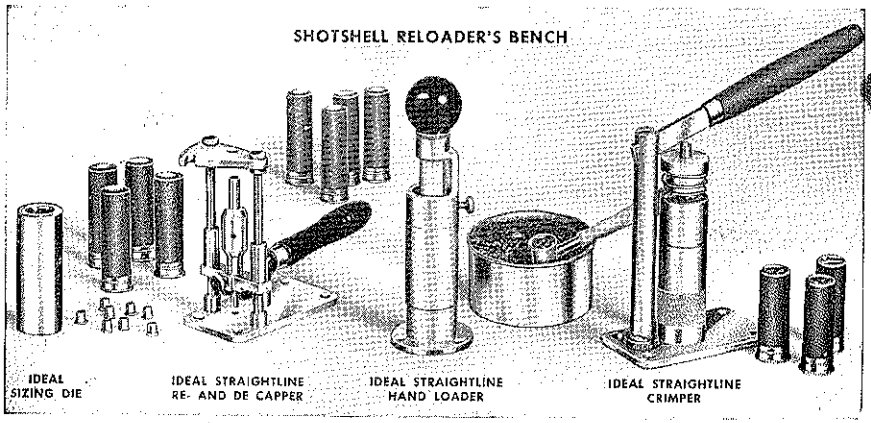
c. 1951 10.00

THE IDEAL HANDBOOK NO. 38

RIFLES, REVOLVERS and PISTOLS



IDEAL HANDLOADER'S BENCH—METALLIC CARTRIDGES



IDEAL HANDLOADER'S BENCH—SHOTSHELLS

Published by
THE LYMAN GUN SIGHT CORPORATION
Middlefield, Conn., U. S. A.

CONTENTS

FOREWORD

THE thirty-seven preceding editions of the IDEAL HAND BOOK have incorporated the gradual changes developed by experience and progress in the art of manufacturing arms and ammunition. The purpose of this second edition of No. 38 is to give the shooter the best and latest information possible to enable him to reload safe and satisfactory ammunition. It does not pretend to limit itself to a discussion of any one or a few particular cartridges but rather to prescribe basic information in a broad sense that may be applied to the reloading of any ammunition.

While the novice will find in Part I and II all that he needs to know in order to reload good ammunition, he will find in Part III a more technical explanation of the subject expressed in the simplest terms.

Once the hand loader has grasped the fundamentals of reloading, he will find the growing science of accuracy, described in Part IV, will fascinate him.

Part V brings an up-to-the-minute picture of Muzzle Loading, the oldest form of hand loading. A new interest in this sport is sweeping the country with amazing results.

For those interested in skeet, trap, or bird hunting, Section VI, Shotshell Reloading, will be of great help.

We are indebted to the many authorities on hand loading who have helped us to compile the data and information in this book. Col. Whelen, Phil Sharpe, Al Barr, Dr. and Mrs. Hirtle, Guy Loverin, Paul Mansfield, and many others have helped us immensely in preparing this 38th edition of the Ideal Hand Book.

Ideal Reloading Tools are produced by skilled workmen many of whom are themselves reloaders and the most modern mechanical equipment is used in their production. They are made for practically all calibers of cartridges and you can purchase them with absolute confidence that properly used they will produce reloaded ammunition for you that is safe and of the finest accuracy. These Tools are described in detail in this book. The complete information and instruction on reloading a cartridge will provide all the information necessary to produce good reloaded ammunition and will acquaint the reader with the desirable characteristics of each tool.

Should you encounter a problem that does not readily yield to your knowledge, we offer our services if you will write to us, assuring you of a prompt and complete reply.

THE LYMAN GUN SIGHT CORPORATION
Middlefield, Conn., U. S. A.

INTRODUCTION

Charles "Red" Norton, ballistics specialist; and Charles E. Lyman III, manager of the Ideal Tool Division, The Lyman Gun Sight Corp.

GENTLEMEN:

In introducing this new edition of the Ideal Hand Book, the preface written by J. W. Barlow for one of the early editions of this book is certainly worth repeating because it is as true in its meaning today as it was thirty years ago.

"The few points of instructions that you will find in this catalogue are intended for our mutual benefit, and we kindly ask you to read them carefully. Our endeavor is to give a few of the principal requirements that must be followed out to insure any degree of success in reloaded ammunition. They are particularly for the benefit of the novice or inexperienced, but it will not hurt some of those who think they know it all, to read and follow. Our efforts to please the Sporting Fraternity in the way of implements for making their own ammunition have been appreciated, and we feel more than gratified at the success attained. The increased demand for our tools is an evidence that the American Sportsmen appreciate a good article, and will have it. We ask you to look the book through carefully, and, if you have any friend who has a set of Ideal tools, ask him about them. Satisfy yourself that they are what you want. Then ask your dealer for them, and if he does not keep them, or will not procure them for you, send us the price direct, and we will get them to you by mail or express. Don't be put off with, "This is just as good," or "We haven't the Ideals, but we have some others." Get the Ideals if you ask for them.

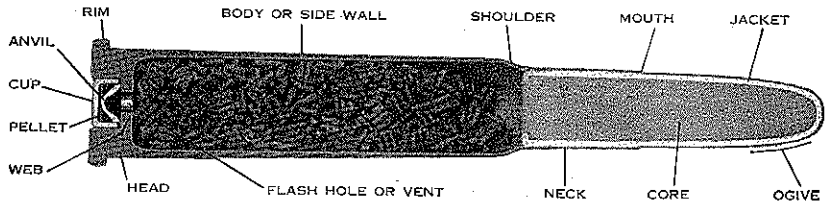
We trust the shooting fraternity will accept what we have to say as a friendly chat with a brother. We know of no body of gentlemen that the word fraternity is applied to more fittingly than the lovers of firearms, whether it be the military gentlemen, the target shooters, or the followers of the mighty Nimrod, the fact that a gentleman is a shooter entitles him to the right hand of fellowship. Recognizing the fact that we can each learn of the other by the exchanging of our experiences, we cordially invite correspondence, and we ask you to remember that there is one place where you can have your ideas carried out, whether you are a crank or not, providing you are willing to pay the fiddler. We like the so-called crank, as we have generally found him a man of experience who has an experimental turn of mind: he is one who appreciates a good job, and is willing to pay for it when it is done. Shooters all, great and small, our business is yours, we depend on you, our desire is to serve you well, and we kindly ask you each and every one into whose hand this little book may fall, to try our goods, try them thoroughly; then speak of them as you find them, and if found worthy recommend them and us to your friends. If after you have read the "Pointers" and complied with all the requirements and instructions the Ideal Implements do not prove satisfactory, correspond with us direct and not with your dealer. Send us a sample of the work done, a shell and a bullet. State plainly the trouble. A letter from us may overcome all your troubles. We guarantee satisfaction".

The above quotation indicates the tradition that has always been associated with Ideal tools.

Cordially,

C. E. LYMAN III

RELOADING AMMUNITION
Rifles, Revolvers and Pistols



Cross section of a cartridge

INTRODUCTION

A CARTRIDGE consists of a brass case which holds a charge of powder, a primer and a bullet. When a cartridge is fired the primer is destroyed, the powder burned and the bullet is propelled out of the barrel. The brass cartridge case that remains represents the most expensive component of all, and ordinarily it is thrown away or, at best, sold to the junk man for a few cents a pound. This case is practically as good as new, and with a few tools and a little time it can be reloaded and made into a cartridge in all respects as good as the original and at small expense.

The Economy of Reloading

	30-06		22 Hornet	
Cost of factory cartridges:		17.50		9.40
Cost of components:				
primers	.80		.80	
powder	.90		.40	
lead and fuel	1.00	2.70	.80	2.00
Savings per 100 cartridges:		14.80		7.40

	38 Spec.		45 Auto.		Shotshells—12 ga.	
Cost of factory cartridges:		6.00		9.00		10.40
Cost of components:						
primers	.80		.80		1.45	
powder	.20		.22		.85	
lead and fuel	.60	1.60	.75	1.77	4.53 (shot & wads)	6.83
Savings per 100:		4.40		7.23		3.57

Accuracy

Reloading will produce ammunition that equals or surpasses the accuracy of most factory ammunition. The manufacturer of ammunition has to make cartridges of a given caliber small enough to enter the chamber of any arm of that caliber freely. There is a considerable variation in the dimensions of chambers in different arms of the same caliber and the rather loose fit of factory cartridges is not conductive to the highest accuracy. When a cartridge is fired in your gun the case is expanded to fit your particular chamber perfectly and by reloading this case properly and selecting or making your bullets to fit your barrel correctly (for there is a variation in barrel dimensions also) you can obtain every bit of accuracy that your rifle is capable of.

Variety of Loads

In addition to accuracy there is the variety of loads to be considered. Factory loaded rifle ammunition is for the most part limited to high power loads and metal jacketed bullets. Such loads are not always adapted for use in settled communities. With Ideal Reloading Tools you can make up light loads with lead alloy bullets for vermin and short range target practice, casting the bullets yourself. Or you can use somewhat heavier loads with a gas-check bullet for deer and similar game and target shooting up to 600 yards. For the latter you may purchase factory jacketed or expanding point bullets and duplicate the factory loads. Even such loads can be made up at a considerable saving. With a wide variety of loads at your finger tips, many of which are not available in factory loaded ammunition, you can adapt your high power rifle to any kind of shooting and with less wear on the barrel.

The Accuracy Life of Your Barrel

Metal jacketed bullets do not of themselves wear a rifle barrel rapidly, but such bullets, in factory ammunition, are loaded with powerful charges of powder that develop high pressures. The burning temperature of the heavy loads is much higher than the melting point of steel, but these temperatures last for so short a period that they do not have time to melt the barrel. They do affect the extreme surface of the barrel and make it possible for the friction of the unburned powder grains and the rushing gas to carry a small amount of steel away with each shot. This is known as erosion and it is erosion that wears out the barrel. If the bullets do not properly fill the grooves in the rifling, the hot gases will squirt past the bullet much like the jets of an acetylene torch, scoring the barrel and causing a condition known as gas cutting.

When lead alloy bullets are used they must be fired with low pressure powders which develop neither the pressure nor the high temperatures of factory ammunition, thus greatly prolonging the life of the barrel. The same applies to the use of metal jacketed bullets with low pressure powders. Even when loading high power ammunition you have an advantage as it is often possible to select powders that do not have the erosive effect of those used in factory ammunition.

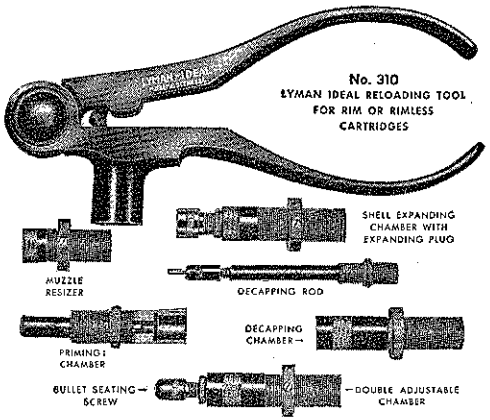
In addition to these material benefits, the reloading of ammunition increases your knowledge of ammunition and firearms as well as the enjoyment you derive from shooting.

Part I

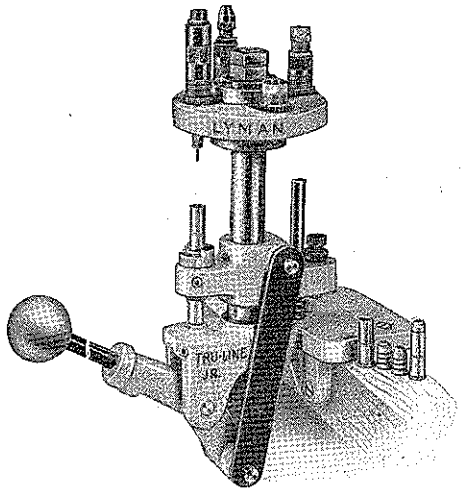
How to Reload a Cartridge

THE No. 310 Tool and Tru-Line Jr. make use of the same dies with the exception that the No. 310 Tool has the priming chamber while the Tru-Line Jr. has the shell holder and priming punch.

For the convenience of describing each operation we shall use the No. 310 Tool.



IDEAL No. 310 TOOL



IDEAL TRU-LINE JUNIOR PRESS

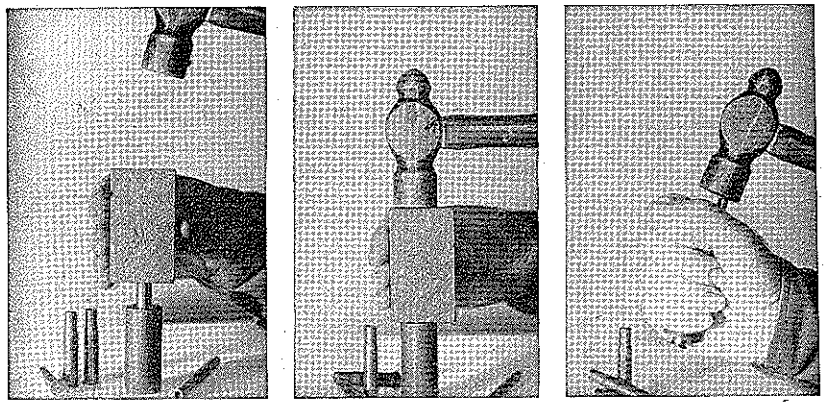
Operation 1. We wish to avoid any possibility of reloading cartridge cases that might stick in the chamber or prevent the proper operation of the revolver so we will try each case in the cylinder to make sure they all enter freely and that the cylinder will rotate properly. (Rifle cases are tried in the chamber by closing the action fully on each one.) If the cases cannot be pushed into the chamber easily with the fingers, discard them or resize them full length with an IDEAL Full Length Sizing Die (cannot be used in 310 Tool or Tru-Line Jr.)

Full Length Resizing

This is done with the Full Length Resizing Die which consists of a steel die of proper shape and a steel punch for driving cases out of the die. To resize cases, first wipe them off with a slightly oily cloth. This will remove any dirt and will leave a thin coat of oil on the cases that will serve as a lubricant. Avoid the use of an excessive amount of oil, especially on bottle-neck cases as the excess oil will be imprisoned between the shoulder of the case and the die causing what is known as an oil dent. Oil dents have no effect upon the shooting of a cartridge but they are unnecessary and make poor looking ammunition.

Insert the case in the die with the fingers. Place a block of hard wood on the head of the case, and with the die supported on a solid surface, strike the block of wood a sharp blow with a hammer or mallet. The blow should be hard enough to drive the case fully into the die. Insert the steel punch into the open end of the die and drive the case out, holding the die in the hand. The die may be rested on a block of wood with a hole in it through which the air can pass, if desired.

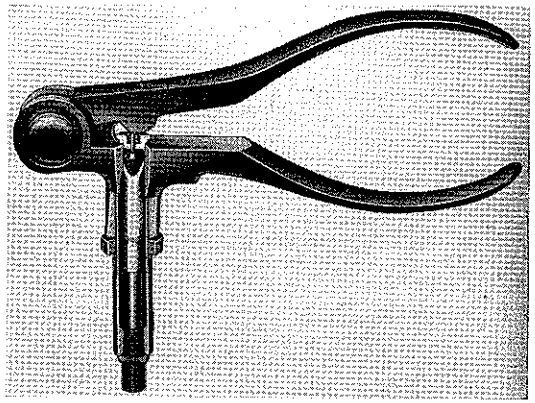
While the above method will work with the majority of cartridges, some of the new cases such as the .220 Swift are made of rather heavy metal and it is very difficult if not impossible to resize them full length unless the resizing die is used in a large vice or an arbor press. As far as the individual reloader is concerned, we



Sequence of operations in resizing a cartridge case full length

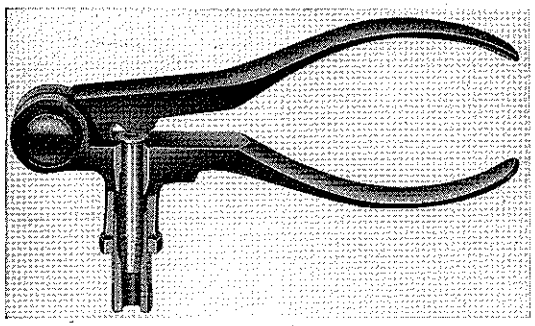
do not recommend the resizing of cartridge cases except when they will not enter the chamber without using force. If you pick up cartridge cases that have been fired in guns other than the one you intend to reload them for, you will probably have to resize some of them full-length. Better accuracy can be obtained with cases that are resized at the neck only.

Operation 2. To decap, screw the decapping chamber into the threaded portion of the tool handles and screw the decapping rod in until the decapping pin protrudes slightly above the opening in the handles. The case may now be put muzzle down into the decapping chamber, making sure that the decapping pin enters the flash hole in the cartridge. Closing the handles will expel the primer.



DECAPPING

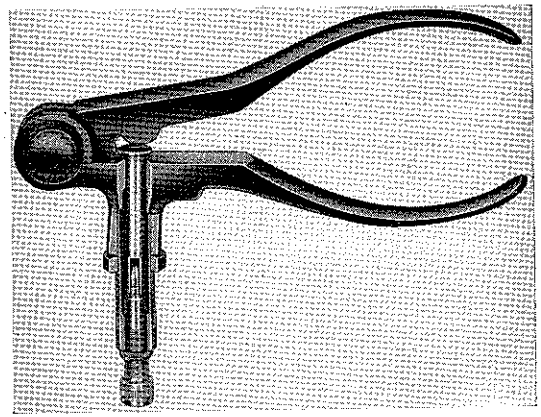
Operation 3. Due to the variations in the amount of expansion of cartridge cases fired in different chambers as well as differences in the thickness of the brass, it is impractical to reduce the inside diameter of the mouth or neck to a uniform dimension by constricting the outside of the case. The outside must be reduced slightly more than is necessary in most cases and the inside expanded to the proper size by forcing the case over a plug of the proper dimension. **The neck of case need only be resized to the depth that the bullet will be seated.** To do this, screw an Ideal Muzzle Resizer into the tool handle just far enough so that the neck of the case will be forced into the die the desired distance. The neck should be wiped off with a slightly oily cloth before resizing it. This lubrication makes the work easier and prolongs the life of the Muzzle Resizer.



MUZZLE RESIZING

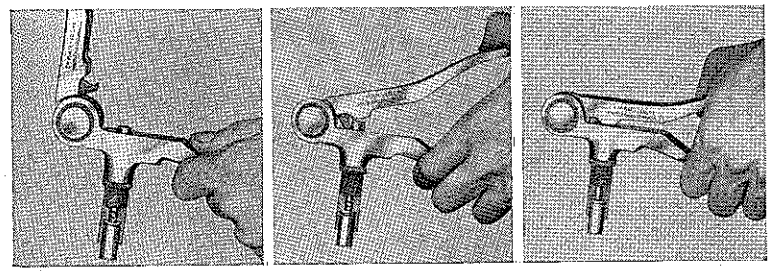
Operation 4. After the neck of the case is reduced, it will be found too small for a bullet to enter. It must be opened up to a uniform and correct diameter. To do this the Shell Expanding Chamber is screwed into the tool in place of the Muzzle Resizer. This chamber carries a plug with steps. The first step is .001 smaller than the diameter of the bullet, while the second step is .001 larger. The plug should be adjusted so that the case will run up part way onto the second step. This will allow the bullet to be started by hand and then to be seated friction tight.

Some slight lubrication of the plug is desirable for the same reasons given for the Muzzle Resizer and as it is inconvenient to remove the expanding plug in order to wipe it off with an oily cloth, a small camels hair brush should be kept at hand for applying a small amount of oil to the plug as occasion requires. Another satisfactory method is to occasionally press the mouth of a case against a small pad of soft cloth well saturated with oil. This will leave a deposit of oil around the extreme inside edge of the case which will be deposited on the expanding plug.



NECK EXPANDING

Operation 5. The seating of new primers is very simple. Screw the priming chamber into the threaded shank to the proper depth, insert cartridge in the shell holder portion of this chamber, place primer in recess between priming punch and head of the case, press handles together until primer is properly seated. Primers should go clear to the bottom of the pocket but should not be forced as this might break down the priming mixture inside the primers.



Sequence of operations in seating a new primer with 310 Ideal Tool

Ideal Primer Pocket Reamer

After Frankford Arsenal cases have been decapped, the Ideal Primer Pocket Reamer is a handy tool to use in removing the burr.

Table of Primers

MAKE	KIND	Large Rifle No. Dia.	Small Rifle No. Dia.	Large Pistol No. Dia.	Small Pistol No. Dia.
Remington	N.C. — N.M.	9½ .210	6½ .175	2½ .210	1½ .175
Peters	N.C. — N.M.	12 .210	65 .175	20-X .210	15 .175
Winchester	N.C. — N.M.	120 .210	116 .175	111 .210	108 .175
	Chlorate	35 .210			
United States	United States primers are identical with, and have the same numbers as Winchester primers.				
Western	N.C. — N.M.	8½ .210 8½G .210	6½ .175	7 .210	1½ .175 1½B (for black powder only.)
Frankford Arsenal	Chlorate	26 Cal. 30 .210		26 Cal. .45 .204	

Remarks:

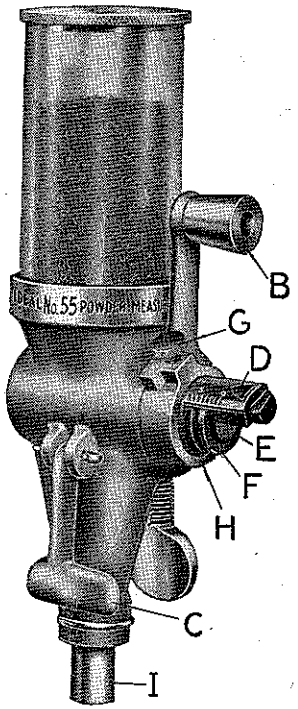
N.C.—N.M. Indicates Non-Corrosive, Non-Mercuric.
The Chlorate primers listed are non-mercuric but not non-corrosive.
The Frankford Arsenal No. 70, Cal. .45 primer is a special size for .45 Automatic cases made at Frankford Arsenal.

Measuring Powder

To load smokeless powder charges you will need an Ideal No. 55 Powder Measure or a sensitive scale. The Ideal Powder Measure will throw charges very accurately and can be adjusted for any charge of any kind of powder by means of its graduated slides (except for maximum loads) (See Pages 11, 16).

Note. Charge Cup should not be used for measuring smokeless powder.

Operation 6. Measuring Powder. The No. 55 Powder Measure has three slides for adjusting the powder charge cavity. These are held in place by the set screw "G". The top or "D" slide is graduated on both edges. The coarse graduations at the front apply to this slide when used alone while those at the rear apply to the "D" and "E" slides when used together. The "F" slide is graduated on the under side. The graduations are for grains weight of black powder but should be regarded as reference points only when setting the measure for smokeless powder. To set the measure refer to the table on page 16 and you will find that each kind of smokeless powder is given a number in order to economize space in the headings of the columns. Select the column headed by the number applying to the kind of smokeless powder you are going to use and from this column select the charge you want. When you locate the correct charge read straight across to the left hand column which will give you the graduation at which you should set the measure in order to have it throw the correct charge.



IDEAL No. 55 Universal Powder Measure

Always have the measure clean and free from any loose powder grains before attempting to set it. If, when empty, the slides cannot be pushed in so that they will all register zero it is due to dirt or powder grains. Remove and clean slides, also cavity. The zero line should be even with the right hand edge of the brass sleeve and all settings of the measure should be made with reference to this point.

When the charge desired is within the limit of capacity of the "D" slide alone, turn the half-head screw so the flat side is up. Draw the "D" slide out until the proper graduation is opposite the outer edge of the brass tube. The other slides should be held in with the finger while this is being done for if they move out the least bit the setting of the measure will not be correct.

To adjust "D" and "E" slides together, turn in the half-head screw all the way and draw the "D" and "E" slides out together while holding the "F" slide in place. Remember that the graduations at the front edge of the "D" slide apply to this slide alone and those at the rear to the "D" and "E" slides when used together.

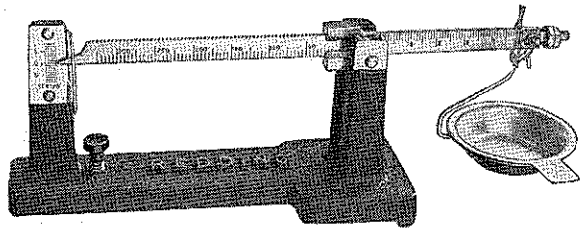
To adjust the "D", "E" and "F" slides together be careful that the inside edges of all the slides are even with one another. Set the "D", "E" and "F" slides by the scale on the bottom of the "F" slide. ALWAYS BE SURE TO TIGHTEN THE SET SCREW "G" AFTER ADJUSTING THE SLIDES. Graduations should be set flush with the edge of the brass sleeve.

When the charge is adjusted, turn the handle "B" down and fill the measure with powder. Flip the knocker "C" several times to settle the powder in the res-

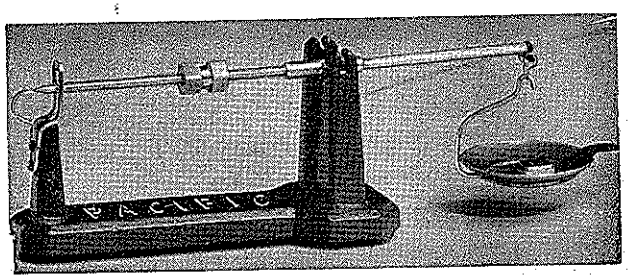
ervoir. Place a cartridge case in contact with the drop tube, raise the handle "B" against its stop without jarring the measure unnecessarily and return it to its downward position. Flip the knocker "C" so that all the charge will be jarred down into the case.

Smokeless powder charges rarely fill the cartridge case. By mistake it is sometimes possible to put in two charges without filling the case. Such an error would be very dangerous. The reloader should be methodical about his loading. Take the empty cases from one side, charge them, and put them down on the other side of the measure. It is good practice to always invert each case before charging it. This habit will prevent any possibility of getting two charges in a cartridge.

SCALES



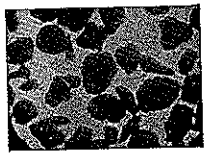
The Redding Scale



The Pacific Scale

POWDERS

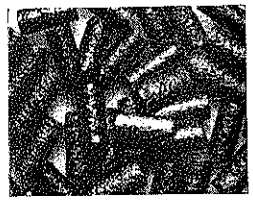
The letter preceding the description of each powder refers to the column headings on the powder measure chart of settings, page 16.



A. DuPont Smokeless Shotgun and Hercules E.C. (Pictured).

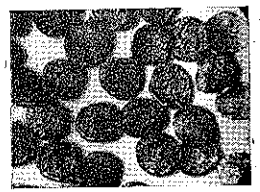
B. Hercules Unique. Here is an excellent and very flexible powder for reduced and midrange loads in a variety of calibers. It was intended for full charge loads in small capacity rifle cartridges, but may also be used in some of the larger revolver loadings.

C. Hercules Bullseye. This is the oldest smokeless pistol powder on the market. It is rapid burning and in such cartridges as the .25 auto pistol, will burn completely in a 2" barrel. It is the most economical powder to use since very light charges are required to develop full normal velocity. For this reason it must be measured or weighed with extreme care. It should never be used in rifle cases.

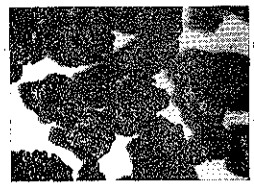


D. Hercules Hi-Vel No. 2. This powder was one of the first produced by the Hercules Powder Company, back in 1913, and while it has been slightly improved throughout the years, there have been no major changes in its composition, grain size or burning characteristics. It is intended for use in medium and large capacity cases, and has extreme flexibility covering a variety of bullet weights and from medium to full charge loadings. Its accuracy performance has long been accepted, and millions of match cartridges have been loaded with this.

E. Hercules 2400. This old favorite is a fine grained powder intended for small capacity cases such as the .22 Hornet. It develops full charge velocities with fine accuracy. It may also be used as a midrange or reduced charge powder in larger capacity cases, but because of its rapid burning characteristics, it must be used with care. While designed for use with jacketed bullets, it performs well with medium loadings with both plain base and gas check bullets. It is also used in some pistol and revolver cartridges, but Hercules warns against this. Pressures developed are too high for the average handgun.

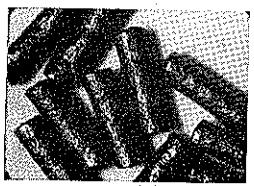


F. DuPont 5066. This is the newest powder in the DuPont line. Despite the excellence of Pistol No. 6, many handloaders preferred the older No. 5 and demanded its return. DuPont responded with an improved version of No. 5 with this new designation. It cannot be loaded charge-for-charge with its older version, and little is known about it other than that it is a fine performer for standard velocity loadings.



G. DuPont Pistol Powder No. 6. This powder generally requires smaller charges than No. 5 and burns cleaner. Its accuracy is well established.

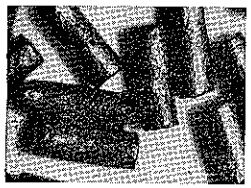
H. DuPont 4227. This is the fastest burning of the IMR line and was developed to replace IMR 1204. It has the **smallest granulation of the series. While it is intended** for small capacity rifle cases such as the .22 Hornet, 25/20 and others, it may be used as a reduced charge in some of the larger cases. It is not the same as 1204, and loading data for the latter should not be used with it. Designed for use with jacketed bullets, in some barrels it works well with medium velocity gas check bullets.



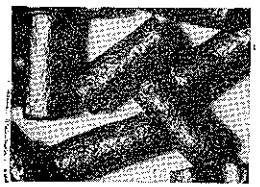
I. DuPont 4198. This powder is similar to 3031 in appearance, but is faster burning. In given calibers in the medium power cartridges, it works best with the lighter jacketed bullets. At maximum charges, pressures developed are high.

J. DuPont 3031. This powder was one of the first of the new IMR series of powders and is perhaps the most flexible. It has a wide loading range through the medium power and military types of cartridges, and in a variety of calibers from the .220 Swift through the .348 Winchester. **It replaces the old IMR 17½. It is medium burning and** lends itself to good performance with both light and heavy bullets.

K. DuPont 4320. This is a small grained powder similar to the early IMR 18 and its successor, IMR 1147. It performs best in such cartridges as the .22 Savage Hi-power, the .250 Savage, .25/35, etc., but with light bullets is also excellent in other calibers such as the .30/06. Slower burning than 4064, it is not quite as flexible in loading.



L. DuPont 4064. This powder burns more slowly than 3031 and works best in large capacity cases of the "military" type and larger. It may be used with heavy bullets in medium capacity cases, but does not burn properly in small cases such as the .22 Hornet. It is very flexible in loading and gives fine accuracy.



M. DuPont 4350. This is the newest and slowest burning of the DuPont line. It appears to have great flexibility, but is intended for heavy bullets in large capacity cases. It has been found to perform equally well with light bullets. In many large cases, this powder gives the most accurate shooting load.

N. DuPont 4759. DuPont classifies this as an "SR" powder—Sporting Rifle. It was designed to replace the old bulk S. R. No. 80. It does not work well in pistols and revolvers with their short barrels, and is intended for reduced and midrange loads in rifle cartridges, only. No. 4759 develops slightly higher velocities with lower pressure than No. 80, and leaves practically no deposit in the bore. This large-grained tubular powder was developed in 1941. Care should be taken in measuring it because of the grain size.

See Powder Measure Chart of Settings, Page 16.

Operation 7. We are now ready to seat the bullet and crimp it in place. A loaded cartridge should be placed in the Double Adjustable Chamber and the tool handles closed. Back off the bullet seating screw and screw in the body of the chamber so that the crimping shoulder bears hard against the crimped edge of the cartridge. Lock it in place with the lock nut and screw in the bullet seating screw to contact with the bullet. Lock it also.

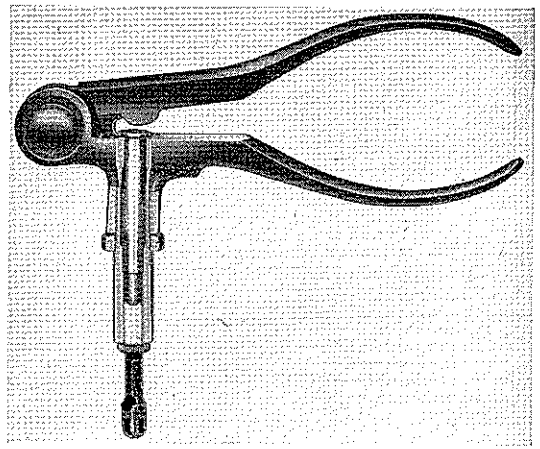
Insert a bullet in a case charged with powder and with the Double Adjustable chamber pointing upward, insert the cartridge into the chamber and close the handles with a firm steady pressure. You should be able to feel the cartridge crimp. Open the handles and you will have a cartridge ready to fire. You may find that some slight additional adjustment of the crimp or depth of seating of the bullet is necessary but by this time you will have learned how to make these.

Care is necessary at this point for if the bullet is shaved or deformed in seating, the accuracy of the cartridge will be destroyed. If the cases have not been resized in any way, the bullets will enter easily, provided the mouths of the cases have been properly opened up. It may be necessary to hold the tool in a horizontal position to prevent the bullet from dropping too deeply into the case before it is crimped.

On the other hand, if the case has been resized full length or with a muzzle resizer and expanded with a shell expanding chamber, the mouth will be too small for the bullet to enter easily. If the base of the bullet is pressed against the mouth of the case and at the same time given a slight twist, it will stick in place and the seating can be completed as described.

Metal jacketed bullets may be dropped into the double adjustable chamber and the tool held at an angle that will permit the case to be inserted without spilling any of the powder. When the mouth of the case is against the base of the bullet, give the case a slight twist to center the bullet and complete the seating by closing the handles. **Boat-tail bullets are easy to seat as the boat-tail guides the case onto the bullet.**

The crimp should be rather heavy as loading in this way you are dependent on the crimp to hold the bullet in place. This method of loading will give satisfactory results but many shooters object to having the bullets so loose that they can be turned around with the fingers. We agree that it is more satisfactory to have the bullets tight in the case which requires the use of the IDEAL Muzzle Resizer and IDEAL Shell expanding Chamber.



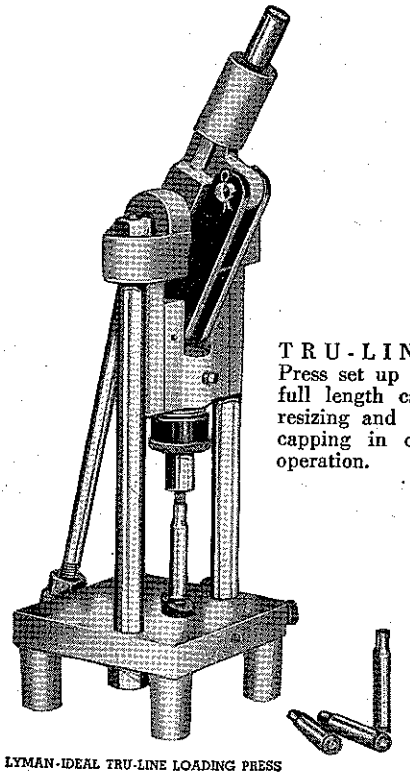
BULLET SEATING

TABLES FOR SETTING IDEAL POWDER MEASURES

These tables do not compare the relative strength of Black and Smokeless Powders. The figures in the first column are the graduations on the Ideal Powder Measure, which are for Grains, Bulk or Weight, of black powder only. The other columns are the weights of certain smokeless powders (pgs. 13-15) which will be thrown by the Ideal Powder Measure when its graduated scales are set as in column 1 on the same line

	No. 1	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	Grains	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.
D. SLIDE	2 equals			1.1		2.0		.9							
	3 "			1.6		3.0		1.4							
	4 "			2.2		4.0		2.0							
	5 "	2.0	2.8	2.7		5.0	2.6	2.6							3.0
	6 "	2.5	3.3	3.3		6.0	3.1	3.2							3.4
	7 "	3.0	3.9	3.8		7.0	3.7	3.8							3.8
	8 "	3.0	4.4	4.4		8.0	4.2	4.3							4.5
	9 "	3.5	4.9	4.9		9.0	4.7	4.9							5.0
	10 "	4.0	5.5	5.5		10.0	5.3	5.5							5.5
	11 "	4.5	6.0	6.0		11.0	5.8	6.1							6.1
	12 "	5.0	6.6	6.6		12.0	6.4	6.7							6.5
	13 "	5.0	7.2	7.1		13.0	7.0	7.3							6.9
	14 "	5.5	7.7	7.7		14.0	7.5	7.9							7.3
	15 "	6.0	8.3	8.2		15.0	8.1	8.4							8.0
D. E. SLIDES	10 "	4.0	5.6		8.1	9.3	4.7	4.5	7.0						6.1
	12 "	5.0	6.8		9.8	11.2	6.0	5.7	9.0						7.3
	14 "	5.5	8.0		11.6	13.0	7.2	6.8	11.0						8.6
	16 "	6.5	9.2		13.2	14.9	8.3	7.9	13.0	12.0					10.0
	18 "	7.5	10.3		14.8	16.8	9.4	8.9	15.0	14.0					11.1
	20 "	8.5	11.5		16.5	18.7	10.4	9.9	17.0	16.0	16.0	18.0	16.0	17.2	12.2
	22 "	9.0	12.6		18.3	20.6	11.5		19.0	17.0	18.0	20.0	18.0	18.8	13.4
	24 "	10.0	13.8		19.9	22.5	12.7		21.0	19.0	20.0	22.0	20.0	20.9	14.6
	26 "	11.0	15.0		21.6	24.4	13.8		23.0	21.0	22.0	24.0	22.0	22.9	15.8
	28 "	12.0	16.2		23.4	26.2	15.1		25.0	22.0	23.0	26.0	24.0	24.7	17.0
	30 "	12.5	17.4		24.9	28.1	16.2		27.0	24.0	25.0	28.0	25.0	26.3	18.6
	32 "	13.5	18.6		26.9	30.0	17.3		29.0	26.0	27.0	29.0	27.0	28.2	19.8
	34 "	14.5	19.8		28.4	31.9	18.1		31.0	28.0	29.0	31.0	29.0	30.1	21.0
	36 "	15.5	21.0		30.0		19.2		33.0	30.0	31.0	33.0	31.0	32.0	22.2
	38 "	16.0	22.2		31.8		20.3		35.0	31.0	33.0	35.0	33.0	33.9	23.4
	40 "	17.0	23.4		33.6		21.4		37.0	33.0	35.0	37.0	34.0	35.5	24.6
	42 "	18.0	24.6		35.2		22.5			35.0	36.0	39.0	36.0	37.1	25.8
	44 "	19.0	25.8		36.9		23.6			37.0	38.0	41.0	38.0	38.7	27.0
	46 "	19.5	27.0		38.7		24.7			38.0	40.0	43.0	40.0	40.3	28.2
	48 "	20.5	28.2		40.3		25.8			40.0	42.0	45.0	41.0	41.9	29.4
	50 "	21.5	29.4		42.0		26.9			42.0	44.0	47.0	43.0	43.6	30.9
D. E. F. SLIDES	40 "	17.0	24.0		34.0				33.0	35.0	36.0	38.0	37.0	35.0	24.5
	45 "	19.5	26.7		38.5				37.0	40.0	40.0	43.0	41.0	39.2	26.5
	50 "	21.5	29.4		42.5				40.5	44.0	44.0	48.0	46.0	43.5	30.4
	55 "	23.5	32.2		47.0				44.5	48.0	49.0	52.0	50.0	47.9	34.3
	60 "	25.5	35.0		51.5				48.5	53.0	53.0	57.0	55.0	52.3	37.2
	65 "	27.5	38.0		55.5				52.5	57.0	58.0	61.0	59.0	57.1	40.6
	70 "	29.5	41.0		60.0				56.0	61.0	62.0	66.0	64.0	62.5	43.8
	75 "	31.5	44.0		64.5				60.1	65.0	66.0	71.0	68.0	65.9	
	80 "	33.5	47.0		68.7				63.5	69.0	71.0		72.0	69.4	
	85 "	36.0	50.0		73.0				67.5	73.0			76.0		
	90 "	38.0	52.7		77.5				71.5	77.0			81.0		
	95 "	40.0	55.6		81.8				75.5				85.0		
	100 "	42.0	58.5		86.0				79.0				89.0		

SENIOR TRU-LINE RELOADING PRESS



LYMAN-IDEAL TRU-LINE LOADING PRESS

TRU-LINE Press set up for full length case resizing and de-capping in one operation.

For Large Scale, Heavy-Duty Reloading

The Tru-line Reloading Press uses entirely different dies than other Ideal Tools. Among these special dies is the full length resizing die.

COMPLETE DESCRIPTIVE LITERATURE AND OPERATIONAL SHEET ON REQUEST.

Casting Bullets

The materials for casting bullets are limited to an IDEAL Bullet Mould, an IDEAL Dipper, a melting pot that will hold between five and ten pounds of metal, such as the IDEAL Melting Pot, some bullet metal and a small amount of beeswax, tallow or salammoniac for fluxing the metal.

There are now several electric furnaces on the market which are very convenient for home use as they may be plugged into any electric outlet. When these are used the dipper is not necessary.

Pure lead is not suitable for bullets. A small amount of tin must be added to prevent a deposit of lead in the barrel of the firearm and to harden the metal. A mixture of 1 part tin to 30 parts lead will be hard enough for revolver bullets and bullets for use in rifles with charges of black powder. A mixture of 1 part tin, 15 parts lead will make a suitable mixture for all-around use. For gas check bullets that are to be given at the maximum velocities permissible for such bullets, the best mixture is an alloy of 1 part tin to 10 parts lead. It should be understood that it is not necessary to adhere rigidly to these alloys as they can be varied to meet circumstances. For those who wish to purchase their bullet metal already mixed we can supply several alloys of different degrees of hardness. These are supplied on pigs or blocks of about 3 pounds each. (Page 24).

Either the Gas Range, Bunsen Burner or one of the several types of electric furnaces makes a very convenient source of heat for casting bullets as the temperature of the metal is easily controlled. However, millions of excellent bullets have been cast over coal fires and the kitchen coal range will serve nicely. You will probably need an IDEAL Lead Pot Holder which can be substituted for one of the stove lids, the lead pot fitting down into a hole in the center.

Place a folded blanket on a table near the stove so the bullets may be dropped onto it from the mould. If it is a good blanket, cover it with a piece of cloth as sometimes the bullets are hot enough to scorch slightly. Bullets should never be dropped on a hard surface nor allowed to hit against each other because the sharp bases may be nicked enough to affect their accuracy.

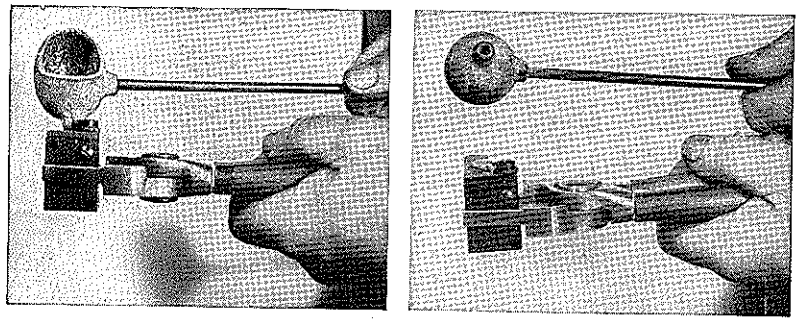
You will also need a fairly substantial stick of wood for striking the Sprue Cutter of the mould and it will be convenient to have an old box at hand preferably of tin, in which to put the dross that is skimmed from the metal.

When you have your materials arranged, heat the lead until all melted. Then add the tin which will melt at once. Now add a piece of beeswax or tallow about half the size of a walnut and stir the metal well. A half teaspoonful of salammoniac will serve as well. The smoke from either of the greases can be ignited with a match, if it doesn't ignite itself, or the lead pot may be taken to a door or window when it is fluxed. This fluxing mixes the metals in the alloy together and causes any impurities to rise to the surface where they can be skimmed off leaving the metal bright and clean. Never skim the metal without first fluxing it.

Pouring Metal

With the ladle about half full of metal, place the spout against the pouring hole in the mould in a horizontal position and turn the mould and ladle together to a vertical position, allowing the cavity to fill. Remove the ladle leaving some metal in the sprue hole, and with a stick of wood, cut off the sprue by striking the projection on the sprue cutter sharply. Open the mould and let the bullet fall on the folded blanket or other pad. If the bullet does not drop from the mould of its own accord tap it with a stick of wood to jar the bullet out. Never strike any part of the mould with a hammer or any hard metal object.

Your first bullets will probably be mis-shapen affairs full of wrinkles, due to the mould being too cold and to the presence of oil in the mould but continue your casting and you will be rewarded with perfect bullets when the mould reaches the proper temperature. If the bullets are bright and shiny but do not fill out in the corners, it is probably due to the mould, the metal, or both being too cool.



Pour bullet metal with the ladle in contact with the mould. Leave molten metal in sprue hole.

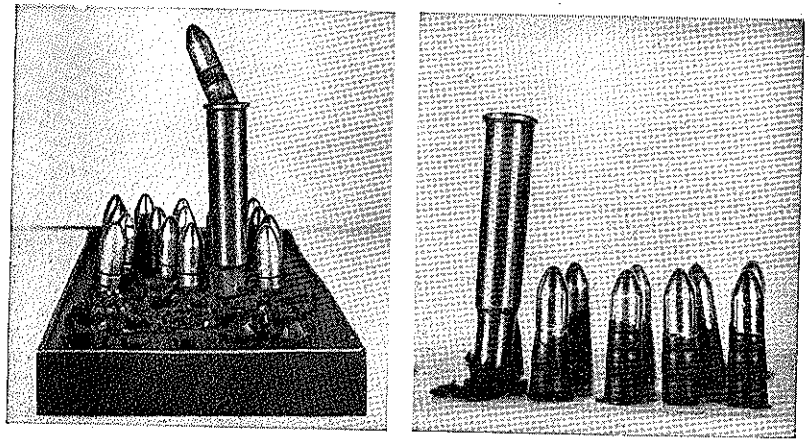
On the other hand, if the bullets have a frosted appearance it is an indication that the mould and metal are too hot. This frosted appearance in no way affects the usefulness of the bullet. Inspect your bullets and melt over again those with imperfections. When they are cool, pack them base down in small cardboard boxes so the bases will not be damaged. Do not throw them loosely into a box.

Lubricating and Sizing Bullets

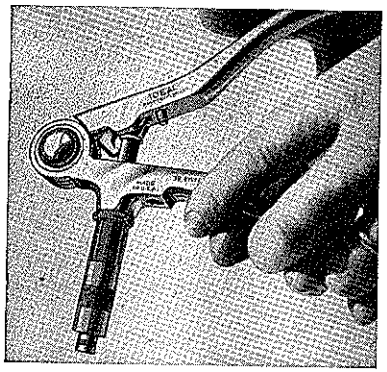
Bullet moulds usually cast bullets slightly larger than their finished size so that they can be forced through a die of the right diameter to true them up and remove any slight inequalities. A Bullet Sizing Chamber may be used with the Number 310 Tool, or Tru-Line Jr. Press. The Bullet Sizing Chamber consists of a die of proper diameter and a punch for forcing the bullet through the die. This punch has the end formed to fit the standard bullet for each caliber and the bullets are forced through the die base first. This is the only correct way to size bullets as sizing them point first usually results in some deformation of the base.

Before the bullets are sized they should have their grooves filled with grease. For this you will need an IDEAL Kake Kutter and some IDEAL Lubricant. Stand a number of bullets on their bases in a pan or shallow box that will not leak. Pour melted lubricant around the bullets so that it is deep enough to cover all the grooves. Allow the grease to cool which will leave the bullets embedded in a matrix of lubricant. The Kake Kutter is used to cut the bullets out of the grease, each bullet pushing the preceding one up through the Kake Kutter. If you have a cartridge case of suitable inside diameter you can make your own Kake Kutter by boring out the head of the case.

This method is time honored but there is another way to lubricate bullets that is in our opinion quicker and cleaner. **See page 21.** Melt the lubricant in a container of such depth that the bullets can conveniently be dipped in it with the fingers. Dip the bullets, one at a time, into the melted lubricant to a depth that will cover the grooves and stand them on their bases on a board or sheet of paper. The lubricant will coagulate around the cold bullet, and when thoroughly set, the excess lubricant may be cut off with the Kake Kutter. Some bullets such as 308403, have bands of different diameters and are intended to be used as cast. Such bullets must be lubricated by the above or some less desirable method. If the bullets are held in the hot lubricant a few seconds, they will become slightly heated and much of the excess lubricant will run off. If they are allowed to get too warm, the lubricant will run out of the grooves. The accompanying illustration will show this method of lubricating bullets. The coating of lubricant on the bullets in the picture is unnecessarily heavy



Two methods of using the Kake Kutter



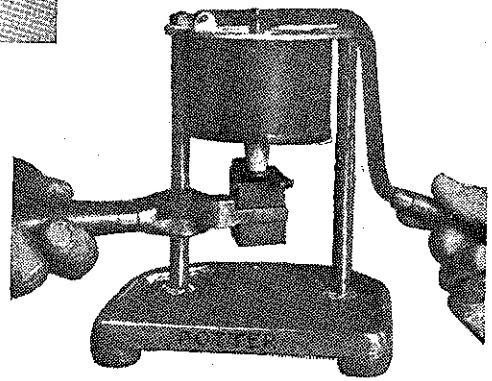
Force the bullet through the sizing chamber base first

and was purposely made that way to illustrate the method.

After the bullets are lubricated, screw a Bullet Sizing Chamber into the tool. Drop a bullet into the chamber, base first. Insert the punch on top of it and close the handles, forcing the bullet through the die. This will size it to the correct diameter and at the same time will pack the grease into the grooves. Some reloaders prefer to use the Bullet Sizing Chamber by itself, driving the bullets through by tapping the end of the punch with a stick.

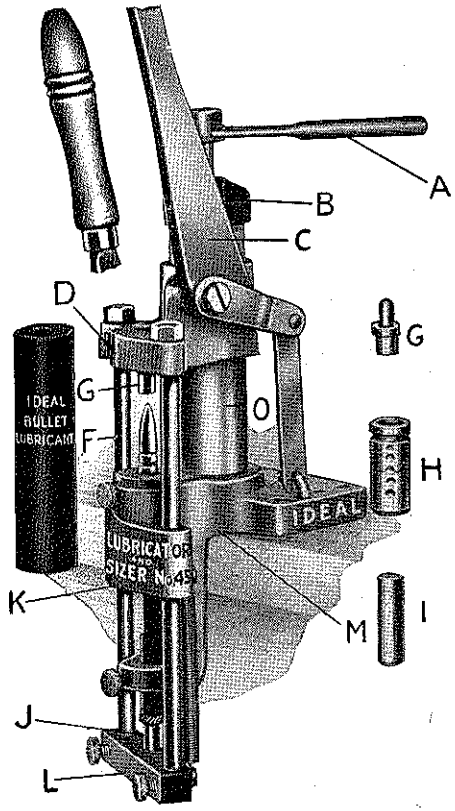
Electric Furnace

The Type "C", Potter Improved Electric Melting Furnace is a self-contained unit which may be plugged in to any electric outlet. It draws approximately 375 watts and the cost will seldom exceed 2¢ per hour. The furnace holds appx. 2½ lbs. of bullet metal used with any single or double cavity mould. 300 to 400 bullets per hour possible.



Model "C" is for single bullet moulds. Model "D" is for gang types of moulds. Model "C" draws approx. 350 watts. Model "D" at full capacity draws approx. 700 watts.

Ideal Lubricator and Sizer No. 45



IDEAL Lubricator and Sizer No. 45 will lubricate and size the bullet and affix the metal gas check cup at the same time, doing the job rapidly, accurately, neatly.

It does the work **easily** and **cleanly** without soiling the hands.

It requires only **one die** to lubricate all lengths of bullets of the same diameter, whether the grooves are narrow or wide.

The leverage is powerful, so that the work is done easily.

It leaves the bullet perfectly **true and clean.**

With one stick of our lubricant it greases 500 of the large and 2,500 of the small bullets.

The **"Ideal Bullet Lubricant"** is a scientific compound prepared in accordance with our special formula. It has been tested by us, for heat and cold. It will not melt in the warmest weather, or crack in the coldest. It is a perfect lubricant that prevents the leading of the barrel. Ideal can supply two types of lubricant—Regular Stick, Special Stick (graphite) for conditions where barrel leading is a problem.

The inside punch must have the end concaved when sizing bullets with metal gas check cups.

In using the No. 45 Ideal Lubricator and Sizer, a very considerable pressure is exerted on the grease column when the handle "A" is rotated. It is, therefore, necessary to maintain a downward pressure on the lever "C" while lubricating the bullet as otherwise grease may be forced in between the base of the bullet and the Inside Punch "I".

The alignment of this type of machine is checked very carefully in the factory with special gauges. Sometimes bullets, when sized, will have more metal taken off one side than the other. This is due to slight irregularities in the bullet itself and is for the purpose of removing inequalities that cast bullets are made slightly over-size and subsequently trued up to the correct diameter.

The No. 45 Lubricator and Sizer employs the same type of sizing dies used in the No. 1 Lubricator and Sizer, enabling the owners of the older sets of dies to use them in the No. 45 Tool. Increased leverage makes possible easier operation on large bullets while large guide rods and a steel grease tube preserve the alignment of the tool.

When the pressure nut is screwed to the bottom, do not force it further or it will jam. This would necessitate returning it to the factory for servicing.

BULLETS

Lead alone is not suitable for making bullets. For one reason it is too soft to resist the thrust against the rifling properly. Also, bases of lead bullets are easily damaged in handling, and lead seems to have a pernicious habit of rubbing off in streaks on the rifling which destroys the accuracy of the barrel until the deposit is removed. When lead is alloyed with tin it is hardened. Bullets made from a lead-tin alloy will take the rifling well when used with suitable powder charges. Tin and lead mix well when melted. When they solidify the lead will contain up to 11% of the tin in a true alloy. Any tin in excess of 11% will crystalize out. Lead-tin alloys have many characteristics to commend them to the reloader:—they are easily melted over the kitchen stove, they flow freely, are less apt to cause leading in the barrel and make better bullets generally.

Antimony can also be used to harden lead, although antimony should never be used alone. The alloy should always contain tin. The reason for this statement lies in the fact that while antimony will mix with lead and form a true alloy in the molten state, it will not remain mixed when the alloy solidifies or freezes. The antimony will crystallize out, and will be found as pure antimony crystals surrounded by pure lead. True, a lead-antimony bullet will feel harder than a lead bullet, but when fired, the lead surrounding the antimony crystals will bear on the barrel and leading may result.

In a lead-tin-antimony mixture the antimony crystals will be present just the same but they will be embedded in a lead-tin mixture. Alloys of lead and tin melt better, cast better and size better than those containing antimony only, but the presence of antimony in the alloy, especially for gas-check bullets in rifles, has an advantage. It hardens the alloy and raises the melting point, making the bullet less liable to gas-cutting or fusion. Because antimony expands when it cools, bullets made with antimony alloys will cast larger than others.

Gas-cutting is a condition caused by using a charge of powder that generates too much heat and pressure. The hot gas melts the side of the bullet, destroying its accuracy and permitting more or less of the gas to escape ahead of the bullet. The molten bullet metal is sprayed through the bore and usually adheres to it. Once lead becomes firmly attached to the steel, it will pick up more lead from the bullets that are fired afterwards. Gas-cutting will cause leading regardless of the alloy used in the bullet.

There have been some experiments conducted using zinc and a new zinc alloy. These seem to offer some promise for high velocities with cast bullets but their maximum range is greatly reduced as both zinc and the zinc alloys are considerably lighter than the lead alloys.

Hardness of Bullet Alloys

In the old black powder days, bullets were usually made several thousandths of an inch smaller than the groove diameter of the barrel in which they were to be fired. Black powder burns so rapidly and builds up pressure so fast that something in the nature of a blow is delivered to the base of the bullet by the burning powder. This blow was depended upon to upset or expand the base of the bullet so that it would fill the grooves. Bullets were made quite soft to facilitate this expansion but later experience with IDEAL bullets has shown that better accuracy will result from the use of a harder bullet sized to the groove diameter of the barrel or even as much as .003 of an inch larger. When bullets are sized in this way there is no particular advantage in using a soft alloy.

When using smokeless powders, bullets should be made from the harder alloys and should be sized to the groove diameter of the barrel (except in some revolvers where they may be sized as much as .003 of an inch larger than groove diameter). It is better to have them slightly over size than under size. IDEAL Bullet Moulds are cut to cast bullets slightly larger than necessary so they can be trued up and sized to the correct diameter. IDEAL Bullet Sizing Dies are made to dimensions that experience has proved will give the best results in the average barrel.

Alloys for Revolver, Pistol and Rifle Bullets

While the following alloys need not be strictly adhered to, they will usually be found satisfactory for the purposes mentioned.

Revolvers.—Not softer than 1 part tin to 40 parts lead. Alloys as hard as 1 part tin to 10 parts lead or 1 part tin, 1 part antimony to 20 parts lead may be used with entire satisfaction.

Automatic Pistols.—1 part tin to 10 parts lead or 1 part tin, 1 part antimony to 20 parts lead. Alloys as soft as 1 part tin to 20 parts lead can be used, but soft bullets are more liable to damage in handling and loading.

Rifles, Black Powder.—1 part tin to 16 parts lead if bullets are undersized. With bullets of groove diameter or larger, use 1 part tin to 10 parts lead or 1 part tin, 1 part antimony and 20 parts lead.

Rifles, Plain Base Bullets.—1 part tin to 15 parts lead with light loads. For normal loads use 1 part tin to 10 parts lead or a 90-5-5% mixture of lead, tin and antimony.

Rifles, Gas-Check Bullets.—1 part tin to 10 parts lead or a 90-5-5% mixture of lead, tin antimony.

Variation of Alloys

The alloys above can be varied to meet individual requirements. The best accuracy in rifles cannot always be obtained without some experimenting. Sometimes rifle bullets prove to be temperamental because variations in the bullet alloy will give unexplainable changes in accuracy. It is an excellent plan for the reloader to keep a record of the alloys he uses and the results obtained with various powders and charges. However, such a record will be of little value unless commercially pure metals or alloys of definitely known composition, such as IDEAL alloys, are used. Block lead obtainable from plumbing shops cannot be relied upon to be pure and may contain amounts of other metals.

Alloys made from scrap lead may be used with entire success, especially for revolver bullets. Some reloaders are situated in localities where it is difficult to get pure metals and of necessity have to use such scrap alloys as are at hand. There is no objection to this, but it will be difficult to exactly duplicate an alloy, once one batch has been used up. In closing this subject we will give a few comments on the commercial alloys that are most likely to be converted into bullets. The percentages that we give are average. They are not exact for the simple reason that the uses to which commercial alloys are put to do not require exact alloying or are varied to meet individual conditions.

Standard Pig Lead, Block Lead, Lead Sheating, etc.

Standard Commercial Pig Lead (99.6% lead) may contain small amounts of tin, antimony, silver or zinc but in quantities so small that they have no appreciable hardening effect on the lead.

Block Lead, as purchased in plumbing shops may contain almost any amount of other metals. Its composition is very uncertain and it must be judged by its hardness. If it can be indented easily with the thumb nail, call it lead.

Block Tin is a name given to a commercial grade of tin which, while not pure, does not contain enough traces of other metals to amount to anything from the standpoint of making bullets. There is no benefit to be derived from using more than about 10% of tin in a bullet alloy.

Antimony usually contains some impurities that can be ignored as the antimony is much harder than any small amounts of other metals that may be contained in it.

Lead Pipe—99.6% lead, same as standard commercial pig lead.

Cable Sheathing—98.5% lead. May contain small amounts of tin or antimony but can be considered pure lead.

Lead Storage Battery Plates and Grids. 9% to 11% antimony; remainder lead. Always add at least 5% tin and soften as desired by the addition of lead.

Plumbers' Solder, used for making wiped joints, contains 67% lead and 33% tin.

Wiped Joints are not uniform in size but will usually be about 30% plumbers' solder and 70% lead pipe.

Type Metal varies but is usually about 3% tin, 82% lead and 15% antimony. It makes a pretty good alloy for hard bullets just as it is.

.22 Caliber Bullets. It is sometimes possible to salvage lead from indoor rifle ranges where .22 caliber ammunition is used entirely. The spent bullets will often be found in almost solid chunks where they are deflected by the back-stop. .22 caliber bullets have small amounts of antimony or other metal to harden them slightly and may be melted up for soft bullets. It will be found advantageous to add about 5% by weight of tin to them for most purposes and for hard bullets, 10% of tin should be added.

Babbitt Metal for high grade, heavy duty bearings contains no lead at all but is composed of tin, antimony and copper. A common composition is 83% tin, 11% antimony and 6% copper. This is known as a tin base babbitt.

Babbitt Metal for low speed bearings has lead substituted for the tin. This is known as lead babbitt. We can suggest no convenient way of determining whether scrap babbitt metal has a lead or a tin base. The copper in it is of no value for making bullets and cannot be melted over a kitchen stove. Even if it were melted it would separate out into patches and spots, not visible to the naked eye but giving a patchy hardness undesirable in bullets. Good results are sometimes obtained with babbitt metal but it is not considered generally satisfactory for bullets.

Ideal Bullet Metal No. 2

Composition: 90 parts lead, 5 parts tin, and 5 parts antimony. IDEAL bullet alloys are made up for us by competent metallurgists and can be relied upon to be of the composition given.

For practical purposes, IDEAL No. 2 Metal may be considered of the same degree of hardness as 1 part tin to 10 parts lead. It is suitable for all hard bullets and is what we use for casting all gas-check bullets. IDEAL No. 2 Metal may be used as a base for making softer alloys according to the following table:

1	part	tin,	10	parts	lead.	Equivalent;	2	parts	No. 2 Metal,	1	part	lead
1	"	"	15	"	"	"	1	part	"	"	1	" "
1	"	"	20	"	"	"	2	parts	"	"	3	parts "
1	"	"	25	"	"	"	1	part	"	"	2	" "
1	"	"	30	"	"	"	2	parts	"	"	5	" "
1	"	"	35	"	"	"	1	part	"	"	3	" "
1	"	"	40	"	"	"						

IDEAL Bullet Metal No. 4—1 Part Tin to 20 Parts Lead.

IDEAL Bullet Metal No. 6—1 Part Tin to 40 Parts Lead.

Alloying Bullet Metal

Regardless of the alloy used, it is well to bear in mind that all of the metals in the alloy do not melt at the same time. The mixtures or metals having the lowest melting point melt first and the other metals afterward as the temperature rises. A good example of this is found in plumbers' solder which contains 67% lead and 33% tin. The lead will contain only about 11% of the tin combined with it when solidified. The remaining tin will crystalize out, the tin crystals being surrounded by the alloy. The plumber heats solder to a temperature that will melt the tin crystals but not all of the lead. The resulting sludge gives him a mixture of pasty consistency required to make a wiped joint in pipes. If all the metal were to melt at the same time, the wiped joint would not be possible.

In casting bullets it is well to bear this in mind. Antimony has a high melting point, too high to be readily melted over the kitchen stove. To alloy it with lead, weigh out the proper quantity and break it up by pounding it with a hammer, the finer the better. Melt the lead and raise to a red heat. Add the antimony and cover the surface of the metal with powdered charcoal to prevent the lead from oxidizing. Stir occasionally and flux with a piece of bees wax or a little salammoniac when the antimony is completely melted.

Antimony is also lighter than lead and will float on the surface of the melted lead. If your bullet metal shows any tendency to sludge on the surface, increase the heat and flux the metal. *Never* skim the metal without fluxing, as you will probably skim off some of the alloying metal and change the character of the alloy. There is also the possibility of getting bullets too high in tin or antimony content from the top of the pot and bullets with an excess of lead from the bottom. Always keep the metal at the proper temperature, stirred and fluxed.

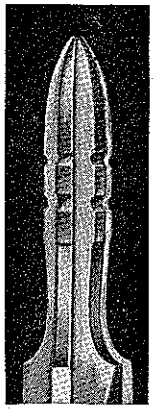
The separate crystals of metal that form when bullet alloys cool, are affected by the time of cooling. They will be large if the metal cools slowly and small if the cooling is rapid. When the mould and metal are so hot that it takes several seconds for the sprue to solidify, the bullets are apt to have a frosty appearance. This is due to the large crystals formed by the slow cooling. We do not know that this has any effect on the accuracy of the bullets, but small caliber bullets are inclined to be temperamental and we suggest that those loading .22 and .25 caliber bullets, use bullets of the same general appearance when loading for extreme accuracy.

How to Measure the Groove Diameter of a Barrel

Clean the bore thoroughly. Swab with a light oil of good lubricating properties. Obtain a soft lead slug or bullet that is slightly *larger* than the groove diameter. If using a bullet of the same caliber as the barrel, upset the base to increase the diameter. Place the slug on the muzzle with a short piece of brass rod against it. With light blows of a hammer, drive the slug into the bore, taking care that the end of the brass rod does not strike the rifling. A ring of lead should be sheared off the slug in driving it into the bore. We receive many sample bullets bearing the marks of rifling, which were not large enough to reach fully to the bottoms of the grooves of the barrel.

Once the slug is well started, place a rod against it, and with a firm support for the barrel, push the slug entirely through the bore. Be careful to catch it on a soft cloth so that it will not be deformed. The slug will carry a negative impression of the rifling, the lands being represented by the grooves and the grooves by the ridges on the slug. Measure across the opposite ridges with a micrometer caliper and you will have the minimum groove diameter of your barrel. If you have no micrometer caliper and cannot borrow one, pack the slug carefully in cotton to prevent its being deformed in transit and send it to us. We will be glad to measure it for you and recommend the proper diameter of bullet for your firearm.

The Manufacture of Ideal Bullet Moulds



Cherry for cutting bullet moulds

Requests are constantly received from reloaders with reference to altering their moulds slightly or obtaining a mould for a regular IDEAL bullet which will differ a little in its weight, shape, or other characteristics from the regulation style. These are perfectly natural requests for one to make, and it is commonly believed by many persons that these moulds can be furnished to their individual requirements without any trouble. Such is not the case. We are accordingly giving in brief the system followed in making an IDEAL bullet mould so that it will be readily understood why we cannot deviate from our standard designs except in the manufacture of a new mould to the customer's complete specifications.

The first step in the manufacture of an IDEAL mould is to design the cherrying tool which not only constitutes a steel master bullet model but which is also used to fabricate the mould cavity itself in the mould blocks. This steel cherrying tool is made up from some particular design by hand by expert tool makers. If the weight of the desired bullet is given, this has to be taken into consideration and compensated for by the length of the bullet itself. After this steel tool is once made up it is very difficult to alter it in any way.

The cherrying tool used for cutting the mould must also be made up with correct allowance for shrinkage of bullet metal, etc., and is then carefully ground and cutting edges made up, after which it is hardened and tempered.

Gas-Check Bullets

311413

Ideal .30-06 Cal. 169 Grs.

The velocity at which plain base lead alloy bullets can be driven is limited by the burning temperature of the powder, its duration and the chamber pressure. If smokeless powder charges are increased beyond a certain point, the bases of the bullets will be melted or fused and the accuracy destroyed. To overcome this difficulty and permit higher velocities to be obtained with home-made bullets, Mr. John Barlow, originator of IDEAL Reloading Tools, devised the gas-check cup. This gas-check takes the form of a shallow gilding metal cup which is attached to the base of a cast bullet. The hard cup protects the base of the bullet from the hot powder gases but if the pressure behind the bullet is too high the gas will force its way past the gas-check and fuse the bullet. There is a limit to the hardness of lead alloys and such bullets are always softer than jacketed bullets. If they are driven too fast, they will jump the rifling and their accuracy will be destroyed. Gas-check bullets can be driven at velocities of from 200 to 300 feet per second faster than plain base bullets, giving flatter trajectories, better wind bucking qualities and greater killing power. They have another advantage in that the hard gas-checks will not be damaged from any ordinary handling nor in seating the bullets cases.

Gas-checks can only be used on bullets made especially for them as may be seen in the illustration at the left of IDEAL bullet 311413. The gas-checks should be tapped onto the bases of the bullets with a stick before melted lubricant is poured around them. After they are cut out of the hardened lubricant with Kake-Kutter, force them through the Bullet Sizing Chamber and then seat the gas-checks firmly and uniformly. When the IDEAL No. 45 Lubricator and Sizer is used, the gas-check need only be placed in position with the fingers or laid on a flat surface and the base of the bullet pressed into it. The pressure of forcing it down into the Sizing die will

complete the seating in a most satisfactory manner. The inside punch "I" that fills the die is furnished with a slightly concave surface for use with gas-check bullets. The cavity fits the gas-check and prevents lubricant from being forced under the bullets. Flat faced punches should be used with plain base bullets.

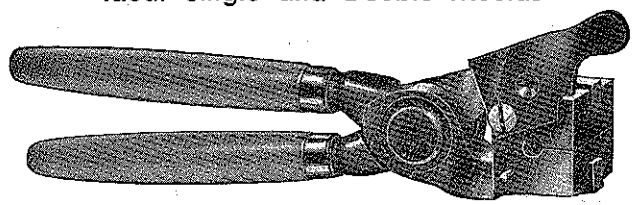
Interchangeable Mould Blocks

The IDEAL Interchangeable Mould Blocks are made in pairs with a small pilot hole drilled into the center of the block faces. Then these blocks are placed in jaws of a machine which hold the rotating cherrying tool and the blocks are slowly brought together around the cutting tool itself. This cherrying tool then imprints or cuts away an exact duplicate of itself in the mould blocks, one-half being in each block face.

It now may be easily seen why any deviations from the standard groove positions, etc., are practically impossible unless a new cherrying tool is made up, and this is the reason that an extra price must be charged covering the manufacture of a new tool and mould complete when individual requirements are placed that cannot be found in one of the standard IDEAL bullets.

We can, on special order, cut mould cavities with base bands narrower or wider than normal and it is sometimes possible to make some bullets with hollow points or bases that are not regularly listed that way.

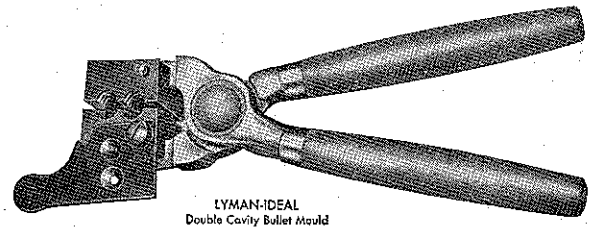
Ideal Single and Double Moulds



Single Bullet Mould With Interchangeable Blocks

The improved IDEAL Single and Double Bullet Moulds are outstanding because they are strong, light in weight, and easily handled. In addition, they permit the reloader to own moulds for many different bullets at the least expense, as blocks and handles will be furnished separately.

The blocks are easily attached to or removed from the handles with the aid of a screw driver. Once in place, the blocks are always in absolutely true alignment. They are held by perfectly fitted dowel pins. The dowel pin holes extend through the block to permit easy freeing of material that might become lodged in them.



Double Cavity Bullet Mould with Interchangeable Blocks

The mould blocks are made of the same special metal from which all IDEAL moulds have always been made, a feature which allows easy "breaking-in". The neat design of the moulds has eliminated all but two screw heads, which are so placed as to be out of the way when using the moulds. The joint and handles are designed to fit the hand easily in closed position. This easy grip, combined with the light weight of the tools are improvements welcomed by the reloader.

Both moulds are accurately made, with smooth riding joints and good workmanship throughout.

Casting Bullets with the Armory Mould

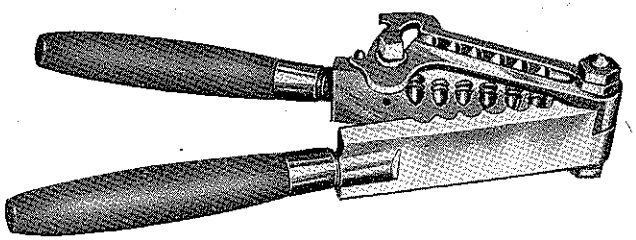
IDEAL Armory or Multiple Cavity Moulds are provided for casting large quantities of bullets. They are used in much the same manner as a single mould, except that the metal should be poured with an open ladle and allowed to run into the cavities. The sprue cutter is provided with a deep channel for this purpose. Due to the large size of the mould blocks, it is necessary to keep the bullet metal at a higher temperature than for single mould casting.

If the bullets do not fall from the mould readily when it is opened, the mould should be rapped with a wooden mallet near *the joint. Never* use a hammer or a metal instrument to strike a mould. Do not strike the blocks near their centers as it may spring them and ruin the mould.

Proper lubrication of the joint is necessary and the newer IDEAL Armory Moulds are equipped with a standard Zerk fitting for this purpose. Failure to provide sufficient lubrication at the joint will result in wear and injure the alignment of the two halves of the mould. There is no remedy for this condition.

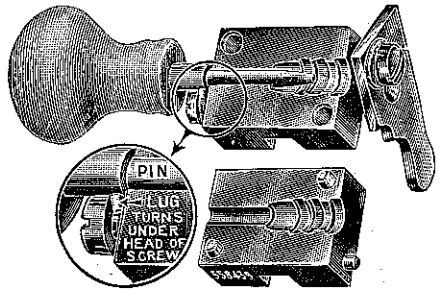
The only lubricant that we have found to be satisfactory for the joints of Armory Moulds is Alemite Pyro Lubricant. It is a special, heavy, non-fluid lubricant for use in joints that are subjected to high temperatures and may be ordered through an Alemite dealer or we can supply it in 1 pound cans. Because the lubricant is stiff, extra pressure on grease gun is required for a thorough job.

Armory Moulds are constructed from the joint, and the faces of the blocks are carefully fitted after the joint is completed and before the cavities are cut. Care must be taken to keep the internal surface free from rust or damage as these moulds cannot be recherried. Armory Moulds because of their size are liable to some warpage after they have been in use for awhile. It is seldom that this is sufficient to impair their usefulness, but we cannot guarantee against it. As a preventive and to insure the best results, we recommend that blocks be clamped at the center with a "C" clamp or vise, with only sufficient pressure to hold blocks in contact with pouring metal.



Ideal Armory Bullet Mould

Ideal Hollow Point Mould and Hollow Point Pin with Lug



The addition of a lug on the Ideal Hollow Point Pin holds the pin securely in place while casting bullets, and permits easy removal after the metal hardens.

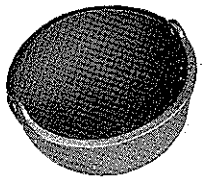
Special Moulds

Special moulds can be made to the customer's specifications, but all specifications must be furnished by him. The regular charge for making new moulds to individual specifications is $30.00.

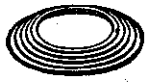
Ideal Dipper for Running Bullets

The IDEAL Dipper is almost a necessity for casting bullets. The spout is formed to fit the pouring holes of IDEAL Moulds and permits bullets to be cast better and faster than with any other type of ladle.

Ideal Lead Pot and Holder



Holds about 10 pounds of lead, the correct amount to use when casting bullets. This amount keeps more even heat than smaller quantity.



Fits melting pot and any size hole. Advisable to use with melting pot to keep lead at even temperature.

SECTION II

RELOADING DATA & INFORMATION

With this 38th edition of the Ideal Hand Book we introduce ten new bullets designed by H. Guy Loverin, noted cast bullet authority.

The numbers of these bullets are:

257463	266469	280468 (Long)	311466	323476
257464	280468	311465	311467	323471

These excellent bullets were designed by Mr. Loverin in honor of the late Mr. Harry M. Pope, a friend of long standing, whose extraordinary accurate barrels required exacting bullets such as those designed by Mr. Loverin.

With Mr. Pope's passing we have lost a great figure in the shooting world made up of hunters, target shooters and gunsmiths.

IMPORTANT NOTICE

Due to the fact that there may be a shortage of gas checks, cast bullets designed for gas checks may be used without them by reducing the charges. The estimated velocity for desired accuracy with cast bullets (less gas check) should be approximately 1200 to 1300 f.p.s.

Key To TOOL CHARTS On Following Pages

310 No. — The number refers to the cartridge or cartridges which can be reloaded in one set of handles. Example: 310 No. 2 can be used for 30/06 and 8 M/M. Either or both cartridges can be reloaded in these handles.

P.C. Priming Chamber (for 310 Tool only)

S.H. Shell Holder (for Tru-Line Jr.)

P.P. Priming Punch (for Tru-Line Jr.)

D.C. Decapping Chamber (for 310 Tool and Tru-Line Jr.)

M.R. Muzzle Resizer (for 310 Tool and Tru-Line Jr.)

E.C. Expanding Chamber (for 310 Tool and Tru-Line Jr.)

E.P. Expanding Plug (for 310 Tool and Tru-Line Jr.)
(The number is given for diameter of cast bullets. Jacketed bullets run approximately .002 smaller. When ordering tools for jacketed bullets, please specify.)

D.A. Double Adjustable Chamber (for 310 Tool and Tru-Line Jr.) (Seating and Crimping)

S.S. Seating Screw (for 310 Tool and Tru-Line Jr.)
(Seating screw should match the point of the bullet. Give number of cast bullet, or shape of jacketed bullet when ordering.)

Key to Suggested Loads

We offer the handloader on the following pages loads with cast and jacketed bullets. It would be impossible for us to list loads for each powder and each bullet. Neither can we say that the load you choose will be the most accurate for your particular gun. A reloader must experiment—the diameter of the bullet, the seating depth, the weight of bullet and different powders and charges are all contributing factors to extreme accuracy. If one refers to Section IV he will find that altering equipment is also a factor.

We do offer safe loads which have been tried and should prove reasonably accurate.

Table of Contents—Section II

.218 Bee

TOOLS. 310 (No. 3) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
10	10	Small	Small	172	Short	.225	172	Use bullet number

IDEAL BULLETS:

43 grs.

#225438 Loverin design. Best accuracy in all 22 cal. barrels.

47.5 grs.

#224450 Designed for 220 Swift, can be used for others.

48 grs.

#225415 For Neidner Baby Hi-Power and others.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
225438	43	Unique	4.0	1450E	
225438	43	No. 4759	7.0	1750E	

.218 Bee, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS (Cont.):					
225438	43	No. 2400	7.5	2030E	
225438	43	No. 4227	8.5	2070E	
225438	43	No. 4198	8.0	1600E	
224450	47.5	No. 2400	12.0	2200	
225415	48	No. 2400	12.0	2190	Slower velocity will be more accurate.
LOADS FOR JACKETED BULLETS:					
WM 8S	40J	No. 2400	15.0	3330	
Sisk	41J	No. 4227	15.0	3200	Sharpe load
Sisk	41J	No. 4227	16.0	3250E	MAX. LOAD
Hornet	45J	No. 2400	13.5	2900E	
WM 8S	45J	No. 2400	15.0	3227	Note: Other makes of bullets may be used with equal results.
WM 8S	45J	No. 4227	14.0	2806	
WM 8S	45J	No. 4227	16.0	3166	
WM 8S	45J	No. 4198	15.0	2800E	
Any	50J	No. 4227	13.5	2700E	
WM 8S	50J	No. 4227	15.0	3081	
WM 8S	50J	No. 4198	15.0	3000E	
WM 8S	50J	No. 2400	12.5	2800E	
Sisk	55J	No. 4198	15.0	2900E	
Sierra	55J	No. 4198	13.0	2310	
Sierra	55J	No. 4198	14.0	2474	

.219 Donaldson Wasp

TOOLS: 310 (No. 6) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
6	6	Large	Small	171	Medium	.225	171	Use bullet number

IDEAL BULLETS:

43 grs.

#225438 Loverin design—Best accuracy in 22 cal.

.219 Donaldson Wasp, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
225438	43	No. 2400	10.0	2100E	Note: Very little has been done with cast bullets for .219 Wasp. Experimentation will be necessary for excellent results. Other cast bullets may also be used.
225438	43	No. 4227	7.0	1400E	
225438	43	No. 4227	10.0	2000E	
225438	43	No. 4759	8.5	1600E	
225438	43	No. 4198	10.0	1800E	
LOADS FOR JACKETED BULLETS:					
WM 8S	45	No. 4320	31.0	3580	
R.C.B.S.	45	No. 4759	20.0	2970*	*7-S bullets used
Swift	48	No. 3031	29.0	3669	
R.C.B.S.	55	No. 3031	28.5	3611*	
R.C.B.S.	55	No. 3031	29.0	3695*	MAX.
R.C.B.S.	55	No. 4198	19.0	3200E*	
R.C.B.S.	55	No. 4198	17.0	2800E*	
LOADS FOR BEST ACCURACY:					
R.C.B.S.	45	No. 4320	31.0	3580	
R.C.B.S.	50	No. 4320	31.0	3620E	
R.C.B.S.	55	No. 3031	26.0	3200E	Note: Other bullets may be used with equal results.
R.C.B.S.	55	No. 3031	27.0	3300E	
R.C.B.S.	55	No. 3031	27.5	3400E	
R.C.B.S.	55	No. 3031	28.0	3500E	
R.C.B.S.	55	No. 4320	28.5	3250E	
R.C.B.S.	55	Govt. 4895	27.0	3500E	

.219 Zipper

TOOLS: 310 (No. 6) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
6	6	Large	Small	171	Med.	.225	171	Use bullet number

IDEAL BULLETS:

43 grs.

#225438 Same as .219 Wasp.

.219 Zipper, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
225438	43	No. 2400	10.0	1900E	Other bullets may be used.
225438	43	No. 4227	12.0	2100E	
225438	43	No. 6 Pistol	5.0	1550E	Light load.
225438	43	No. 4759	8.0	1850E	
LOADS FOR JACKETED BULLETS:					
Sisk	40	No. 3031	29.5	3500E	
Sisk	41	No. 4198	16.0	1800	
WM 8S	45	No. 4759	12.0	2260	
WM 8S	45	No. 4759	16.0	2820	Other bullets may be used with equal results.
WM 8S	45	No. 4759	18.0	3026	
WM 8S	45	No. 4759	20.0	3345	
WM 8S	45	No. 3031	27.0	3400E	
WM 8S	45	No. 4198	22.5	3280E	
Factory Hollow Pt.	45	No. 4064	29.0	3072	
High Speed	46	No. 3031	28.0	3440	
WM 8S	50	No. 4759	16.0	2655	
WM 8S	50	No. 4759	21.0	3425E	
WM 8S	50	No. 4198	19.2	2900E	
WM 8S	50	No. 3031	28.0	3300E	
Any	55	No. 4759	16.0	2582	
Any	55	No. 3031	26.5	3250E	
Any	55	No. 4064	27.0	3000E	
Any	55	No. 4320	27.5	3040E	
Factory Hollow Pt.	56	No. 3031	25.6	3100	
Factory Hollow Pt.	56	No. 4064	26.5	2910	
Sisk	63	No. 4064	26.5	2650E	

.219 Zipper Improved

TOOLS: 310 (No. 6) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
6	6	Large	Small	171	Med.	.225	171	Use bullet number

IDEAL BULLETS:

Use Cast bullets and loads listed for 219 Donaldson Wasp.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR JACKETED BULLETS:					
Sisk	55	No. 3031	32.0		MAX. No. 115 Win. primers
Sisk	55	No. 4320	34.5		MAX. used. If No. 120 or No. 9½ are used, reduce charge 1. gr.

.219 K-Zipper

TOOLS: 310 (No. 6) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
6	6	Large	Small	171	Med.	.225	171	Use bullet number

IDEAL BULLETS:

Use Cast bullets and loads listed for 219 Donaldson Wasp.

LOADS FOR JACKETED BULLETS:

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
Morse 8S	45	No. 3031	33.5	4305	
Morse 8S	50	No. 3031	33.0	4080	
Morse 8S	50	No. 4320	34.0	3906	
Morse 8S	50	No. 4895	33.0	3875	
Sisk	55	No. 3031	31.0	3815	
Sisk	55	No. 4320	33.0	3820	
Sisk	55	No. 4895	33.0	3840	
Morse 8S	60	No. 4895	32.0	3660	

.22 Hornet

TOOLS: 310 (No. 4) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
4	4	Small	Small	165	Short	224	165	Use bullet number

IDEAL BULLETS:

43 grs.

#225438 Loverin bullet designed specially for 22 Hornet.

.22 Hornet, cont.

47.5 grs.

#224450 Can be used in Hornet.

#225415 Can be used in Hornet.

48 grs.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
225438	43	Unique	3.5	1400E	Squirrel load
225438	43	No. 4759	7.0	1850E	
225438	43	No. 2400	8.5	2000E	No. 225438 — Best bullet for 22 cal. rifles.
225438	43	No. 6 Pistol	4.5	1600E	
225438	43	No. 4227	8.5	1910E	
225438	43	No. 4759	5.0	1540E	
225438	43	No. 4759	7.5	1910	
225438	43	No. 2400	7.5	1950	
224450	47.5	No. 4227	10.0	2400	Lower velocity more accurate.
224450	47.5	No. 4227	8.8	2000E	
225415	48	No. 4227	8.8	2000E	
225415	48	No. 4227	10.8	2410	Lower velocity more accurate.

NOTE: The following loads were developed for the particular shooter by H. Guy Loverin.

LIGHT LOADS:

225438	43	No. 4759	7.7	2000E	Note: Use long funnel to pour powder when settling is necessary.
225438	43	Bulk shotgun	4.1		
225438	43	Unique	3.9	1450E	

DUPLEX LOADS:

225438	43	No. 4227	8.0	1950E	No. 4227 by weight. Pistol powder — set powder measure at 3 gr. on slide.
		No. 5 Pistol or No. 5066	3.0		
225438	43	No. 4759	8.0	2000E	Note: Use long funnel to pour powder when settling is necessary.
		Unique	5.0		Note: These two duplex charges to be mixed thoroughly in a larger case before filling Hornet case.

.22 Hornet, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
HEAVY LOADS:					
225438	43	No. 4227	10.3	2275E	Pour slowly through long funnel
LOADS FOR JACKETED BULLETS:					
Jacketed	35	No. 4227	10.0	2750	Sisk bullet
Jacketed	35	No. 2400	7.0	1900	Sisk bullet
Jacketed	35	No. 2400	9.5	2340	Sisk bullet
Jacketed	35	No. 2400	11.6	3020	Sisk bullet
Jacketed	35	No. 2400	12.0	3100	Sisk bullet
Jacketed	40	No. 2400	7.0	1870	
Jacketed	40	No. 2400	9.5	2460	
Jacketed	40	No. 2400	11.2	2860	
Jacketed	45	No. 4227	8.8	2045	
Jacketed	45	No. 4227	10.8	2410	
Jacketed	45	No. 2400	6.0	1665	
Jacketed	45	No. 2400	8.0	2200	
Jacketed	45	No. 2400	9.7	2600	
Jacketed	45	Unique	3.5	1480	
Jacketed	45	Unique	4.7	1955	
Jacketed	55	Unique	3.0	900	Sisk bullet
Jacketed	55	Unique	4.3	1555	Sisk bullet
Jacketed	55	No. 2400	6.0	1580	Sisk bullet
Jacketed	55	No. 2400	7.5	1965	Sisk bullet

.22 K-Hornet

TOOLS: 310 (No. 4) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
4	4	Small	Small	165	Short	224	165	Use bullet number

43 grs.

IDEAL BULLETS:

#225438 Loverin bullet designed specially for Hornet. Best 22 cal. bullet.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
225438	43	No. 6 Pistol	4.5	1500E	Other bullets may be used
225438	43	No. 2400	7.0	1875E	
225438	43	No. 2400	7.5	1950E	

NOTE: Any loads for Standard Hornet may be used.

.22 K-Hornet, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR JACKETED BULLETS:					
Jacketed	40	No. 2400	11.0	3080	Morse 8S bullet
Jacketed	40	No. 2400	12.5	3311	Morse 8S bullet
Jacketed	40	No. 4227	11.5	3040	Sisk bullet
Jacketed	40	No. 4227	12.5	3122	Morse 8S bullet
Jacketed	40	No. 4227	13.0	3185	Morse 8S bullet
Jacketed	41	No. 2400	11.0	3024	Sisk bullet
Jacketed	41	No. 2400	11.5	3140	Morse 8S bullet
Jacketed	41	No. 4227	11.5	3031	Sisk bullet
Jacketed	41	No. 4227	12.0	3100E	Morse 8S bullet
Jacketed	41	No. 4227	13.0	3162	Sisk bullet
Jacketed	42	No. 2400	11.5	3127	Sisk bullet
Jacketed	43	No. 4227	11.5	3052	Morse 8S bullet
Jacketed	45	No. 4227	11.0	2944	Sierra bullet
Jacketed	45	No. 4227	12.0	3050	Morse 8S bullet
Jacketed	45	No. 4227	12.5	3072	Factory bullet
Jacketed	46	No. 4227	12.5	3055	Factory bullet
Jacketed	47	No. 4227	11.5	2945	Morse 8S bullet
Jacketed	50	No. 4227	11.0	2754	Morse 8S bullet
Jacketed	50	No. 4198	12.5	2760	Sisk bullet
Jacketed	55	No. 4198	13.0	2680	Sisk bullet

NOTE: No. 4198 powder can not be burned properly in K-Hornet case unless you use Western No. 1½ pistol primer and a heavy bullet.

.22/250 Varminter

TOOLS: 310 (No. 2) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
2	2	Large	Small	22/250	Med.	.224	22/250	Use bullet number

43 grs.

IDEAL BULLETS:

#225438 Loverin bullet for Hornet. Also excellent for Varminter.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
225438	43	No. 2400	10.5	1900E	Other cast bullets such as No. 224450 and No. 225415 may be substituted
225438	43	No. 4227	8.5	1800E	
225438	43	No. 4227	10.0	2000E	
225438	43	Bulk shotgun	8.0	1700E	
225438	43	No. 4759	9.0	1700E	
225438	43	No. 4198	12.0	1650E	

.22/250 Varminter, cont.

LOADS FOR JACKETED BULLETS:

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
Jacketed	40	No. 4759	29.0	4100	WM 8S bullet
Jacketed	40	No. 4320	40.0	4585	WM 8S bullet
Jacketed	40	No. 4320	41.0	4635	WM 8S bullet
Jacketed	45	No. 4759	22.5	3410	WM 8S bullet
Jacketed	45	No. 4759	25.0	3720	WM 8S bullet
Jacketed	45	No. 4759	29.0	3860	WM 8S bullet
Jacketed	45	No. 3031	37.0	4065	WM 8S bullet
Jacketed	45	No. 3031	38.0	4155	WM 8S bullet
Jacketed	45	No. 4198	22.0	3200E	WM 8S bullet
Jacketed	45	No. 4227	8.5	1985	WM 8S bullet
Jacketed	45	No. 4227	10.0	2150	WM 8S bullet
Jacketed	45	No. 4227	12.5	2440	WM 8S bullet
Jacketed	46	No. 4227	8.5	1792	Factory Hornet bullet
Jacketed	46	No. 4227	12.5	2268	Factory Hornet bullet
Jacketed	48	No. 4320	38.0	4014	Swift bullet
Jacketed	48	No. 4320	40.0	4183	Swift bullet
Jacketed	50	No. 4759	10.0	1830	WM 8S bullet
Jacketed	50	No. 4759	15.0	2412	WM 8S bullet
Jacketed	50	No. 4759	18.0	2675	WM 8S bullet
Jacketed	50	No. 4759	20.0	2830	WM 8S bullet
Jacketed	50	No. 4759	22.0	3210	WM 8S bullet
Jacketed	50	No. 4759	22.5	3245	WM 8S bullet
Jacketed	50	No. 4759	26.0	3450E	WM 8S bullet
Jacketed	50	No. 4759	28.0	3600E	WM 8S bullet
Jacketed	50	No. 3031	22.5	3145	WM 8S bullet
Jacketed	50	No. 3031	27.5	3320	WM 8S bullet
Jacketed	50	No. 3031	35.0	3980	WM 8S bullet
Jacketed	50	No. 4198	22.0	3240	WM 8S bullet
Jacketed	50	No. 4198	15.0	2390	WM 8S bullet
Jacketed	50	No. 4198	18.0	2650	WM 8S bullet
Jacketed	50	No. 4320	35.0	3720	WM 8S bullet
Jacketed	50	No. 4320	36.0	3867	WM 8S bullet
Jacketed	50	No. 4320	37.0	3885	WM 8S bullet
Jacketed	50	No. 4320	38.0	4014	WM 8S bullet
Jacketed	50	No. 4320	39.0	4170	WM 8S bullet
Jacketed	50	No. 4320	40.0	4245	WM 8S bullet
Jacketed	55	No. 4064	38.0	3983	Sisk bullet
Jacketed	55	No. 4320	35.0	3720	Sisk bullet
Jacketed	55	No. 4320	36.0	3820	Sisk bullet
Jacketed	55	No. 4320	37.0	3890	Sisk bullet
Jacketed	55	No. 4320	38.0	3975	Sisk bullet
Jacketed	55	No. 3031	30.0	3640E	Sisk bullet
Jacketed	55	No. 4759	18.0	2651	Sisk bullet
Jacketed	63	No. 4064	34.0	2975	Sisk bullet
Jacketed	63	No. 4350	37.0	2900	Sisk bullet
Jacketed	65	No. 4350	40.0	3550	WM 8S bullet
Jacketed	65	No. 4759	23.5		WM 8S bullet

NOTE: Other Jacketed bullets can be used with equal success.

.22 Lovell 2R

TOOLS: 310 (No. 12) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
19	19	Small	Small	173	Small	.225	165	Use bullet number

IDEAL BULLETS:

43 grs.

#225438 Loverin bullet. Best in 2R Lovell.

47.5 grs.

#224450 Also good in 2R Lovell.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
225438	43	Unique	3.5	1300E	Note: No. 225415 may be substituted for either of these bullets. Slower velocity will give better accuracy
225438	43	No. 4759	8.0	1850E	
225438	43	No. 4227	8.0	1750E	
224450	47.5	No. 4227	11.0	2490	

LOADS FOR CAST BULLETS:

LOADS FOR JACKETED BULLETS:

Jacketed	35	No. 2400	14.0	3200E	Sisk bullet
Jacketed	35	No. 4759	9.5		
Jacketed	35	No. 4759	10.3		
Jacketed	40	No. 4227	13.0	3100	WM 8S bullet
Jacketed	40	No. 4227	16.5	3475	Sisk bullet
Jacketed	40	No. 2400	13.0	3100	WM 8S bullet
Jacketed	40	No. 2400	14.0	3100	Sisk bullet
Jacketed	40	No. 4198	17.5	3340	Sisk bullet
Jacketed	45	No. 4227	8.0	1884	WM 8S bullet
Jacketed	45	No. 4227	9.0	2044	WM 8S bullet
Jacketed	45	No. 4227	10.0	2220	WM 8S bullet
Jacketed	45	No. 4227	14.0	2940	WM 8S bullet
Jacketed	45	No. 4227	15.5	3225	WM 8S bullet
Jacketed	45	No. 4227	16.0	3280	WM 8S bullet

.22 Lovell 2R, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR JACKETED BULLETS (Cont.)					
Jacketed	45	No. 4227	16.3	3319	WM 8S bullet
Jacketed	45	No. 4759	8.0	1900	WM 8S bullet
Jacketed	45	No. 4759	10.0	2160	WM 8S bullet
Jacketed	45	No. 4759	12.0	2500	WM 8S bullet
Jacketed	50	No. 4759	12.5	2485E	WM 8S bullet
Jacketed	50	No. 4198	16.0	2850E	WM 8S bullet
Jacketed	50	No. 4198	16.5	2950	WM 8S bullet
Jacketed	50	No. 4198	17.0	3050	WM 8S bullet
Jacketed	50	No. 4227	15.0	3103	WM 8S bullet
Jacketed	50	No. 4227	17.0	3200E	WM 8S bullet
Jacketed	50	No. 2400	15.0		
Jacketed	55	No. 2400	13.0	2800	Maximum load
Jacketed	55	Hi-Vel No. 2	14.0	2800	Maximum load
Jacketed	55	No. 4227	14.2	2700	
Jacketed	55	No. 4227	16.8	3050E	Maximum load
Jacketed	55	No. 4198	16.5	2925E	Sisk bullet
Jacketed	55	No. 4198	17.3	3116	Sisk bullet
Jacketed	55	No. 4198	17.1	3058	Sisk bullet

Old K-Lovell
New K-Lovell

TOOLS: 310 (No. 12) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
19	19	Small	Small	7	Small	.224	7	Use bullet number

IDEAL BULLETS:

Note: Use same load and cast bullets as Standard Lovell 2R.

LOADS FOR JACKETED BULLETS:

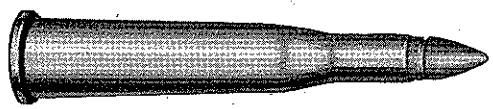
Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
Old K-Lovell					
Jacketed	45	No. 4227	15.5	3345	Morse 8S bullet
Jacketed	41	No. 4198	18.0	3301	Sisk bullet
Jacketed	43	No. 4198	18.0	3292	Morse 8S bullet
Jacketed	45	No. 4198	17.5	3250	Morse 8S bullet
Jacketed	47	No. 4198	18.0	3275	Morse 8S bullet
Jacketed	50	No. 4198	18.0	3254	Sisk bullet

New 22 K-Lovell

Jacketed	41	No. 4227	16.0	3540	Sisk bullet
Jacketed	45	No. 4227	15.0	3360	Morse 8S bullet
Jacketed	41	No. 4198	17.5	3305	Sisk bullet
Jacketed	43	No. 4198	17.5	3301	Morse 8S bullet
Jacketed	45	No. 4198	17.0	3257	Sierra bullet
Jacketed	47	No. 4198	16.5	3200	Morse 8S bullet
Jacketed	47	No. 4198	17.5	3361	Morse 8S bullet
Jacketed	50	No. 4198	17.5	3311	Sisk bullet

NOTE: No. 4227 powder is almost too fast for use in K-Lovell case due to sharp K shoulder which was designed to burn No. 4198 powder better. Use care with such a fast powder.

.22 Savage Hi-Power



TOOLS. 310 (No. 6) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
6	6	Large	Small	141	Med.	.228	141	Use bullet number

IDEAL BULLETS:

60 grs.

#228367 Only Ideal bullet suitable for 22 Hi-Power.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
228367	60	No. 4759	13.0	2000E	Other makes of bullets of similar weight may be used.
228367	60	No. 2400	12.0	1950E	
228367	60	Unique	6.5	1650E	
228367	60	No. 5066 Pistol	4.0	1000E	10 to 25 yd. load

.22 Savage Hi-Power, cont.

LOADS FOR JACKETED BULLETS:

Jacketed	35	No. 2400	12.0	2250	
Jacketed	35	No. 2400	17.0	3200	
Jacketed	35	No. 2400	19.0	3367	
Jacketed	40	No. 2400	12.0	2302	
Jacketed	40	No. 2400	14.0	3000	
Jacketed	40	No. 2400	18.0	3149	
Jacketed	40	No. 2400	19.0	3284	
Jacketed	45	No. 2400	10.0	2000	
Jacketed	45	No. 2400	13.0	2480	
Jacketed	45	No. 2400	15.0	2790	
Jacketed	45	No. 2400	17.4	3150	Maximum load
Jacketed	45	Hi-Vel No. 2	13.0	1720	
Jacketed	45	Hi-Vel No. 2	23.0	2940	
Jacketed	45	Hi-Vel No. 2	29.5	3780	Not safe for lever guns
Jacketed	55	No. 2400	12.0	2140	
Jacketed	55	No. 2400	15.5	2634	
Jacketed	55	No. 2400	16.9	2780	
Jacketed	55	Hi-Vel No. 2	26.0	3000	
Jacketed	55	No. 3031	25.0	2859	
Jacketed	55	No. 3031	30.0	3260	
Jacketed	63	No. 3031	28.0	3000	
Jacketed	63	Hi-Vel No. 2	26.0	3040	Not safe for lever guns
Jacketed	70	No. 2400	8.0	1580	
Jacketed	70	No. 2400	11.0	1930	
Jacketed	70	No. 2400	13.0	2182	
Jacketed	70	No. 2400	16.2	2600	
Jacketed	70	Hi-Vel No. 2	10.0	1160	
Jacketed	70	Hi-Vel No. 2	20.0	2410	
Jacketed	70	Hi-Vel No. 2	24.0	2900	
Jacketed	70	Unique	7.0	1620	
Jacketed	70	Unique	10.7	2270	
Jacketed	70	No. 4320	24.0	2450	
Jacketed	70	No. 4320	30.0	2930	Maximum load
Jacketed	70	No. 4198	15.0	1990	
Jacketed	70	No. 4198	21.0	2705	

K-Savage .22 Hi-Power

TOOLS: 310 (No. 4) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
6	6	Large	Small	141	Med.	.228	141	Use bullet number

IDEAL BULLETS:

Note: 22 Hi-Power Cast bullets loads may be used as listed.

LOADS FOR JACKETED BULLETS:

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
Jacketed	55	No. 3031	33.0	3745	Morse 8S bullet
Jacketed	50	No. 3031	34.0	3875	Sisk bullet
Jacketed	54	No. 4895	33.0	3536	Sisk bullet
Jacketed	50	No. 4895	35.0	3965	Morse 8S bullet

.220 Swift

TOOLS: 310 (No. 5) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
5	5	Large	Small	169	Med.	.224	169	Use bullet number

IDEAL BULLETS:

43 grs.

#225438 Loverin bullet for Hornet. Excellent in Swift.

47.5 grs.

#224450 Designed for Swift.

48 grs.

#225415 May also be used in Swift with good results.

LOADS FOR CAST BULLETS:

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
225438	43	No. 2400	12.5	2200E	
225438	43	No. 2400	12.0	2191	Good load
225438	43	No. 4227	13.0	2000E	
225438	43	No. 4759	13.0	2232	Fair load
224450	47.5	No. 4198	20.0	2376	Slower velocity — more accurate
225415	48	No. 2400	11.0	2000E	
225415	48	No. 2400	10.0	1830E	

NOTE: Bullet No. 225438 will usually give best accuracy.

.220 Swift, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR JACKETED BULLETS:					
Cast	29	No. 3031	40.0	4760	Kirksite metal bullet
Jacketed	40	No. 2400	20.0		
Jacketed	40	No. 4064	38.0		
Jacketed	45	No. 4320	35.0	3500E	
Jacketed	45	No. 3031	36.0	3500E	
Jacketed	45	No. 4064	37.0	3890E	
Jacketed	45	No. 4227	18.0		
Jacketed	46	No. 2400	20.5	3135	Factory HP bullet
Jacketed	46	No. 4320	36.0	3600E	Factory HP bullet
Jacketed	46	No. 4064	37.0	3900E	Factory HP bullet
Jacketed	48	No. 4320	40.0	4150	Factory SP bullet
Jacketed	48	No. 3031	37.0	3871	Factory SP bullet
Jacketed	48	No. 3031	39.0	4040	Factory SP bullet—maximum
Jacketed	50	No. 4320	39.0	4050	WM 8S bullet
Jacketed	50	No. 4350	42.0	3896	WM 8S bullet
Jacketed	50	No. 4759	18.0	2720	WM 8S bullet
Jacketed	55	No. 4350	42.0	3600	WM 8S bullet
Jacketed	55	No. 4759	16.0	2330	WM 8S bullet
Jacketed	55	No. 4759	18.0	2535	WM 8S bullet
Jacketed	55	No. 4759	25.0	3235	WM 8S bullet
Jacketed	55	No. 4064	35.0	3360E	WM 8S bullet
Jacketed	55	No. 4064	37.0	3500	WM 8S bullet
Jacketed	55	No. 4064	38.5	3780E	WM 8S bullet
Jacketed	55	No. 4320	38.5	3750E	WM 8S bullet
Jacketed	63	No. 4064	36.5	3420	Sisk bullet
Jacketed	63	No. 3031	35.0	3290	Sisk bullet
Jacketed	65	No. 4350	40.0	3555	WM 8S bullet

NOTE: Other bullets may be used with equal success.

K- .220 Swift

TOOLS: 310 (No. 5) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
5	5	Large	Small	169	Med.	.224	169	Use bullet number

IDEAL BULLETS:

Note: Same loads as Standard Swift for cast bullets.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR JACKETED BULLETS:					
Jacketed	55	No. 4064	41.0	4045	Morse 8S bullet
Jacketed	50	No. 4320	41.0	4150	Morse 8S bullet
Jacketed	50	No. 4895	42.0	4335	Morse 8S bullet
Jacketed	55	No. 4895	40.0	4000	Sisk Ex bullet

.222 Remington

TOOLS: 310 (No. 222) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
26	25	Small	Small	222	Med.	.224	222	Use bullet number

IDEAL BULLETS:

43 grs.

#225438 Probably best bullet for 222 Rem.

47.5 grs.

#224450 225415 may also be used.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
225438	43	Unique	4.0	1300E	
225438	43	No. 4759	9.0	1850E	
225438	43	No. 4227	9.0	1750E	
224450	47.5	No. 4227	12.0	2450E	Slower velocity will be more accurate
LOADS FOR JACKETED BULLETS:					
Any Jacket	50	No. 4759	14.0	2668	
Any Jacket	55	No. 4759	13.0	2440	Uniform Velocity
Any Jacket	50	No. 4227	17.0	2885	
Any Jacket	55	No. 4227	16.0	2640	Uniform Velocity
Any Jacket	55	No. 4198	19.0	2810	
Any Jacket	55	No. 4198	20.0	2970	Best load
Any Jacket	55	No. 4198	21.0	3100	MAX.

.25-20 Repeater

TOOLS: 310 (No. 3) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
10	10	Small	Small	10	Small	.257	10	Use bullet number

IDEAL BULLETS:

65 grs.

#257420 Fine light weight bullet for 25-20.

85 GRS.

#257283 Standard plain base bullet for 25-20.

85 grs.

#257312 Successful bullet in 25-20. Seat to middle band except for tubular magazine. Crimp in forward groove for tubular magazine.

LOADS FOR CAST BULLETS:

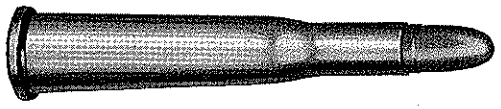
Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
257420	65	No. 2400	8.0	1620	
257420	65	No. 4759	9.0	1560	
257420	65	No. 4759	10.0	1770	Any bullets of similar wt. may be used
257420	65	No. 4227	9.0	1700E	
257420	65	Unique	4.5	1500E	
257283	85	Unique	5.0	1300E	
257283	85	No. 4759	6.3	1307	
257312	85	No. 4759	10.0	1770	
257312	85	No. 2400	8.0	1572	

.25-20, cont.

LOADS FOR JACKETED BULLETS:

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
Factory Jacketed	60	No. 4227	9.7	1785	
Factory Jacketed	60	No. 2400	10.0	2060	
Factory Jacketed	60	No. 4227	12.7	2195	MAX.
Factory Jacketed	86	No. 4759	7.5	1425	
Factory Jacketed	86	No. 4227	8.7	1410	
Factory Jacketed	86	No. 4759	10.0	1620	

.25-35 Winchester



TOOLS: 310 (No. 6) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
6	6	Large	Small	11	Med.	.257	11	Use bullet number

IDEAL BULLETS:

#257231 Plain base bullet. Can be had in 66 gr., 88 gr., and also 111 gr.

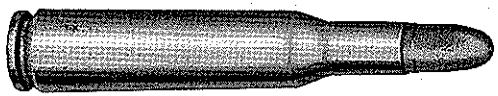
111 grs.

#257325 Excellent, has check bullet for 25-35 and Rem. Auto.

.25-35 Winchester, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
257231	88	No. 4759	8.0	1375	
257231	111	Unique	7.0	1400	
257231	111	No. 4759	9.3	1425	
257325	111	No. 2400	13.0	1850	
257325	111	No. 2400	11.0	1650	
257325	111	No. 4198	15.5	1800E	
257325	111	Hi-Vel No. 2	20.0	2000E	
LOADS FOR JACKETED BULLETS:					
Jacketed	60	No. 2400	18.0	2595	
Jacketed	86	No. 4759	12.0	1700E	86 or 87 gr. factory bullet
Jacketed	86	Hi-Vel No. 2	26.6	2711	86 or 87 gr. factory bullet max.
Jacketed	87	No. 2400	16.0	2125	
Jacketed	87	No. 4198	19.0	2260	
Jacketed	87	No. 4198	21.5	2560	
Jacketed	87	No. 3031	30.0	2795	
Jacketed	87	No. 4320	32.0	2730	
Jacketed	100	No. 4198	21.0	2365	
Jacketed	100	No. 3031	27.0	2450	
Jacketed	100	No. 4320	29.0	2465	
Jacketed	117	No. 2400	14.0	1740	
Jacketed	117	No. 4198	17.5	1930	
Jacketed	117	No. 4198	20.5	2210	Maximum
Jacketed	117	Hi-Vel No. 2	24.2	2365	Maximum
Jacketed	117	No. 3031	26.5	2350	Maximum
Jacketed	117	No. 4320	28.0	2295	Maximum

.25 Remington (Rimless)



TOOLS: 310 (No. 6) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
15	15	Large	Small	133	Med.	.257	133	Use bullet number

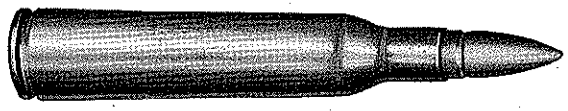
IDEAL BULLETS:

Note: Use same Cast bullets and loads as 25-35 Win.

.25 Remington, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR JACKETED BULLETS:					
Jacketed	60	No. 2400	19.0	2700E	
Jacketed	60	No. 2400	29.9	3040	Max. load S. D. .285"
Jacketed	60	No. 4227	23.5	2675	
Jacketed	87	No. 2400	18.0	2256	
Jacketed	87	Hi-Vel No. 2	27.0	2663	Maximum
Jacketed	100	No. 2400	14.0	1800	O. P. bullet
Jacketed	100	No. 3031	27.0	2396	O. P. bullet
Jacketed	117	No. 2400	18.0	2000	Maximum
Jacketed	117	No. 3031	21.5	1900	
Jacketed	117	No. 3031	26.0	2225	Maximum
Jacketed	117	Hi-Vel No. 2	26.9	2419	

.257 Roberts



TOOLS: 310 (No. 2) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
8	8	Large	Small	166	Med.	.257	166	Use bullet number

IDEAL BULLETS:

75 grs.

#257463 New Loverin bullet for all 25 cal. barrels.

Fine small game bullet in 257 Roberts and others. #257312

85 grs.

.257 Roberts, cont.

97 grs.

#257464 Heavier Loverin bullet which should show extreme accuracy with right load.

Standard bullet for 257 Roberts. Sometimes proves more accurate in some barrels if hollow pointed. #257418

100 grs.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
257463	75	No. 4759	15.0	1920	
257463	75	No. 3031	25.0		Other bullets of similar wts. may be used
257463	75	No. 4198	19. to 21.		
257312	85	No. 4198	22.0		
257312	85	No. 4227	17.0		
257312	85	No. 2400	15.0		
257312	85	No. 4759	10.0	1400E	
257312	85	No. 4895	19.0		Duplex load
		No. 6 Pistol	2.5		
257312	85	No. 4759	14.0	1850E	Nos. 257463 and 257464 are new bullets designed by H. Guy Loverin
257464	97	No. 4759	13.0	1575E	
257464	97	No. 2400	18.0	2000E	
257464	97	No. 4198	20.0	1900E	
257464	97	No. 4895	15.0	1600E	Duplex load
		No. 6 Pistol	3.0		
257418	100	Unique	11.0	1805	
257418	100	No. 4759	13.0	1550	
257418	100	No. 4198	20.0	1880E	
LOADS FOR JACKETED BULLETS:					
Jacketed	60	No. 4064	42.5	3200E	.25-20 bullet
Jacketed	60	No. 4320	42.5	3200E	.25-20 bullet
Jacketed	87	Hi-Vel No. 2	33.0	2870	
Jacketed	87	No. 3031	36.0	2300	
Jacketed	87	No. 3031	40.5	3220	Maximum load
Jacketed	87	No. 4064	43.5	3250	Maximum load
Jacketed	87	No. 4320	39.0	2850E	
Jacketed	87	No. 4320	45.0	3163	Maximum, Rem. HS bullet

.257 Roberts, cont.

Jacketed	100	No. 3031	38.5	2920	
Jacketed	100	No. 4320	41.0	3014	
Jacketed	100	No. 4064	41.0	2995	Maximum load
Jacketed	100	No. 4895	35.0	2700E	
Jacketed	110	No. 4320	36.5	2800E	
Jacketed	117	No. 2400	16.0	1660	
Jacketed	117	No. 2400	18.3	2085	
Jacketed	117	No. 3031	36.0	2660	Maximum load
Jacketed	117	No. 4320	38.0	2875	
Jacketed	117	No. 4064	38.0	2705	
Jacketed	125	No. 4350	45.0	2900	Barnes bullet, MAX.

6.5 M/M Jap (25 cal.)

TOOLS: 310 (No. 2) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
2	2	Large	Small	137	Med.	.266	137	Use bullet number

IDEAL BULLETS:

118 grs.

#266454 Lightest bullet for Jap rifle. Loverin design. Same bullet as 266455 except shorter. 100 grs.

#266455 Medium weight Bullet for Jap rifle. Loverin design. Has proved successful.

145 grs.

#266469 Heaviest bullet for Jap rifle. Has proved successful and should make good game bullet. Newest Loverin design.

6.5 M/M Jap, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
266454	100	No. 4759	13.0	1500E	These bullets can be shot as cast in some oversize Jap. barrels. Ordinarily .268 dia. will perform excellently. Accurate
266454	100	Unique	10.0	1600E	
266454	100	No. 4198	17.0	1700E	
266455	118	No. 4198	20.0	1800E	
266469	145	No. 4198	20.0	1600E	
266469	145	No. 4198	22.0	1700E	
266469	145	No. 4198	25.0	1850E	Hunting accuracy
LOADS FOR JACKETED BULLETS:					
Jacketed	120	Hi-Vel No. 2	31.0	2500E	Speer S. P.
Jacketed	120	No. 4064	36.0	2800E	Speer S. P.
Jacketed	129	Hi-Vel No. 2	35.0	2625E	Speer S. P.
Jacketed	156	No. 4350	38.5	2600E	Norma S. P.
Jacketed	162	Hi-Vel No. 2	29.2	2100E	Full Metal Patch
Jacketed	162	No. 4350	37.0	2500E	Full Metal Patch
All diameters .263-.264					

NOTE: Cases may be formed from .35 Rem. brass with Ideal Full Length Die.

.250-3000

TOOLS: 310 (No. 2) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
2	2	Large	Small	143	Med.	.257	143	Use bullet number

IDEAL BULLETS:

65 grs.

#257420 Fine bullet for short range. Very accurate for 75 yds.

New bullet designed by H. Guy Loverin. Should prove very accurate. #257463

75 grs.

.250-3000, cont.

80 grs.

#257388 Standard Spitzer pointed bullet for 250-3000.

This 25-20 bullet has proved successful in .250-3000. #257312

85 grs.

85 GRS.

#257283 Good bullet for medium velocity.

Another new Loverin bullet which should also prove very successful. #257464

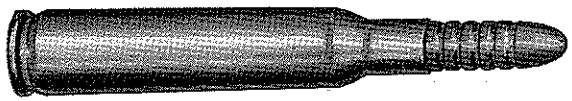
97 grs.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
257420	65	Bullseye	4.9	1100E	Very accurate at 75 yds.
257420	65	Bulk Smokeless	8.5	1200E	
257463	75	No. 4198	14.5	1600E	
257463	75	No. 4759	13.0	1700E	
257463	75	No. 2400	15.0	2000E	
257463	75	No. 4227	12.5	1700E	
257388	80	No. 4759	13.0	1700	
257388	80	No. 2400	15.5	2100E	
257388	80	No. 4198	15.0	1500E	
257312	85	No. 4198	16.5	1900E	
257283	85	No. 4759	8.0	1300	
257283	85	No. 4759	13.0	1700	
257464	97	No. 4759	10.0	1200E	
257464	97	No. 4759	13.0	1675E	
257464	97	No. 4198	15.5	1775E	
257464	97	No. 4198	16.0	1850E	
257464	97	No. 4198	18.5	1950E	
LOADS FOR JACKETED BULLETS:					
Jacketed	60	No. 4227	29.5		
Jacketed	60	No. 4198	28.5	2700E	
Jacketed	60	No. 3031	39.0	3500E	
Jacketed	70	No. 3031	37.0	3200E	WTCW bullet
Jacketed	70	No. 3031	39.0	3350E	WTCW bullet
Jacketed	70	No. 4064	38.0	3150	WTCW bullet

.250-3000, cont.

Jacketed	70	Hi-Vel No. 2	33.0	3200	WTCW bullet
Jacketed	87	No. 4759	12.0	1500	Very accurate small game load
Jacketed	87	No. 2400	16.4	2200	
Jacketed	87	No. 2400	20.5	2565	Maximum load
Jacketed	87	No. 3031	36.5	3110	Maximum load
Jacketed	87	No. 4064	38.0	3095	Maximum load
Jacketed	100	No. 2400	19.8	2290	Maximum load
Jacketed	100	No. 4320	36.0	2820	Maximum load
Jacketed	100	No. 4064	35.5	2750E	
Jacketed	100	No. 4064	34.5	2625E	
Jacketed	100	No. 4064	36.5	2885	Maximum load

6.5 M/M Mannlicher-Schoenauer



TOOLS: 310 (No. 5) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
5	2	Large	Small	137	Med.	.268	137	Use bullet number

IDEAL BULLETS:

118 grs.

#266454 Light bullet by Loverin for 6.5 MM and 25 Jap. Same as 266455, only shorter.

#266455 Heavier bullet by Loverin which has proved successful.

Plain base bullet for 6.5 MM for light loads #266324

115 grs.

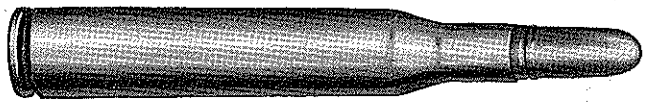
145 grs.

#266469 New bullet by Loverin which has proved excellent in 25 cal. Jap and should perform the same in 6.5 Mann-Schoen.

6.5 M/M M.-S., cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
266454	100	No. 4759	14.0	1550E	
266454	100	Unique	11.0	1600E	
266454	100	No. 4198	17.0	1650E	
266324	115	No. 4759	14.5	1575E	
266455	118	No. 4198	20.5	1800E	
266469	145	No. 4198	21.0	1600E	
266469	145	No. 4198	22.0	1700E	
266469	145	No. 4198	26.0	1850E	
LOADS FOR JACKETED BULLETS:					
Jacketed	129	No. 3031	37.5	2580	Maximum
Jacketed	140	No. 3031	36.0	2450	Maximum
Jacketed	140	Hi-Vel No. 2	36.0	2475	
Jacketed	156	No. 4350	38.5	2550E	Norma S. P.
Jacketed	160	No. 4064	32.0	1990	Round nose
Jacketed	160	No. 4064	37.0	2260	Round nose
Jacketed	160	Hi-Vel No. 2	32.7	2177	
Jacketed	162	No. 4350	38.5	2600E	Full Patch

.270 Winchester



TOOLS: 310 (No. 2) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
2	2	Large	Small	153	Large	.280	153	Use bullet number

IDEAL BULLETS:

103 grs.

#280468-S A new bullet designed by H. Guy Loverin. Should prove to be very successful for light loads.

.270 Winchester, cont.

125 grs.

A heavier bullet similar to preceding. Also a new Loverin bullet. #280468-L

138 grs.

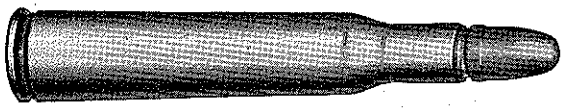
#280412 A standard bullet for 270 Win. Accuracy not quite equal to above bullets of Loverin design.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
280468-S	107	No. 4198	19.0	1750	No. 280468 Short\ New Lover-
280468-S	107	No. 4759	16.0	1767	No. 280468 Long/ in bullets
280468-S	107	No. 2400	13.0	1500E	
280468-S	107	Unique	9.0	1500E	
280468-S	107	No. 4198 / No. 6 pistol	14.0 / 3.0	1800E	Duplex load
280468-L	123	Unique	8.0	1375E	
280468-L	123	No. 4759	16.0	1750E	
280468-L	123	No. 4198	18.0	1545E	
280412	138	Unique	8.0	1240	
280412	138	No. 4759	16.0	1800E	Accuracy of this bullet is sometimes improved by Hollow Pointing
280412	138	No. 4759	12.0	1400E	
280412	138	No. 3031	23.0	1900E	
280412	138	No. 2400	13.0	1445	
LOADS FOR JACKETED BULLETS:					
Jacketed	95	Hi-Vel No. 2	38.0	2710	
Jacketed	95	Hi-Vel No. 2	48.0	3250	Maximum load
Jacketed	95	No. 4064	52.0	3300E	
Jacketed	95	No. 4320	54.5	3310E	
Jacketed	100	No. 4064	50.0	3400E	
Jacketed	100	No. 3031	50.0	3250	
Jacketed	100	No. 4320	54.0	3280E	
Jacketed	100	No. 4198	18.0	1900	
Jacketed	130	Hi-Vel No. 2	36.0	2310	
Jacketed	130	Hi-Vel No. 2	47.8	3020	Maximum load
Jacketed	130	No. 3031	48.0	3051	Maximum load

.270 Winchester, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR JACKETED BULLETS (Cont.):					
Jacketed	130	No. 4064	49.5	3090	Maximum load
Jacketed	130	No. 4320	50.0	3000E	
Jacketed	130	No. 4320	52.0	3110	Maximum load
Jacketed	130	No. 4350	60.0	3050	
Jacketed	145	No. 4064	47.0	3000E	
Jacketed	150	No. 4350	54.0	2960	Maximum load
Jacketed	160	No. 4350	53.0	2800	Barnes bullet

7 M/M Mauser



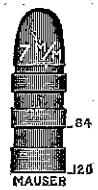
TOOLS: 310 (No. 2) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
2	2	Large	Small	116	Med.	.287	116	Use bullet number

IDEAL BULLETS:

#285227 Round ball for cellar loads or small-game at short range. 35 grs.

Can be furnished in 84 gr. weights. Standard short range bullet. #285202



125 grs.

#285448 Splendid bullet by Loverin.

Heavier bullet for 7MM rifles. Suitable for hunting loads. #285346

138 grs.

7 M/M Mauser, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
285227	35	Bullseye	2.5	1000E	Rd. Ball for 25 yds.
285202	84	Unique	4.0	1200E	No. 285364-89 gr. pointed bullet may be used.
285202	84	No. 4759	6.0	1200E	
285202	120	No. 4759	10.0	1300E	
285202	120	No. 2400	14.0	1700E	
285202	120	No. 4198	17.5	1700E	
285448	125	No. 2400	15.0	1700E	Note: No. 285448 Loverin bullet considered most accurate
285448	125	No. 4198	17.5	1700E	
285448	125	No. 4227	14.5	1700E	
285346	138	No. 4759	16.6	1775	
285346	138	No. 2400	19.0	1800	No. 285442 may be substituted
285346	138	Hi-Vel No. 2	30.0	2185	
LOADS FOR JACKETED BULLETS:					
Jacketed	105	No. 4064	46.0	2988	Barnes bullet
Jacketed	105	No. 4064	48.0	3098	Barnes bullet
Jacketed	105	No. 4064	50.0	3280	Barnes bullet
Jacketed	139	Hi-Vel No. 2	31.0	2160	
Jacketed	139	Hi-Vel No. 2	42.0	2840	Maximum load
Jacketed	139	No. 3031	42.5	2920	Maximum load
Jacketed	139	No. 4064	44.0	2780	
Jacketed	139	No. 4064	45.0	2815	
Jacketed	139	No. 4064	46.0	2905	Maximum load
Jacketed	145	No. 3031	40.0	2700E	Barnes bullet
Jacketed	145	No. 4350	47.0	2950E	Barnes bullet
Jacketed	160	No. 4064	45.0	2461	Barnes bullet
Jacketed	160	No. 4350	48.0	2636	Barnes bullet
Jacketed	160	No. 4350	50.0	2850	Barnes bullet
Jacketed	160	No. 3031	39.0	2580E	Barnes bullet
Jacketed	175	No. 4320	42.0	2580	Maximum load
Jacketed	175	No. 4064	42.0		Maximum load
Jacketed	175	Hi-Vel No. 2	39.8	2540	Maximum load
Jacketed	180	No. 3031	38.0	2450E	Barnes bullet
Jacketed	180	No. 3031	39.0	2500E	Barnes bullet — Maximum
Jacketed	180	No. 4350	47.0	2600E	Barnes bullet — Maximum

NOTE: Due to the wide variation in rifles and actions for the 7 m/m Mauser cartridge, maximum loads should never be used in tight chambers or other than Bolt Actions. Do not use maximum loads in Model 1893 Mauser rifles.

.30 M1 U. S. Carbine

TOOLS: 310 (No. 30M1) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
23	19	Small	Large	29	Short	.308	29	Use bullet number

IDEAL BULLETS:

109 grs.

#311359 Will not mangle small game.

Excellent small game bullet #311316

111 grs.

115 grs.

#3118 Plain base bullet. Cannot be driven as fast as above two bullets.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
311359	109	No. 2400	14.0	2100E	If charges are lowered too much malfunction of the arm will result.
311316	111	No. 2400	14.0	2100E	
3118	115	No. 2400	14.0	2100E	
LOADS FOR JACKETED BULLETS:					
Luger S.P.	93	No. 2400	14.0	2000E	Note: These loads have been tried and we pass them along assuming no responsibility for failures etc. All appear safe.
M.G.S.	110	No. 2400	13.0	1900E	
M.G.S.	110	No. 2400	13.5		Consider this Max.
M.G.S.	110	No. 4227	13.5		No. 4227 not too well suited
M.G.S.	110	No. 4227	14.0		
M.G.S.	110	Unique	6.5		
M.G.S.	110	Unique	7.0		Heavy muzzle blast
M.G.S.	110	Unique	7.5		Fired cases appear same as fired issue cases. Heavy muzzle blast

NOTE: Other bullets of similar weight can be substituted.

.30-30 Winchester

and

.30 Remington (Rimless)

TOOLS: 310 (No. 6) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
6	6	Large	Large	13	Med.	.311	13	Use bullet number

IDEAL BULLETS:

87 grs.

#31113 Round ball for cellar load and small game at close range. 45 grs.

#308245 Same as above but can be loaded heavier as needed.

125 and 154 gr. weights giving excellent performance. Standard plain base for 30 cal. #308241

165 grs.

#308291 Can be loaded heavier than #308241. Good deer bullet. Standard 30-30 gas check bullet.

Standard Spitzer point bullet for 30 cal. rifles. #311413 Extremely accurate. Not for use in tubular magazine.

169 grs.

Note: The new Loverin Bullets #311465 and #311466 can be substituted for #308241-125 gr. and #308241-154 gr. Should prove extremely accurate when properly loaded.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
31113	45	Bullseye	2. to 3.	900E	Rd. ball cellar and small game load No. 31358 may be substituted
308245	87	Bullseye	3.5	1200E	
308245	87	No. 4759	7.5	1300E	
308241	125	No. 2400	16.0	1765	New Loverin bullet No. 311465 can be used
308241	125	Unique	13.0	1350	
308241	154	No. 4759	10.0	1300	
308241	154	Unique	9.0	1300E	
308241	154	No. 4198	18.0	1677	New Loverin bullet No. 311466 can be substituted for 154 gr. to 169 gr. bullets
308291	165	No. 4759	14.0	1500E	
308291	165	No. 2400	20.0	2000E	
311413	169	No. 2400	16.0	1715	No. 311413 not for use in tubular magazines
311413	169	No. 2400	20.1	2050	

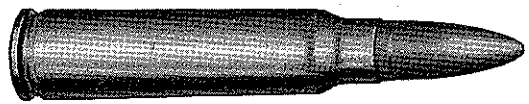
NOTE: A fine squirrel load consists of bullet No. 3118 using 5.0 gr. No. 5066 pistol powder or 4.0 to 4.5 gr. No. 6 pistol powder.

LOADS FOR JACKETED BULLETS:

Jacketed	110	No. 2400	21.3	2435	Hi-Speed bullet maximum
Jacketed	110	No. 4198	32.5	2745	Maximum
Jacketed	150	No. 2400	24.2	2250	Maximum
Jacketed	150	No. 4198	27.0	2305	Maximum
Jacketed	150	Hi-Vel No. 2	30.9	2300	Maximum
Jacketed	170	Lightning	23.6	2000	Original, 30-30 load
Jacketed	170	Hi-Vel No. 2	30.0	2175	Maximum
Jacketed	170	No. 3031	33.5	2300	Maximum

NOTE: Many other combinations could be listed but are too numerous to mention.

.300 Savage



TOOLS: 310 (No. 2) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
2	2	Large	Large	146	Med.	.311	146	Use bullet number

IDEAL BULLETS:

85 grs.

#311419 Light bullet for short range shooting.

.300 Savage, cont.

111 grs.

32-20 bullet. Will not mangle game. #311359

#311316 32-20 bullet. Makes fine H.P.

109 grs.

150 grs.

New Loverin bullet. Should prove most accurate. #311465

#311414 Standard gas check bullet for .300 Savage.

120 grs.

153 grs.

.30 Squibb bullet. #311413

#311466 New Loverin bullet of medium weight.

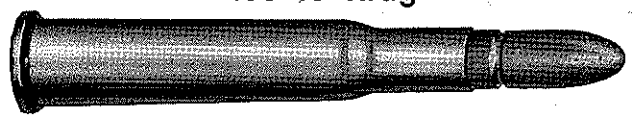
169 grs.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
311419	85	Unique	10.0	1875	Lightest practical bullet for 300 Sav.
311359	109	Unique	13.0	2000	
311316	111	Unique	13.0	2000E	
311465	125	No. 4759	12.0	1600E	New Loverin bullet No. 311465
311414	150	No. 2400	16.0	1800	
311466	153	No. 4759	18.0	1800E	New Loverin bullet No. 311466 may be substituted for 150 to 169 gr. loads.
311413	169	No. 4759	15.0	1700E	

.300 Savage, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR JACKETED BULLETS:					
Jacketed	80	No. 2400	28.5	3000	.32-20 bullet
Jacketed	85	Hi-Vel No. 2	38.0	2750	.30 Mauser bullet
Jacketed	93	No. 3031	45.0	2950	.30 Luger bullet
Jacketed	100	Hi-Vel No. 2	38.0	2700	.32-20 bullet
Jacketed	100	No. 3031	42.0	2700	.32-20 bullet
Jacketed	100	No. 4198	36.0	2700	.32-20 bullet
Jacketed	110	No. 2400	23.0	2340	
Jacketed	110	No. 2400	32.2	2860	Maximum load
Jacketed	110	Hi-Vel No. 2	42.8	3120	Maximum load
Jacketed	110	No. 4198	35.0	2550	
Jacketed	110	No. 4198	40.0	3120	Maximum load
Jacketed	150	Hi-Vel No. 2	39.2	2710	Maximum load
Jacketed	150	No. 4198	35.5	2600	Maximum load
Jacketed	150	No. 3031	41.0	2565	
Jacketed	170	Hi-Vel No. 2	36.7	2490	.30-30 bullet
Jacketed	173	Hi-Vel No. 2	36.0	2430	M1 boattail bullet
Jacketed	173	No. 4198	33.0	2380	M1 boattail bullet
Jacketed	173	No. 3031	39.5	2390	M1 boattail bullet
Jacketed	173	Hi-Vel No. 2	33.0	2200	M1 bullet — match load
Jacketed	180	Hi-Vel No. 2	36.0	2430	Maximum load
Jacketed	180	No. 3031	40.0	2450	
Jacketed	180	No. 4198	34.0	2375	Maximum load

.30-40 Krag



TOOLS: 310 (No. 5) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
7	7	Large	Large	15	Med.	.311	15	Use bullet number

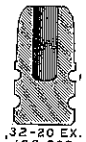
IDEAL BULLETS:

77 grs.

#31358 Rd. ball—cellar load. 47 grs.

#308252 25 yd.-35 yd. bullet.

32-30 Hollow point. Good for small game in 30-40 Krag. #31133



115 grs.

#3118 Same as above except solid point.

Standard 30-30 bullet 125 gr. and 154 gr. #308241 Good in Krag.

.30-40 Krag, cont.

165 grs.

#308291 Standard 30-30 gas check bullet. Good in Krag.

Standard Squibb bullet for all 30 cal. rifles. #311413

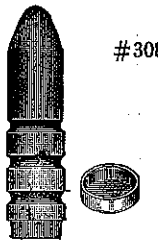
169 grs.

180 grs.

#311467 New Loverin bullet. Should surpass others in accuracy.

Standard plain base bullet for Krag. #308278

197 grs.



207 grs.

#308284 Standard gas check bullet for Krag.

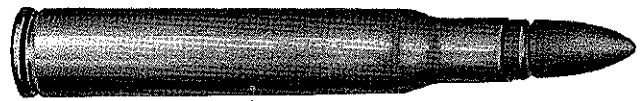
Note: The new Loverin bullets can be used with these where bullet wts. are similar.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
31358	47	Bullseye	3.0	900E	Round ball — cellar and small game load
308252	77	Bullseye	3.5	900E	25-35 yd. load
31133	100	Unique	8.0	1580	Hollow Point
311359	109	Unique	8.0	1500	
3118	115	Unique	11.0	1770	Nos. 311465, 311359, 311316, 308241 125 gr. may be substituted for any 100 to 125 gr. load
3118	115	No. 4759	14.0	1500	
3118	115	No. 2400	16.0	1700E	
308241	125	No. 4759	14.2	1519	

.30-40 Krag, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS (Cont.):					
308241	125	No. 4198	15.0	1500E	
308241	154	No. 4227	19.0	1700E	
308241	154	No. 4759	12.0	1325E	New Loverin bullet No. 311466 can be used with any 154 to 169 gr. load
308291	165	No. 4759	18.0	1600E	
308291	165	No. 2400	16.0	1500E	
308291	165	No. 4759	22.0	1700	
308291	165	No. 4227	18.0	1600E	
311413	169	No. 2400	19.5	1800E	Accurate to 200 yds. No. 308375 may be substituted
311467	180	Hi-Vel No. 2	24.0	1650E	No. 311467 new Loverin bullet
311467	180	Unique	10.0	1400E	No. 308329 may be substituted for 180 gr. loads
311467	180	No. 4759	15.0	1500E	
311467	180	No. 4198	23.0	1700E	
308278	197	No. 4759	14.9	1340	
308284	207	No. 4759	18.0	1650E	
308284	207	No. 4759	22.0	1815	
LOADS FOR JACKETED BULLETS:					
Jacketed	80	No. 2400	33.6	3350	Maximum load
Jacketed	80	Hi-Vel No. 2	36.0	2740	
Jacketed	80	Hi-Vel No. 2	43.2	3310	Maximum load
Jacketed	110	No. 4198	37.9	2885	Maximum load
Jacketed	110	Hi-Vel No. 2	41.1	3040	Maximum load
Jacketed	110	No. 3031	45.5	2950	Maximum load
Jacketed	115	Unique	11.0	1800	
Jacketed	150	Hi-Vel No. 2	38.2	2680	Maximum load
Jacketed	150	No. 3031	42.0	2665	Maximum load
Jacketed	150	No. 4064	46.0	2770	Maximum load
Jacketed	173	No. 2400	19.0	1685	M1 boattail bullet
Jacketed	173	No. 4064	42.0	2565	Maximum load
Jacketed	180	No. 3031	36.5	2345	Maximum load
Jacketed	180	Hi-Vel No. 2	36.0	2450	Maximum load
Jacketed	180	No. 4064	40.0	2425	Maximum load
Jacketed	180	No. 4895	38.0	2297	Powder lot No. 2192. Low pressure
Jacketed	180	No. 4350	46.0	2478	Accurate — safe load
Jacketed	220	No. 4350	44.0	2330	Near maximum — safe load
Jacketed	220	Hi-Vel No. 2	33.0	2000	Equal to Krag service load
Jacketed	220	No. 3031	36.0	2100	Maximum
Jacketed	220	No. 4064	39.0	2200	Maximum

.30-06



TOOLS: 310 (No. 2) Tru-Line Jr. Tru-Line Sr.

.30-06, cont.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
2	2	Large	Large	123	Large	.311	123	Use bullet number

IDEAL BULLETS:

111 grs.

#311316 32-20 bullet. Good in 30-06 for small game.

New Loverin bullet, light. #311465

120 grs.

153 grs.

#311466 New Loverin bullet, medium.

Standard 30-30 bullet. Good in 30-06 in both wts. #308241

165 grs.

#308291 Standard gas check bullet for 30-30. But good game bullet for 30-06 rifle.

Standard 30-06 Squibb bullet. Accurate. #311413

169 grs.

180 grs.

#311467 New Loverin bullet, heavy. Should be excellent on game particularly if hollow pointed.

Standard Spitzer bullet for Springfield. #308329

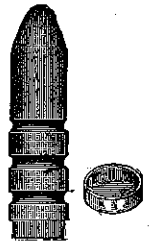
185 grs.

.30-06, cont.

194 grs.

#308334 Another good bullet for 30-06 rifles.

Krag bullet. Good in 30-06 as game bullet. Excellent hollow pointed. #308284



207 grs.

LOADS FOR CAST BULLETS:

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
311316	111	No. 4198	16.0	1600E	Substitute No. 311359
311316	111	No. 2400	18.0	1700E	Substitute No. 311359
311316	111	No. 4759	14.0	1500E	Substitute No. 311359
311465	125	No. 4759	14.0	1375E	Substitute No. 308241-215 gr. new bullet designed by H. Guy Loverin
311465	125	No. 4198	20.0	1800E	
311465	125	No. 2400	20.0	1900E	
311466	153	No. 4759	12.0	1100E	Note: Interchange No. 308241 and No. 311466 with any of these charges·
311466	153	No. 2400	20.0	1800E	
311466	153	No. 4198	23.0	1950E	
311466	153	Unique	10.0	1500E	No. 311466 — new bullet by H. Guy Loverin
311466	153	No. 2400	16.0	1450E	
308241	154	No. 4759	19.0	1713	
308241	154	No. 4198	23.0	1763	
308291	165	No. 4064	36.0	1900E	Deer loads — substitute No. 311413
308291	165	No. 4895	35.0	1900E	
311413	169	No. 4895	25.0	1700E	Note: Nos. 308291 and 311413 are interchangeable with any of these loads
311413	169	No. 4198	23.0	1700E	
311413	169	No. 4759	18.0	1600E	
311413	169	No. 4227	15.0	1400	
311413	169	No. 4759	15.0	1252	
311413	169	No. 4759	18.0	1432	
311413	169	No. 2400	24.0	1965	
311413	169	Hi-Vel	35.0	2120	
311413	169	No. 4895 / No. 6 Pistol / No. 4198	23.0 / 4.0 / 23.0	1750E	Duplex loads by Paul Mansfield
311413	169	No. 6 Pistol	3.0	1750E	Duplex loads
311467	180	No. 4759	20.0	1725E	New bullet designed by H. Guy Loverin No. 311467
311467	180	No. 4198	25.0	1575E	
311467	180	Hi-Vel No. 2	30.0	1800E	
311467	180	No. 4895	27.0	1650E	
308329	185	No. 4227	12.0	1330E	
308329	185	No. 4759	17.0	1400	
308329	185	No. 4198	26.0	1750E	
308329	185	Hi-Vel No. 2	25.0	1700E	
308329	185	Unique	15.0	1650E	
308334	194	No. 4227	12.0	1300	
308334	194	No. 4759	30.0	2400E	
308334	194	No. 2400	19.5	1600E	

.30-06, cont.

LOADS FOR CAST BULLETS (Cont.):

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
308284	207	Hi-Vel No. 2	25.0	1580	
308284	207	Hi-Vel No. 2	34.0	2060	
308284	207	No. 2400	22.0	1750	
308284	207	Unique	15.0	1530	
308284	207	No. 4064	40.0	2000E	

LOADS FOR JACKETED BULLETS:

(In special tight chambered barrel, reduce maximum charges two grains).

Jacketed	74	No. 2400	42.5	3800	.32 auto bullet
Jacketed	74	No. 2400	30.0	2900	.32 auto bullet
Jacketed	74	No. 2400	18.0	2000	.32 auto bullet
Jacketed	80	No. 2400	34.0	3000	.32-20 bullet
Jacketed	80	Hi-Vel No. 2	43.0	2775	.32-20 bullet
Jacketed	85	Hi-Vel No. 2	43.0	2760	.30 Mauser bullet
Jacketed	93	No. 2400	29.0	2650	.30 Luger bullet
Jacketed	93	Hi-Vel No. 2	52.8	3500	.30 Luger bullet
Jacketed	93	No. 4320	57.0	3200	.30 Luger bullet
Jacketed	93	Hi-Vel No. 2	35.0	2400	.30 Luger bullet
Jacketed	93	Hi-Vel No. 2	46.0	3120	.30 Luger bullet
Jacketed	93	No. 3031	54.0	3150E	.30 Luger bullet
Jacketed	100	No. 4198	27.0	2700	.32-20 bullet
Jacketed	100	No. 4064	48.0	2700	.32-20 bullet
Jacketed	100	Hi-Vel No. 2	43.0	2700	.32-20 bullet
Jacketed	100	No. 3031	47.0	2700	.32-20 bullet
Jacketed	110	No. 3031	50.0	2860	
Jacketed	110	No. 4759	30.0	2372	
Jacketed	110	No. 3031	54.5	3310	Maximum load
Jacketed	110	No. 4064	50.0	2710E	
Jacketed	110	No. 4064	56.0	3285	Maximum load
Jacketed	110	Hi-Vel No. 2	47.0	2600	
Jacketed	110	Hi-Vel No. 2	52.5	3300	Maximum load
Jacketed	110	No. 4320	60.5	3300	
Jacketed	110	No. 4895	62.0	3475	
Jacketed	115	Hi-Vel No. 2	47.0	2600	
Jacketed	115	No. 3031	47.0	2550	
Jacketed	115	No. 4064	48.0	2550	
Jacketed	115	No. 4198	27.0	2500	
Jacketed	125	No. 4350	59.0	3200	Barnes bullet
Jacketed	125	No. 3031	52.0	2960E	Barnes bullet
Jacketed	150	No. 4320	50.0	2800E	Barnes bullet
Jacketed	150	No. 4759	18.0	1508	Whelen small game load
Jacketed	150	No. 2400	22.0	2000E	
Jacketed	150	No. 4320	50.0	2800E	
Jacketed	150	Hi-Vel No. 2	45.0	2730	
Jacketed	150	No. 4064	57.0	3065	Maximum load (F. A. Primer)
Jacketed	150	No. 3031	54.0	3015	Maximum load (F. A. Primer)
Jacketed	150	No. 4320	57.5	3010	
Jacketed	150	No. 4064	54.0	3005	Maximum load (Comm. Primer)
Jacketed	153	No. 4895	36.0	2000	M2 bullet
Jacketed	153	No. 4895	45.2	2500	M2 bullet
Jacketed	153	No. 4895	47.0	2620	M2 bullet

Note: Maximum Loads with F. A. Primers should be reduced 4.0 grains for Commercial Primers.

.30-06, cont.

LOADS FOR JACKETED BULLETS (Cont.):

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
Jacketed	153	No. 4895	48.9	2710	M2 bullet
Jacketed	153	No. 4895	50.7	2800	M2 bullet
Jacketed	153	No. 4895	52.5	2900	M2 bullet
Jacketed	153	No. 4895	55.0	3060	
Jacketed	153	No. 4895	58.0	3230	Pressure 52,000 — danger
Jacketed	153	No. 4895*	50.0	2700	
Jacketed	153	No. 4895*	51.0	2735	
Jacketed	153	No. 4895*	52.0	2800	
Jacketed	153	No. 4895*	53.0	2880	
Jacketed	153	No. 4895*	54.0	2930	
Jacketed	153	No. 4895*	55.0	2950	
Jacketed	153	No. 4895*	56.0	3005	
Jacketed	153	No. 4895*	57.0	3055	
Jacketed	153	No. 4895*	58.0	3100	Pressure 52,000 — danger
Jacketed	153	No. 4895*	59.0	3160	Danger, pressure 54,000
Jacketed	153	No. 4895*	60.0	3185	Danger, pressure 55,000
Jacketed	153	No. 4895*	61.0	3250	Danger, pressure 58,000
Jacketed	153	No. 4895*	62.0	3300	Danger, pressure 62,000
Jacketed	160	No. 4759	25.0	1868	.30-30 bullet
Jacketed	170	No. 4198	36.5	2500	
Jacketed	170	No. 3031	43.0	2500	
Jacketed	170	No. 4320	45.0	2500	
Jacketed	170	No. 4064	45.0	2500	
Jacketed	170	Hi-Vel No. 2	44.0	2500	
Jacketed	173	Unique	13.2	1500	M1 bullet
Jacketed	173	No. 4759	20.0	1500	M1 bullet
Jacketed	173	Hi-Vel No. 2	36.4	2200	M1 bullet — 300 meter load
Jacketed	173	No. 3031	45.5	2800	Maximum load
Jacketed	173	No. 4064	48.0	2820	Maximum load
Jacketed	173	No. 4320	50.0	2800E	
Jacketed	173	No. 4350	57.0	2860	
Jacketed	180	Hi-Vel No. 2	36.4	2200	
Jacketed	180	Hi-Vel No. 2	45.0	2560	
Jacketed	180	No. 4198	41.0	2560	
Jacketed	180	No. 3031	48.5	2745	Maximum load
Jacketed	180	No. 4320	50.0	2650E	
Jacketed	180	No. 4320	53.5	2785	Maximum load
Jacketed	180	No. 4064	50.0	2710E	
Jacketed	200	No. 4350	59.0	2600	
Jacketed	200	Hi-Vel No. 2	37.8	2200	
Jacketed	200	Hi-Vel No. 2	40.0	2560	Maximum load
Jacketed	220	Hi-Vel No. 2	43.2	2405	Maximum load
Jacketed	220	No. 4320	49.0	2415	Maximum load
Jacketed	220	No. 4350	52.0	2100E	
Jacketed	225	No. 3031	42.0	2210	Maximum load
Jacketed	225	No. 4320	44.5	2340	Maximum load

*NOTE: This is a different lot of 4895 to show variation in lots. Handle this powder carefully!

.300 H. & H. Magnum

TOOLS: 310 (No. 8) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
13	13	Large	Large	168	Large	.311	168	Use bullet number

IDEAL BULLETS:

120 grs.

#311465 New Loverin bullet. Should prove successful in .300 Mag.

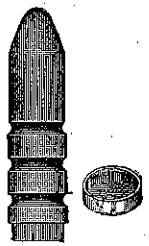
New Loverin bullet. Should prove very accurate #311466 at medium ranges.

153 grs.

180 grs.

#311467 New Loverin bullet recommended for long range shooting.

Heavy bullet for long range target and game #308284 shooting.

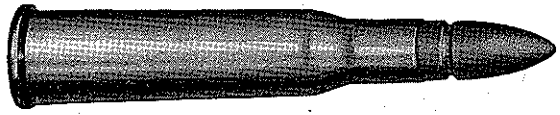


207 grs.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
311465	125	No. 4198	25.0	1800E	
311465	125	No. 4759	19.0	1400E	
311465	125	No. 2400	25.0	1900E	Note: Nos. 311413 and 308241 may be substituted for 153 gr. loads
		No. 4895	25.0		
311466	153	No. 6 Pistol	4.0	1900E	

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS (Cont.):					
311466	153	Unique	21.0	2070E	These estimated loads for 300 Magnum will afford the shooter a basis for further experimentation. All are considered safe
311466	153	No. 4759	23.0	1800E	
311467	180	No. 4759	25.0	1700E	
311467	180	No. 4198	30.0	1600E	
311467	180	Hi-Vel No. 2	35.0	1800E	
311467	180	No. 4895	32.0	1600E	
308284	207	No. 4895	38.0	1900E	
308284	207	Hi-Vel No. 2	39.0	2000E	
LOADS FOR JACKETED BULLETS:					
Jacketed	110	Hi-Vel No. 2	56.0	3035	
Jacketed	110	Hi-Vel No. 2	58.0	3600	Maximum load
Jacketed	110	No. 4064	55.0	3035	
Jacketed	110	No. 4064	67.5	3600	Maximum load
Jacketed	125	No. 3031	60.0	3300E	Barnes bullet
Jacketed	125	No. 3031	62.0	3500E	Barnes bullet — Maximum
Jacketed	150	No. 4350	68.0	3300E	
Jacketed	153	No. 4064	47.5	2530	M2 bullet
Jacketed	153	No. 4064	59.5	3060	M2 bullet
Jacketed	153	No. 4350	63.0	3000E	M2 bullet
Jacketed	173	No. 4064	47.5	2530	M1 bullet
Jacketed	173	No. 4064	59.5	3060	M1 bullet
Jacketed	173	No. 4350	67.0	3160E	M1 bullet
Jacketed	180	Hi-Vel No. 2	56.5	2854	
Jacketed	180	No. 4350	67.0	3125E	
Jacketed	180	No. 4064	57.5	3030	
Jacketed	220	No. 4064	44.5	2215	
Jacketed	220	No. 4064	55.6	2635	
Jacketed	220	Hi-Vel No. 2	55.0	2575	
Jacketed	220	Hi-Vel No. 2	56.0	2625	Maximum load
Jacketed	220	No. 4350	65.0	2639E	
Jacketed	225	No. 4064	44.5	2150	
Jacketed	225	No. 4064	55.5	2550	

7.62 M/M Russian



TOOLS: 310 (No. 10) Tru-Line Jr.

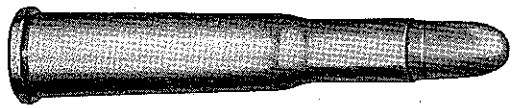
P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
16	17	Large	Large	163	Large	.311	163	Use bullet number

IDEAL BULLETS:

Note: Use same cast bullets and charges as 30-06.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR JACKETED BULLETS:					
Jacketed	150	Hi-Vel No. 2	36.0	2280	
Jacketed	150	No. 3031	50.0	3035	Maximum
Jacketed	173	No. 4320	48.5	2800	Maximum
Jacketed	220	No. 4064	45.0	2380	Maximum
Jacketed	220	No. 4350	46.0	2400E	

.303 Savage



TOOLS: 310 (No. 5) Tru-Line Jr. Tru-Line Sr.

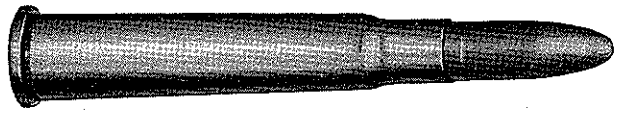
P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
5	7	Large	Large	16	Med.	.310	16	Use bullet number

IDEAL BULLETS:

Note: Use any cast bullets and charges for 30-30 Winchester.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR JACKETED BULLETS:					
Jacketed	80	No. 2400	27.2	3065	Maximum
Jacketed	110	No. 2400	22.5	2400	Maximum
Jacketed	190	Lightning	24.0	2065	Maximum
Jacketed	190	Hi-Vel No. 2	30.0	2000	Maximum
Jacketed	190	No. 4320	36.5	2145	Maximum

.303 British and Canadian Ross



TOOLS: 310 (No. 5) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
7	7	Large	Large	17	Med.	.313	17	Use bullet number

IDEAL BULLETS:

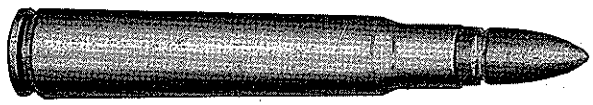
310 grs.

#311299 Standard bullet for 303 British and Ross rifles.

Note: Use same cast bullets as 30-40 Krag, but size .313 diameter.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
311299	210	No. 4759	18.0	1650E	
311299	210	No. 4759	22.0	1810E	
LOADS FOR JACKETED BULLETS:					
Jacketed	80	Hi-Vel No. 2	43.8	3140	.32-20 bullet
Jacketed	80	No. 2400	26.0	2900	.32-20 bullet
Jacketed	100	Hi-Vel No. 2	37.0	2700	.32-20 bullet
Jacketed	115	No. 2400	20.2	2120	.32-20 bullet
Jacketed	174	Hi-Vel No. 2	32.7	2200	
Jacketed	174	No. 3031	43.0	2510	
Jacketed	174	No. 4320	45.0	2515	
Jacketed	174	No. 4064	43.0	2400	
Jacketed	215	No. 2400	18.5	1480	
Jacketed	215	Hi-Vel No. 2	30.8	1950	
Jacketed	215	No. 3031	40.0	2265	
Jacketed	215	No. 4320	43.5	2340	
Jacketed	215	No. 4064	42.5	2275	

7.7 M/M Jap (31 cal.)



TOOLS: 310 (No. 2) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
2	2	Large	Large	146	Med.	.311	146	Use bullet number

IDEAL BULLETS:

Use same cast bullets as .300 Magnum and also #311413. Size bullets .314 to .315 or shoot as cast.

7.7 M/M Jap, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
311465	125	No. 4759	14.0	1425E	Note: Nos. 311465, 311466, 311467 new bullets by H. Guy Loverin
311465	125	No. 2400	18.0	1650E	
311465	125	No. 4198	18.0	1750E	
311466	153	No. 4759	12 0	1200E	
311466	153	No. 4198	21.0	1900E	
311466	153	No. 2400	20.0	1850E	
311466	153	No. 2400	24.0	2200E	
311466	153	No. 4895	35.0	2100E	
311466	153	No. 3031	35.0	2100E	
311413	169	No. 4759	18.0	1650E	.314 to .315 bullet diameter or as cast
311413	169	No. 4759	20.0	1700E	
311413	169	No. 4198	22.0	1700E	
311467	180	No. 4198	26.0	1800E	Same as above
311467	180	No. 4759	20.0	1700E	
308284	207	No. 4759	30.0	2200E	Same as above

NOTE: If 30-06 brass is used for cases, a reduced charge should be used for blowing the cases out to chamber dimension.

LOADS FOR JACKETED BULLETS:					
Jacketed	150	No. 4350	48.0	2600	Full Metal Patch
Jacketed	150	Hi-Vel No. 2	36.0	2200	Full Metal Patch
Jacketed Speer	180	No. 4350	44.0	2300	.311 dia. — most accurate Speer bullet
Jacketed	180	No. 3031	40.5	2300	Silvertip
Jacketed	180	No. 4350	44.0	2300	Silvertip

NOTE: Any .30 cal. jacketed bullet may be substituted with same weights and charges.

.32-20

TOOLS: 310 (No. 3) Tru-Line Jr. Tru-Line Sr.

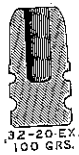
P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
10	10	Small	Small	29	Short	.311	29	Use bullet number

IDEAL BULLETS:

85 grs.

#311419 Light bullet for shorter ranges.

Hollow point bullet with fine killing power. #31133



115 grs.

#3118 Same as 31133 only solid point.

109 grs.

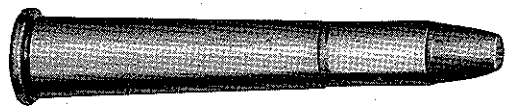
Gas check bullet can be driven faster than plain base bullet. Fine for hollow point. #311316

111 grs.

#311359 Same as above but not for use in tubular magazines, will not mangle game.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
311419	85	No. 2400	10.0	1600E	
31113	100	No. 2400	10.0	1415	Hollow Point
311316	111	Unique	5.5	1500E	
311316	111	No. 2400	11.0	1670	Note: No. 311359 may be substituted except in tubular magazines
311316	111	No. 4759	11.0	1575	
3118	115	No. 4759	8.6	1475	
3118	115	No. 2400	10.8	1555	
3118	115	No. 4759	11.0	1575	
LOADS FOR JACKETED BULLETS:					
Jacketed	80	No. 4759	12.0	1605	
Jacketed	80	No. 2400	13.0	1845	
Jacketed	80	No. 4227	17.0	1975	
Jacketed	115	No. 2400	10.8	1555	
Jacketed	115	No. 4759	11.5	1636	Maximum

.32-40



TOOLS: 310 (No. 6) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
6	6	Large	Large	28	Med.	.321	97	Use bullet number

.32-40, cont.

IDEAL BULLETS:

160 grs.

#319247 Standard plain base bullet for 32-40 rifles.

Standard plain base bullet for 32 Win. Spec. work exceedingly well in 32-40 single shot rifles. #321232

170 GRS.

174 grs.

#319295 Very satisfactory bullet for high velocity repeaters. Crimp in front groove.

For Schuetzen rifles. Barrel does not require throating. Shoot as cast. #319289

185 GRS.

185 GRS.

#319273 Hudson bullet for Schuetzen rifles. Barrel requires special throating. Shoot as cast.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
319247	165	No. 4759	9.0	1107	Also Nos. 319261-321232 and 321265. Same as above
319247	165	No. 4759	13.2	1427	
319247	165	No. 2400	13.6	1545	
321232	170	No. 4759	13.2	1400	
319295	170	No. 4759	16.0	1700E	
319289	185	No. 2400	11.0	1250	No throating necessary — for Schuetzen rifle
319273	185	No. 4759	13.0	1350E	Barrel needs to be throated to accept bullet. Hudson bullet for Schuetzen rifle
LOADS FOR JACKETED BULLETS:					
Jacketed	165	No. 2400	13.7	1470	
Jacketed	165	No. 4198	21.5	1870	
Jacketed	165	No. 4198	17.0	1460	Note: Do not use higher vel. in Ballard or Stevens single shot rifles
Jacketed	165	No. 3031	24.0	1835	
Jacketed	165	No. 3031	28.0	1955	MAX.

.32 Winchester Special and .32 Remington Automatic

TOOLS: 310 (No. 6) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
6	6	Large	Large	97	Med.	.321	97	Use bullet number

IDEAL BULLETS:


115 grs.

#32359 Light wt. plain base bullet for short range and small game.


140 grs.

Light wt. gas check bullet especially for 32-40 and 32 special. #321427

154 grs.

#321317 Standard bullet for rifles using 32 Rem. rimless cartridge. Can be used in 32 special.

New 8 MM bullet designed by Loverin. Should prove extremely successful in 32 spec. as a deer killer. #323470


160 grs.

#321297 Standard gas check bullet for 32 special. Very accurate and a good killer on deer.

181 grs.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
32359	115	No. 4759	9.5	1205	
321427	140	No. 2400	19.0	1900E	
321317	154	No. 4759	10.0	1300E	
321317	154	Unique	9.0	1300E	
321317	154	No. 4198	18.0	1650E	
323470	165	No. 3031	30.0	2000E	Deer load. New Loverin bullet
321232	170	No. 4759	15.2	1625	
321232	170	No. 2400	16.0	1595	
321297	181	No. 2400	20.0	1700E	
321297	181	No. 4759	17.0	1725E	

.32 Win., and Rem., cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR JACKETED BULLETS:					
Jacketed	110	No. 2400	15.0	1760	
Jacketed	110	No. 2400	18.4	2120	Maximum
Jacketed	110	No. 4198	29.0	2400	
Jacketed	110	No. 4198	36.0	2825	
Jacketed	110	No. 4320	40.0	2415	
Jacketed	170	No. 4759	15.2	1500	
Jacketed	170	No. 4198	30.0	2260	
Jacketed	170	No. 3031	33.5	2230	

8 M/M Mauser
(7.92 x 57 and 8 x 57)

TOOLS: 310 (No. 2) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
2	2	Large	Large	118	Med.	.323	118	Use bullet number

IDEAL BULLETS:

140 grs.

#321427 Light gas check bullet for 32-40 and 32 special. Also for use in 8 MM.

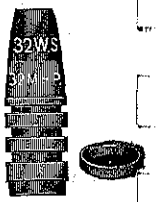
New Loverin bullet for 8 MM rifles. Accurate for target and game shooting. #323470

176 grs.

#320366 Spitzer point for 8 MM.

Gas check bullet for 32 special. Performs very well in 8 MM. Good deer bullet. #321297

165 grs.



181 grs.

215 grs.

#323471 New heavy bullet by H. Guy Loverin. Should prove very effective on deer with proper loads. Also hollow pointed.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
321427	140	No. 2400	16.0	1500E	
323470	165	No. 4759	18.0	1700E	No. 311470 — new bullet by H. Guy Loverin
323470	165	No. 4198	20.0	1600E	
323470	165	No. 4198	22.0	1750E	
323470	165	No. 4198	25.0	1950E	Accurate load
320366	176	Hi-Vel No. 2	25.0	1700E	
320366	176	No. 4895	28.0	1700E	Faster speed is inaccurate
320366	176	No. 4064	28.0	1700E	
321297	181	No. 4759	20.0	1500E	
321297	181	No. 4198 / No. 6 Pistol / No. 4895	18.0 / 3.0 / 18.0	1600E	Duplex loads by Paul Mansfield
321297	181	No. 6 Pistol	3.0	1600E	
321297	181	No. 3031	25.0	1579	
321297	181	No. 2400	22.4	1900	
321297	181	No. 4759	18.0	1649	
323471	220	No. 4198	28.0	1610E	No. 323471 — new bullet by H. Guy Loverin
323471	220	Hi-Vel No. 2	30.0	1700E	

NOTE: All 8 mm bores should be slugged. Bullets not more than .003 oversized to be used.

This cartridge, long popular, must be watched carefully. Although American arms companies no longer make rifles for it, the cartridge has been popular here for sixty years. Before loading this ammunition, barrels should be slugged and "miked" to determine groove diameter. Many rifles, brought back as war souvenirs, have barrels .316" to .320 diameter, full grooves. The military rifles made since 1906 usually measure .323. Choice of bullet diameter to fit must be made. Oversize bullets create dangerous pressures.

LOADS FOR JACKETED BULLETS:					
Jacketed	125	No. 3031	49.0	3000E	Speer bullet
Jacketed	154	No. 2400	23.6	2130	Maximum load
Jacketed	154	Hi-Vel No. 2	33.0	2100	
Jacketed	154	No. 4198	43.5	2905	Maximum load
Jacketed	154	No. 3031	51.0	2945	Maximum load

8 M/M Mauser, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR JACKETED BULLETS (Cont.):					
Jacketed	150	No. 4895	52.0	3005	Speer bullet
Jacketed	170	No. 3031	51.0	2900E	Maximum load
Jacketed	170	No. 3031	49.0	2800E	
Jacketed	170	No. 3031	44.0	2500	Best accuracy
Jacketed	170	No. 4895	49.0	2750	
Jacketed	170	No. 4320	50.0	2700E	Speer bullet
Jacketed	170	No. 4895	46.5	2700E	Speer bullet
Jacketed	170	No. 4064	45.0	2600E	Speer bullet
Jacketed	198	Hi-Vel No. 2	46.0	2800E	Maximum load
Jacketed	227	No. 4320	48.0	2455	Maximum load
Jacketed	236	No. 4064	49.0	2450	

NOTE: All Speer bullets used were .323 diameter. If 30-06 brass is used reduce max. loads by 2. gr. for safety.

.33 Winchester

TOOLS: 310 (No. *) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
17	17	Large	Large	98	Spec.	.338	98	Use bullet number

IDEAL BULLETS:

195 grs.

#338237 Kephart bullet for short range in .33 Winchester.

Standard gas check bullet for .33 Winchester. #338320 Excellent game bullet.

195 grs.

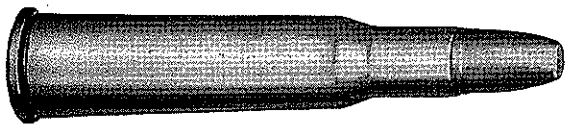
(If gas checks unavailable, reduce charges!)

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
338237	195	Unique	5.0	1100E	
338237	195	No. 4759	12.0	1161	
338237	195	No. 4759	17.0	1597	
338320	195	No. 4759	18.0	1650E	
338320	195	Hi-Vel No. 2	32.0	1940	
338320	195	Unique	16.8	1885	
338320	195	No. 2400	25.2	2100	

* Special Tool.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR JACKETED BULLETS:					
Jacketed	200	No. 2400	26.4	2155	Maximum load
Jacketed	200	No. 4320	44.5	2225	Maximum load
Jacketed	200	No. 4064	46.0	2260	Maximum load
Jacketed	200	No. 3031	37.0	2050	
Jacketed	200	No. 3031	42.0	2260	MAX load
Jacketed	200	No. 4064	41.0	2010	
Jacketed	200	No. 4320	38.0	2000	

.348 Winchester



TOOLS: 310 (No. 11)

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
18	None	Spec.	Spec.	170	Spec.	.350	170	Use bullet number

IDEAL BULLETS:

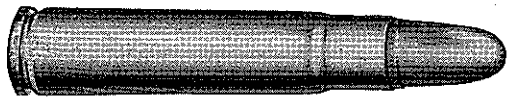

190 grs.

#350447 Standard gas check bullet for 348 Winchester.

(If gas checks unavailable, reduce loads!)

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
350447	190	No. 4759	25.0	1650E	Note: Other bullets up to 220 gr. may be used with these charges
350447	190	No. 4759	20.0	1400E	
350447	190	No. 4198	33.0	2000	
350447	190	No. 4759	15.0	1200E	
LOADS FOR JACKETED BULLETS:					
Jacketed	150	No. 4198	39.8	2590	Maximum
Jacketed	150	No. 4320	58.0	2795	
Jacketed	150	No. 4064	58.5	2835	Maximum
Jacketed	200	No. 4198	34.5	2100	
Jacketed	200	No. 3031	43.0	2200	
Jacketed	200	No. 4320	52.0	2470	Maximum
Jacketed	200	No. 4064	53.6	2535	Maximum

.35 Remington



TOOLS: 310 (No. 5) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
20	2	Large	Large	128	Spec.	.358	128	Use bullet number

IDEAL BULLETS:

158 grs.

#360274 Round ball for cellar load and short range small game load. 72 grs.

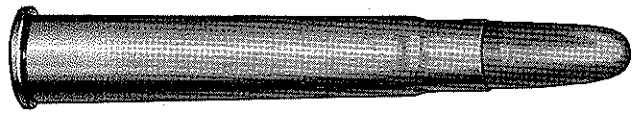
#358311 Standard 38 S & W bullet. Can be used for small game load in 35 Remington.

Standard bullet for 35 Remington. May also be used in other 35 cal. rifles and 9 MM rifles. #358315

200 grs.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
36074	72	Bullseye	3.0	900E	Cellar load
358311	158	Unique	10.0	1500E	Small game
358311	158	Bullseye	4.5	1000E	Small game
358311	158	No. 4759	15.0	1600E	
358315	200	No. 4759	22.0	1852	
358315	200	No. 4198	24.0	1700	
358315	200	No. 2400	19.9	1820	
358315	200	No. 3031	31.8	1700E	
LOADS FOR JACKETED BULLETS:					
Jacketed	150	No. 2400	26.0	2196	
Jacketed	150	No. 4198	36.0	2400	Maximum
Jacketed	200	No. 2400	20.5	1800	
Jacketed	200	No. 2400	24.0	1910	
Jacketed	200	No. 3031	39.0	2130	Maximum

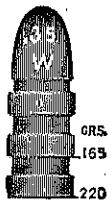
.35 Winchester



TOOLS: 310 (No. 5)

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
1	None	Large	Large	124	Spec.	.358	124	Use bullet number

IDEAL BULLETS:



#358238 165 and 220 gr. plain base bullet for 35 Win.

249 gr. gas check bullet for 35 Winchester and others such as 35 Whelen and 35 Magnum rifles. A good killer on large game at medium ranges. #358318

249 grs.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
358238	165	Unique	7.0	1206	
358238	165	No. 4759	13.5	1186	
358238	220	No. 4759	17.5	1395	
358238	220	Hi-Vel No. 2	30.0	1600E	
358318	249	No. 4198	25.0	1500E	
358318	249	No. 2400	26.4	1700E	
LOADS FOR JACKETED BULLETS:					
Jacketed	250	No. 4759	18.0	1350	
Jacketed	250	No. 2400	26.4	1740	
Jacketed	250	Hi-Vel No. 2	34.0	1680	
Jacketed	250	No. 3031	49.0	2320	
Jacketed	250	No. 4320	51.5	2250	

9 M/M Mauser & Mannlicher-Schoenouer

TOOLS: 310 (No. *) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
2	2	Large	Large	126	Spec.	.358	.126	Use bullet number

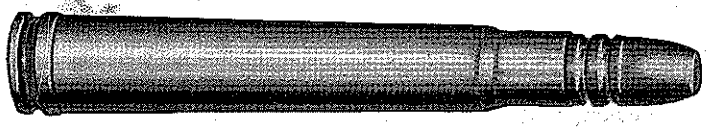
IDEAL BULLETS:

Use same cast bullet (165 gr. wt.) as .35 Winchester.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
358238	165	No. 4759	13.5	1186	
358238	165	Unique	7.0	1100E	
NOTE: Other bullets may be used if sized .360. Also charges for .35 Win. Model 95.					
LOADS FOR JACKETED BULLETS:					
Jacketed	280	No. 3031	38.0	1715	
Jacketed	280	No. 3031	43.0	2010	
Jacketed	280	No. 4064	46.0	2035	

* Special Tool.

.375 H. & H. Magnum



TOOLS: 310 (No. 8) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
13	13	Large	Large	162	Spec.	.375	162	Use bullet number

IDEAL BULLETS:

149 grs.

#37583-S Light Weight bullet for 38-55 rifle. Can be sized to .375 diameter for short range shooting in .375 Mag.

278 grs.

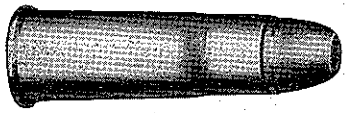
Plain base bullet for 38-55 rifles. Must be ordered small enough to size .375. Good short range bullet. #375248

#375449 Standard cast bullet for 375 Mag. rifles. Good game bullet at short to medium ranges.

255 grs.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
37583-S	149	No. 4759	15.0	1300 f.s.	38-55 Bullet
375248	255	No. 4759	20.0	1500	38-55 Bullet
375449	278	No. 4759	30.0	1650	
375449	278	No. 4895	35.0	1600E	
375248	255	No. 4759	30.0	1700E	38-55 Bullet
375449	278	No. 3031	42.0	2000	Note: 38-55 bullets must be small enough to size .375 diameter
375449	278	No. 4198	30.0	1600E	
375449	278	No. 4198	35.0	1800E	
375449	278	Hi-Vel	35.0	1400E	
LOADS FOR JACKETED BULLETS:					
Jacketed	235	No. 4064	57.0	2300	
Jacketed	235	No. 4064	71.0	2810	
Jacketed	255	No. 4759	30.0	1700E	38-55 M. C. bullet
Jacketed	270	No. 4064	69.0	2690	
Jacketed	270	No. 4064	57.0	2220	
Jacketed	300	No. 4064	56.0	2160	
Jacketed	300	No. 4064	63.0	2450	
Jacketed	300	No. 4759	30.0	1550	
Jacketed	300	No. 4350	70.0	2299	Barnes bullet
Jacketed	300	No. 4350	73.0	2410	Barnes bullet — accurate

.38-40 Winchester



TOOLS: 310 (No. 9) Tru-Line Jr.

.38-40, cont.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
14	26	Large	Large	162	Short	.401	42	Use bullet number

IDEAL BULLETS:

180 GRS.

#40397 Round ball for very short range. 96 grs.

#40043 Standard bullet for 38/40 rifles.

Semi-wad cutter bullet designed by Douglas Sorenson. Very effective in 38/40 rifles. #40388


174 grs.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS (Rifles Only):					
40397	96	Unique	2. to 3.	900E	Rd. ball (light)
40043	180	Unique	8.0	1280	
40043	180	No. 4759	15.5	1415	
40043	180	No. 2400	22.6	1870	
40388	174	No. 4759	15.0	1425E	Bullet by Douglas Sorenson
40388	174	No. 2400	20.0	1750E	
LOADS FOR JACKETED BULLETS:					
Jacketed	130	No. 2400	24.0	1950	
Jacketed	130	No. 2400	26.0	2130	
Jacketed	130	No. 4227	30.5	2100	
Jacketed	180	No. 4759	18.0	1765	
Jacketed	180	No. 2400	22.6	1870	
Jacketed	180	No. 4227	26.0	1850	
Jacketed	180	No. 2400	25.5	2200	

.38-55

TOOLS: 310 (No. 6) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
6	6	Large	Large	44	Spec.	.379	44	Use bullet number

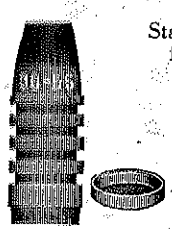
IDEAL BULLETS:


149 grs.

#37587 Round ball for 25 yd. small game shooting. 75 grs.

#37583 Standard 38-55 short range bullet.

255 grs.

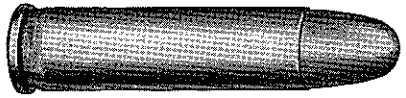

280 grs.

Standard plain base 38-55 bullet. Crimp in front groove for tubular mag. #375248

#375296 For 38-55 high power rifles having nickel or smokeless steel barrels. Crimp for tubular mags. as above.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
37587	75	Bullseye	5.0	1000E	25 yd. small game
37583	149	No. 4759	7.0	1100E	
37583	149	Unique	5.0	1000	25 yd. small game
375248	255	No. 4759	10.5	1050E	
375248	255	Unique	9.9	1355	
375248	255	No. 2400	17.0	1450E	
375248	255	FFg. / No. 4759	38.0 / 5.5		Duplex load. Put black powder in last and compress
375296	280	No. 2400	16.0	1450E	
375296	280	No. 4759	21.0	1589	
375296	280	Hi-Vel No. 2	29.0	1695	
LOADS FOR JACKETED BULLETS:					
Jacketed	255	Hi-Vel No. 2	29.0	1645	
Jacketed	255	No. 2400	18.7	1505	
Jacketed	255	No. 3031	30.0	1555	
Jacketed	255	No. 3031	35.0	1820	Maximum load

.401 Winchester



TOOLS: 310 (No. *)

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
2	2	Large	Large	147	Med.	.412	147	Use bullet number

IDEAL BULLETS:

250 grs.

#410426 Standard bullet for .401 Winchester Auto loading rifle.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
410426	250	No. 2400	12.0	1050	Note: Loadings for .401 Win. are not as flexible as others because enough pressure must be maintained for proper functioning of the arm
410426	250	No. 2400	15.0	1285	
410426	250	No. 2400	18.0	1480	
410426	250	Unique	10.0	1330	
LOADS FOR JACKETED BULLETS:					
Jacketed	200	No. 4759	20.0	1525	
Jacketed	200	No. 2400	26.0	2061	
Jacketed	250	No. 2400	18.0	1430	
Jacketed	250	No. 4759	19.0	1425	Powder slightly compressed
Jacketed	250	No. 4227	27.5	1850	Maximum load

*NOTE: Spec. tool furnished only when production facilities are available.

.405 Winchester

TOOLS: 310 (No. *)

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
7	7	Large	Large	121	Long	.412	121	Use bullet number

IDEAL BULLETS:

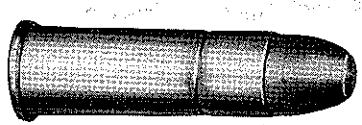
300 grs.

#412263 Standard bullet for .405 Winchester and .400 Whelen. Can be crimped in middle groove.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
412263	300	No. 2400	20.0	1200E	
412263	300	Unique	16.0	1460	
412263	300	Hi-Vel No. 2	25.0	1140	
412263	300	Hi-Vel No. 2	40.0	1705	
412263	300	Hi-Vel No. 2	55.0	2355	
LOADS FOR JACKETED BULLETS:					
Jacketed	300	No. 4759	20.0	1200E	
Jacketed	300	Hi-Vel No. 2	52.2	2207	
Jacketed	300	No. 3031	57.0	2250	Maximum
Jacketed	300	No. 4320	62.0	2220	Maximum

*NOTE: Special tool furnished only when production facilities are available.

.44-40 Winchester



TOOLS: 310 (No. 9) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
14	26	Large	Large	78	Short	.427	78	Use bullet number

IDEAL BULLETS:

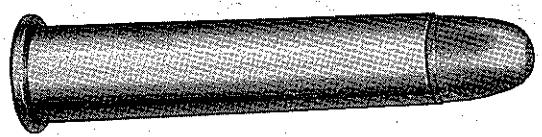
.44-40, cont.

#42498 Standard plain base bullet for 44-40 rifles and pistols. For most rifles, size to about .428 diameter.

Excellent gas check bullet for 44-40 rifle when loaded with 26.0 gr. #2400 powder. #429434

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
42498	210	No. 4759	13.7	1300	Note: These loads not to be used in revolvers
42498	210	No. 2400	22.0	1530	
42498	210	No. 2400	24.0	1800	
42498	210	No. 2400	26.0	1900E	
429434	221	No. 2400	26.0	1850E	
LOADS FOR JACKETED BULLETS (For Rifles Only):					
Jacketed	140	No. 2400	29.6	2200	Maximum
Jacketed	200	No. 4759	18.0	1625	
Jacketed	200	No. 2400	23.5	1700	
Jacketed	200	No. 4759	25.0	1710	
Jacketed	200	No. 4227	29.0	1890	

.45-70
Government & Winchester



TOOLS: 310 (No. 10) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
17	17	Large	Large	89	Large	.457	89	Use bullet number

IDEAL BULLETS:

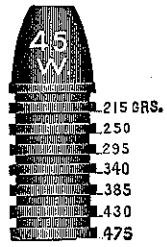
#457129 Round ball for short range, small game shooting. 146 grs.

#457130 Collar button bullet for small game shooting. Can be loaded slightly heavier than round ball if necessary.

Another very popular small game short range bullet. #457127

#456191 Standard bullet for 45-90 but preferred by many in place of heavier bullets.

This bullet can be furnished in any wt. shown but is very successful in 340 gr. wt. in the 45/70 rifle. #456121

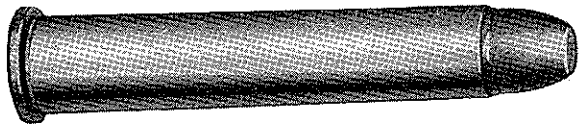


#457124 Standard 405 gr. bullet for 45/70. Usually used in Springfield. Excellent on moose, elk and bear.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
457129	146	No. 6 Pistol	5.0	950E	Rd. ball
457130	144	Unique	5.0	900E	Collar button bullet
457127	210	Bulk shot gun	6.5	1000E	Very mild
457127	210	Unique	7.0		
456191	300	No. 2400	20.0	1325	Good
456191	300	No. 4759	26.0	1375	Good
456121	340	No. 2400	20.0	1300	Accurate
457124	405	No. 4759	20.0	867	Very mild
457124	405	FFg	62.0	1400E	Put black powder in last. Enough so that bullet compresses powder charge. Burns clean.
		No. 6 Pistol	8.0		Note: 62 gr. FFg may be varied to obtain correct bulk in case
LOADS FOR JACKETED BULLETS:					
Jacketed	300	No. 4759	25.0	1565	
Jacketed	300	No. 3031	48.0	1675	
Jacketed	300	No. 2400	30.6	1905	
Jacketed	300	Unique	18.7	1685	
Jacketed	405	No. 4198	36.0	1417	Rem. S. P. bullet

NOTE: Above loads safe for Springfield and other weaker 45/70 rifles.

.45-90 Winchester



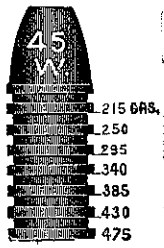
TOOLS: 310 (No. 10) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
17	17	Large	Large	89	Large	.457	89	Use bullet number

IDEAL BULLETS:

300 grs.

#456191 Standard bullet for 45-60, 45-90, 45-125 Winchester express.



This bullet can be furnished in any wt. shown. #456121


405 grs.

#457124 Standard bullet for 45-70 but performs equally well in the 45-90.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
456191	300	No. 4759	27.4	1539	
456191	300	Unique	12.0	1000	25 yd. load
456121	340	Unique	14.0	1250E	
456121	340	Unique	18.4	1485E	
457124	405	Unique	17.0	1380	
457124	405	No. 2400	30.0	1575E	

NOTE: Duplex load listed for 45-70 may be duplicated except that additional black powder should be added to fill case to base of bullet. Compress slightly.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR JACKETED BULLETS:					
Jacketed	300	No. 4759	27.0	1494	
Jacketed	300	No. 4759	29.5	1618	
Jacketed	300	No. 2400	31.5	1685	
Jacketed	300	No. 4198	57.0	2215	Maximum
Jacketed	300	No. 3031	64.0	2040	Maximum
Jacketed	405	No. 2400	30.2	1595	
Jacketed	405	No. 3031	60.0	1950	Maximum

PISTOL RELOADING DATA

.30 Luger

TOOLS: 310 (No. *) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
12	12	Small	Large	120	Short	.311	120	Use bullet number

IDEAL BULLETS:

#308244 Standard Bullet for .30 Luger and .32 (7.65MM) Mauser pistols.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
308244	89	No. 6	3.4	1025	
308244	89	Bullseye	3.5	1150	
308244	89	Unique	5.0	1300E	Estimated safe load
308244	89	P-5066	3.5	1000E	Estimated safe load

*NOTE: Special tool furnished only when production facilities are available.

.32 S.&W. Long
.32 Colt New Police

TOOLS: 310 (No. 3). Tru-Line Jr. (S.&W. Long only)

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
9	9	Small	Large	122	Short	.313	122	Use bullet number

.32 S.&W. Long and Colt, cont.

IDEAL BULLETS:

100 grs.

#31357 Standard Bullet for 32 S.&W. Long or 32 Colt New Police.

98 GRS.

#313226 Standard 32 S.&W. Long Bullet. Affords a crimping groove.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
313226	98	No. 6	2.5	840	
313226	98	Unique	4.3	1010	
313226	98	P-5066	2.5	700E	Estimated safe load
313226	98	Bullseye	2.7	910	
31357	100	No. 6	2.4	830	
31357	100	Unique	4.0	980E	
31357	100	P-5066	2.4	800E	Estimated safe load
31357	100	Bullseye	2.1	745	

.32 Automatic

TOOLS: 310 (No. 3)

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
9	None	Small	Large	Spec.	Short	.312	122	Use bullet number

IDEAL BULLETS:


77 grs.

#308252 Standard bullet for .32 Colt and .32 Savage Auto. Pistols. (Also good in 30 cal. rifle for short range with 3½ grs. Bullseye.)

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
308252	77	No. 6	2.2	965	
308252	77	Bullseye	2.2	970	
308252	77	Unique	3.3	990E	Estimated safe load
308252	77	P-5066	2.4	950E	Estimated safe load

.32 S.&W.

TOOLS: 310 (No. 3)

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
9	9	Small	Large	22	Short	.313	122	Use bullet number

IDEAL BULLETS:

#313249 Standard bullet for 32 S.&W. Crimp in beveled groove.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
313249	87	No. 6	1.3	710E	Estimated safe load
313249	87	Bullseye	1.4	725	
313249	87	Unique	2.0	830E	Estimated safe load
313249	87	P-5066	1.3	700E	Estimated safe load

.32-20

TOOLS: 310 (No. 3) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
10	10	Small	Large	29	Short	.311	29	Use bullet number

IDEAL BULLETS:


115 grs.

#3118 Standard bullet for 32-20 revolvers and 32-20 W.C.F. Rifles.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
3118	115	No. 6	3.2	805	
3118	115	Bullseye	3.1	850	
3118	115	Unique	4.5	925	
3118	115	P-5066	4.6	900E	Estimated safe load

.357 Magnum

TOOLS: 310 (No. 1) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
3	3	Large	Large	95	Spec.	.357	95	Use bullet number

IDEAL BULLETS:

156 grs.

#357446 Standard bullet for 357 Magnum Revolvers.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
357446	156	No. 6	4.5	1100	Note: These are all 20,000 lb. pressure loads and are considered safe in heavy frame guns in good condition
357446	156	Bullseye	3.9	1035	
357446	156	Unique	6.0	1210	
357446	156	P-5066	5.0	1070E	
		Other bullets of very similar weight may be used.			

9 M/M Luger

TOOLS: 310 (No. 1*) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
12	12	Small	Large	134	Spec.	.356	134	Use bullet number

IDEAL BULLETS:

123 grs.

#356402 Standard bullet for 9 MM Luger.

Standard bullet for 38 Colt Auto. Can be used in 9MM Luger.

#358242

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
356402	123	No. 6	3.4	1010	
356402	123	Bullseye	4.8	1120	
356402	123	Unique	6.0	1300E	Estimated safe load
356402	123	P-5066	5.5	1100E	Estimated safe load

*NOTE: This cartridge may be loaded in same handles as other 38 calibers, if hole is reamed large enough.

.38 S.&W.

TOOLS: 310 (No. 1) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
25	21	Small	Large	34	Spec.	.358	34	Use bullet number

IDEAL BULLETS:

#358242 Standard for Colt Auto., can be furnished one band shorter. 107 gr. wt.

Standard bullet for 38 S.&W. revolvers #358246

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
358242	125	Bullseye	2.0	620	
358242	125	Bullseye	2.5	740	
358242	125	Bullseye	3.0	850	15,000 lbs.
358242	125	Unique	3.0	585	
358242	125	Unique	4.0	770	
358242	125	Unique	4.9	920	15,000 lbs.
358246	147	Bullseye	2.0	580	
358246	147	Bullseye	2.5	695	
358246	147	Bullseye	3.0	800	15,000 lbs.
358246	147	Unique	3.0	590	
358246	147	Unique	4.0	780	
358246	147	Unique	4.7	895	15,000 lbs.
358246	147	#6 Pistol	2.2	640	
358246	147	#6 Pistol	2.8	760	
358246	147	#5066	3.8	796	

.38 Colt Automatic

TOOLS: 310 (No. 1) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
12	12	Small	Large	119	Spec.	.358	119	Use bullet number

IDEAL BULLETS:

#358242 Standard bullet for 38 Colt Auto. Pistol. Can be furnished 1 band shorter. 107 gr. wt.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
358242	125	No. 6	4.4	1040	
358242	125	Bullseye	4.0	1100	
358242	125	Unique	7.0	1270	
358242	125	P-5066	4.7	1000E	Estimated safe load

.38 Special

TOOLS: 310 (No. 1) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
1	1	Small	Large	95	Spec.	.358	95	Use bullet number

IDEAL BULLETS:


156 grs.

Excellent bullet for 38 Spec. Good distribution of lubricant. #358250

158 grs.

#358311 Standard bullet for 38 Spec. revolvers.


158 grs.

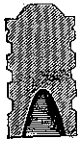
Desired by many humane societies. Excellent for target shooting. #358416


158 grs.

#358430 Very satisfactory bullet designed by John Leonard of Avon, Conn.


155 grs.

Wad cutter type bullet. Cuts clean hole in target. #358432
358432-S available in 140 grs.


140 grs.

#358395 Excellent hollow base bullet providing air space for deep seating. Mid range. Designed by Ed. McGivern of Lewiston, Montana.


173 grs.

Bullet by Elmer Keith. Can also be had in Hollow Point #358439 and in Hollow Base #358431. #358429


150 grs.

#360271-S Can also be had to size .360 dia. in #360271 for certain S.&W. Barrels.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
358311	158	No. 6	4.0	920	Note: These charges may be used with any other 158 gr. bullet shown
358311	158	Bullseye	3.5	920	
358311	158	Unique	5.4	1000	
358311	158	P-5066	5.0	920	
358395	148	No. 6	4.0	960	Note: Use with any other bullet of similar weight such as No. 360271-S as shown
358395	148	Bullseye	3.5	960	
358395	148	Unique	5.3	1030	
358395	148	P-5066	5.0	960	
358429	173	No. 6	4.0	890	
358429	173	Bullseye	3.5	890	
358429	173	Unique	5.3	990E	
358429	173	P-5066	5.0	890	

.380 Colt Automatic

TOOLS: 310 (No. 1) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
12	12	Small	Large	144	Spec.	.358	34	Use bullet number

IDEAL BULLETS:

125 grs.

#358242 Picture as shown is for .38 Colt Auto. It can be furnished one band shorter for Colt .380 Auto. 107 gr.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
358242	107	No. 6	3.0	850E	Note: This is our only bullet suited to the Colt .380 Auto. pistol. It must be ordered one band shorter than pictured.
358242	107	Bullseye	2.7	895	
358242	107	Unique	4.5	970	
358242	107	P-5066	3.3	910E	

.38/40 (Revolver)

TOOLS: 310 (No. 9) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
14	26	Large	Large	42	Spec.	.401	42	Use bullet number

.38-40, cont.

IDEAL BULLETS:

180 GRS.

#40043 Standard bullet for 38-40 rifles and pistols. Note: This cal. should be sized .401 dia. even though it is called a .38 caliber.


174 grs.

#40388 A very successful bullet developed by Douglas Sorenson.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
40043	180	No. 6	7.0	940	No. 40388 can be substituted with some charges
40043	180	Bullseye	5.9	960	
40043	180	Unique	10.0	1105	
40043	180	P-5066	8.0	1000E	
40090	158	No. 6	7.8	1105E	This bullet is Hollow Point version of No. 40043 as shown
40090	158	Bullseye	5.9	1030E	
40090	158	Unique	10.0	1250E	
40090	158	P-5066	8.8	1100E	

.41 Colt (Long)

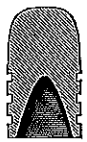
TOOLS: 310 (No. 14)

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
25	None	Small	Large	72	Short	.386	72	Use bullet number

IDEAL BULLETS:

196 grs.

#386177 This bullet is seated to the bottom of the first band over the heel. This will give the finished cartridge the same dia. on the case and bullet. It is lubricated outside.


200 grs.

#386178 This is an inside lubricated bullet and depends on expansion from explosion to completely fill and seal the barrel.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
386177	196	No. 6	4.0	800E	Note: No. 386177 should not be sized larger than .403 dia. which is .002 over groove dia.
386177	196	Bullseye	3.0	700	
386177	196	Unique	5.0	890E	
386177	196	P-5066	4.2	730	
386178	200	No. 6	4.0	790E	This bullet should be sized 386 dia. to fit inside the case. It depends upon expansion to fill the bore
386178	200	Bullseye	3.0	700E	
386178	200	Unique	5.0	880E	
386178	200	P-5066	4.1	720E	

.44 S.&W. Russian

TOOLS: 310 (No. 9)

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
7	7	Large	Large	150	Short	.429	150	Use bullet number

IDEAL BULLETS:

253 grs.

#429251 Standard bullet for S.&W. Russian. Crimp in bevel groove. Also standard for 44 Spec.


175 GRS.

#429220 Designed by A. L. A. Himmelwright, former Pres. of U.S. Rev. Asso. Cuts clean hole in target.

205 GRS.

#429215 Designed by Thomas Anderton who made world's record with it. Seat friction tight with no crimp.


175 grs.

#429106 Light bullet for medium ranges. Preferred by many because of its light recoil.

Note: Many of the 44 Spec. bullets may also be used in S.&W. Russian, including #429348 and #429352.

.44 S.&W. Russian, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
429220	175	No. 6	5.3	855	No. 429348-173 gr. may be substituted. Also No. 429106
429220	175	Bullseye	3.0	800E	
429220	175	Unique	7.0	1100E	
429220	175	P-5066	6.0	1000E	
429215	205	No. 6	5.0	785	
429215	205	Bullseye	3.0	750E	
429215	205	Unique	7.0	990E	
429215	205	P-5066	5.8	800E	
429251	253	No. 6	4.2	645	Nos. 429352, 429336, 429421 and others may be used in S & W Russian
429251	253	Bullseye	3.0	630E	
429251	253	Unique	6.0	800E	
429251	253	P-5066	5.2	750E	

.44 Special

TOOLS: 310 (No. 9) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
7	7	Large	Large	150	Short	.429	150	Use bullet number

IDEAL BULLETS:

173 grs.

#429348 Square nose lighter wt. bullet for 44 S.&W. Spec. Cuts clean hole in target.

231 grs.

#429360 Designed by Boser for 44 Spec.

245 grs.

#429352 Made for M. L. Holman of St. Louis for 44 S.&W. Russian and 44 Spec.

250 grs.

#429421 Elmer Keith bullet. Extremely accurate and most desirable as a heavy hunting bullet. Can be furnished hollow pointed. Hollow base can be ordered by #429422.

250 grs.

#429336 Made for C. E. Heath of Boston Rev. Club. Cuts clean hole in target and has excellent stopping power on game.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
429348	173	No. 6	6.8	880	No. 429220-175 gr. and No. 429106-175 gr. may be substituted
429348	173	Bullseye	6.8	1055	
429348	173	Unique	10.3	1170	
429348	173	P-5066	7.7	1100E	
429360	231	No. 6	6.3	940	
429360	231	Bullseye	5.3	875	
429360	231	Unique	8.1	1005	
429360	231	P-5066	6.9	900E	
429352	245	No. 6	6.6	900	
429352	245	Bullseye	5.6	900	
429352	245	Unique	7.8	990E	
429352	245	P-5066	7.0	900	
429421	250	No. 6	5.9	850E	These loads for No. 429421 may be used with No. 429336
429421	250	Bullseye	4.9	805	
429421	250	Unique	7.8	970	
429421	250	P-5066	7.4	920E	
429421	250	No. 2400	18.5	1200	Keith Load. This load for Heaviest frame guns. Hard crimp and bullet not over size more than .001 or .002

NOTE: Bullet No. 429422 or No. 429421 Hollow Pt. may be used with the Keith load above.

.44-40 (.44 W.C.F.)

TOOLS: 310 (No. 9) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
14	26	Large	Large	78	Short	.427	78	Use bullet number

IDEAL BULLETS:

#42498 Standard bullet for 44-40 rifles and pistols. Can be furnished in hollow point by #42499.

.44-40, cont.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
42498	210	No. 6	7.2	880	No. 42499 H.P. may be substituted, also No. 429215
42498	210	Bullseye	6.5	930	
42498	210	Unique	10.9	1100	
42498	210	P-5066	8.0	1000E	

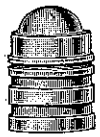
NOTE: Some 44 Spec. and Russian Bullets may be used if seating depth is flexible enough to allow revolver cylinder to rotate.

.45 Auto. Rim. (.45 Colt New Service Revolver)

TOOLS: 310 (No. 7) Tru-Line Jr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
14	14	Large	Large	127	Short	.452	127	Use bullet number

IDEAL BULLETS:



237 grs.

#454309 An excellent semi-wad cutter type for 45 Auto. Rim.

240 grs.

#452423 Keith bullet especially for 1917 Service revolvers.

250 grs.

#454424 Keith bullet for 45 Colt single action. Can be used in 1917 New Service revolver.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
454309	237	No. 6	4.9	905	No. 452460 can be substituted for No. 454309 with slightly higher velocities
454309	237	Bullseye	4.5	860	
454309	237	Unique	7.0	915	
454309	237	P-5066	4.9	757E	
454424	250	No. 6	4.6	850	No. 452423 can be used with any charges listed for No. 454424
454424	250	Bullseye	4.5	745	
454424	250	Unique	7.2	845	
554424	250	P-5066	4.6	725E	

NOTE: These charges may be used in Standard 45 automatic rimless cases if half-moon clips are employed. This will enable the Shooter to use these cases in 1917 New Service revolver.

.45 Colt Automatic

TOOLS: 310 (No. 7) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
2	2	Large	Large	127	Short	.452	127	Use bullet number

IDEAL BULLETS:

230 grs.

#452374 Our standard bullet for 45 Colt Automatic pistol. Do not crimp in groove.

200 grs.

#452460 Wad cutter type bullet similar to new commercial bullets in appearance and performance. Do not crimp in groove.

Note: Headspace in 45 Auto. is governed by mouth of cartridge contacting shoulder in chamber. If crimp is used, head space has been created. Use tight friction fit and crimp on band if necessary.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
452374	230	No. 6	4.7	880	Lower powered loads may result in malfunction of the arm
452374	230	Bullseye	4.7	870	
452374	230	Unique	7.2	940	
452374	230	P-5066	5.5	850E	
452460	200	No. 6	5.1	970	
452460	200	Bullseye	4.7	900E	
452460	200	Unique	7.6	980E	
452460	200	P-5066	6.6	905	

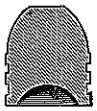
.45 Colt

TOOLS: 310 (No. 7) Tru-Line Jr. Tru-Line Sr.

P.C.	S.H.	P.P.	D.C.	M.R.	E.C.	E.P.	D.A.	S.S.
11	11	Large	Large	86	Short	.454	86	Use bullet number

.45 Colt, cont.

IDEAL BULLETS:


180 grs.

#45468 Light weight hollow base bullet for 45 Colt. Can also be furnished in solid base, if desired.


237 grs.

#454309 Excellent bullet for target or game.


250 grs.

#454424 Keith bullet especially for Colts revolver.

255 GRS.

#454190 Standard bullet for 45 Colt Frontier revolver.

Bullet	Grs. Wt.	Powder	Charge Grs. Wt.	Muzzle Vel. F. S.	Remarks
LOADS FOR CAST BULLETS:					
45468	180	No. 6	8.0	1040E	Solid base version of this bullet may be used with same charges
45468	180	Bullseye	7.8	1100E	
45468	180	Unique	11.8	1200E	
45468	180	P-5066	8.5	1020E	
454309	237	No. 6	7.2	915	
454309	237	Bullseye	6.8	950	
454309	237	Unique	10.7	1050	
454309	237	P-5066	9.0	900E	
454424	250	No. 6	7.7	915	
454424	250	Bullseye	6.6	900	
454424	250	Unique	10.3	1030	
454424	250	P-5066	8.5	925	
454190	255	No. 6	7.0	855	
454190	255	Bullseye	6.6	905	
454190	255	Unique	9.7	985	
454190	255	P-5066	8.0	870	

Partial List—SPECIAL IDEAL BULLETS

25720


308403
172 grs.
Pope


313445
93 grs.
.32 S.&W.


358425
110 grs.
.38 cal.


360344-S
150 grs.
.38 S.&W.


401452
206 grs.
.401 Win.
Gordon C. Boser

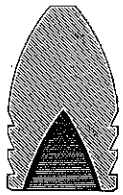
170 GRS.
450225
170 grs.
.44 cal.


450229
180 grs.
.44 cal.


45468
180 grs.
.45 Colt

456122
330 grs.
.45-330

515141
450 grs.
.50-70 Govt.


575213
476 grs.
.58 Govt.

Complete list of Special Ideal Bullets sent free on request.

Part III
CHARACTERISTICS OF CARTRIDGES

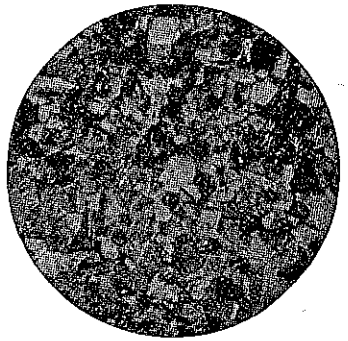
Cartridge Cases

CARTRIDGE cases are made of a high grade of brass. This brass is composed of about 70 parts of copper to 30 parts of zinc and must be practically free from the inclusion of other metals. As the cartridge case is the first thing we must have in order to reload a cartridge, we will give a very brief description of the way the average case is made and the forces that effect it so the reader can better understand the *reasons* for performing or not performing certain operations on the case in the process of reloading.

Brass for cartridge cases is rolled in strips to the width and thickness required for the cartridge cases that are to be made from it. The brass is annealed or soft, and in this state it can be formed, drawn or otherwise "cold-worked". The brass is passed under presses that blank out discs of the proper size which are, in turn, forced through a die by a punch which forms the discs into cups.

Brass can only be softened by heating or annealing it. It can only be hardened by working it while it is cold. The action of forming the discs into a cup hardens the brass so that nothing further can be done until it is annealed. The accompanying illustrations show how brass looks through a microscope.

Hard worked brass



Partially annealed brass

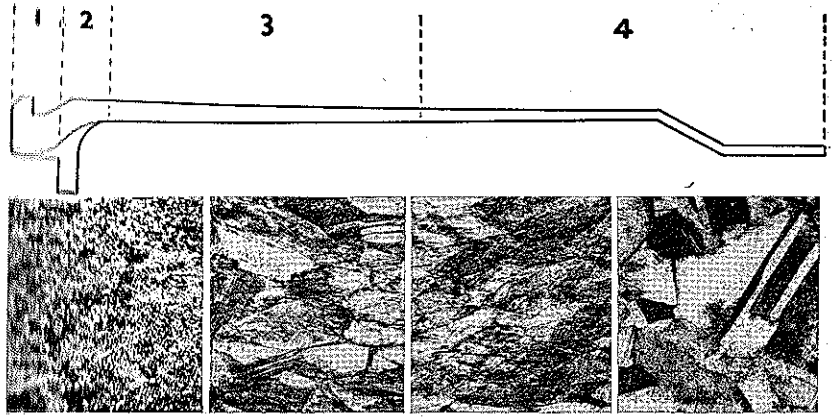
Fully annealed brass

Formation of Brass Crystals

In soft brass the crystals are large and angular. The size of these crystals depends upon the temperature to which the brass is heated and the time the temperature is maintained. When the brass is cold-worked (drawn, bent or compressed) the crystals are stretched out or mashed. This hardens the brass. After the crystals are drawn out or compressed they cannot be returned to their original form by pulling them in an opposite direction. They will resist such a force to a limited extent after which they will separate at the point of strain and form a crack in the brass. That is why cartridge cases are apt to split in loose chambers.

A peculiarity of brass is that after it is cold-worked it can be heated or annealed and the brass crystals will reform, their size depending upon the temperature and its duration.

Annealing softens the brass so it can be drawn or worked further and it is through this process of drawing and annealing that a piece of brass is drawn out and ultimately formed into a cartridge case. On some calibers of cases there are over one hundred different operations required to complete the case which will partly explain why this component is the most expensive part of a cartridge.



1 2 3 4

Illustrating some of the variations in grain size of brass in a commercial cartridge case. All sizes are not shown nor will the same condition be found in all calibers of cases

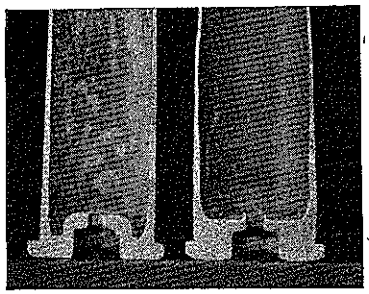
A cartridge case should not have a uniform grain size (or hardness) all over. As a rule the head must be tough and hard enough to resist the sudden pressure exerted against it by the burning powder, otherwise it might give way or the primer pocket enlarge, permitting gas to escape to the rear. The rim must be hard enough to resist the pull of the extractor. The side walls near the head must be soft enough so there will be no danger of rupturing at this point, but hard enough to spring back from the chamber walls, permitting easy extraction. The side walls must be fairly hard and springy for the same reason and the neck, or that portion that holds the bullet, must be harder and more springy than the side walls so as to grip the bullet firmly. To get these graduations in hardness is not easy and the anneals between operations must be worked out very carefully with relation to the subsequent drawing and tapering operations so the case will have the proper characteristics when it is finished.

We sometimes hear of cases having a "soft anneal" or a "hard anneal". Such expressions merely mean that the cases in question have an average hardness slightly above or below normal. They do not mean that the one is dead soft and the other extremely hard or brittle.

A cartridge case is, in reality, part of the arm it is fired in. It is the obturator or the means by which the breech is sealed against the escape of gas to the rear. The case must perform this function above all others.

Two Types of Cartridge Cases

Cartridge cases can be divided into two classes or types, folded head and solid head. The folded head type of cases is made by drawing the brass out rather thin throughout the case and subsequently bending or folding the head and primer pocket



Two types of solid head cartridges. Often called the "folded head", the left is more properly called "semi-balloon". It has been replaced in most revolver and all rifle calibers with the stronger "solid web" type on the right.

into shape. As the grain structure of the brass follows the form of the case, this makes a much stronger case than might be supposed. This type of case was used up to about the time smokeless powder came into general use. The folded head case is satisfactory for all black powder cartridges and for low pressure smokeless loads. It is not satisfactory for modern high pressure loads.

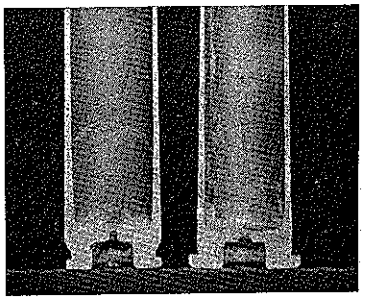
The solid head type of case is made by drawing the cups in such a way that very little metal is drawn from the bottom of the cup. This part is left thick and is cold forced or bulldozed to form the head and primer pocket. The solid head case is necessary for high pressure loads and for rimless cases and is now used for almost all rifle and pistol cartridges.

There is a further division of types into rimmed, rimless, semi-rimmed and "belted" cases. The rimmed type is positioned in the chamber by a rim or flange around the head of the case that limits the forward movement of the case into the chamber. The rim or flange is larger than the body of the case.

This rimless case has no such projection to stop the forward movement of the case into the chamber. This type is positioned in the chamber by the shoulder of the case coming into contact with the corresponding shoulder in the chamber or if it be a straight case, by the forward edge of the case coming in contact with the forward edge of the chamber.

The semi-rim type is a combination of the two, having the appearance of the rimless type but with the head proper sufficiently large to engage against the rear of the barrel or chamber.

The rimless or semi-rimless types of cases are only made with solid heads but the rimmed type is made with a folded head for some revolver cartridges and there are still many old rimmed rifle cases in existence, made with folded heads, that are still serviceable if not overloaded.



Rimless and rimmed cases

Belted cases are actually very much like rimmed cases except that the belted portion extends forward from the head for a much greater distance. Noticeable examples are the 300 and 375 Magnum cases.

Regardless of the form that cartridge cases may take the method of manufacture is generally the same. They are drawn out in deep cups and ultimately formed to the proper shape. The strains thus imposed on the brass could only be entirely removed by complete annealing, which would ruin the case, therefore, cartridge cases always contain internal strains in the brass to a greater or less degree.

These strains sometimes give rise to a condition known as "season-cracking", that is, the brass arising spontaneously, or of its own accord. Fortunately, in small arms cases, this defect is limited to the necks and shoulders of the bottle-neck type of case. Since 1920, military and commercial cases of the bottle-neck type have had

the necks partially annealed after the cases are completed, to relieve the internal strains. This greatly reduces the chance of season-cracking and both commercial and military ammunition will remain serviceable for a much longer time when kept in stock. This mouth anneal can usually be recognized by a dark or bluish discoloration around the necks and shoulders of some rifle cartridges and such cases are better for reloading purposes than those that are not so annealed.

Cartridge cases are also referred to by their external forms, that is, as straight, straight taper or bottle-neck. All straight cases such as the revolver cases have a very slight taper, but to all appearances the body of such a case is a cylinder.

The straight taper case has a decided taper from the head to the neck although the neck, in order to hold the bullet properly, is a cylinder. The .32-40 is an excellent example of this.

The bottle-neck case has a body that tapers more or less to a decided shoulder where the diameter of the case has been reduced abruptly to form the neck, giving it a form similar to a bottle.

Thus we have seen that there are cases that may be referred to in any one of the following ways and that one case may contain more than one of the features mentioned: folded head, solid head, rimmed, rimless, semi-rimmed, straight, straight taper and bottle-neck.

Taking the rimless, bottle-neck type as a model, we will discuss the things that happen to it when fired and the work that should be performed on it to prepare it for reloading, with separate comments on the other types. We have selected the bottle-neck as a model because this type is used principally for high power rifles and is subjected to more severe strains than some of the other types.

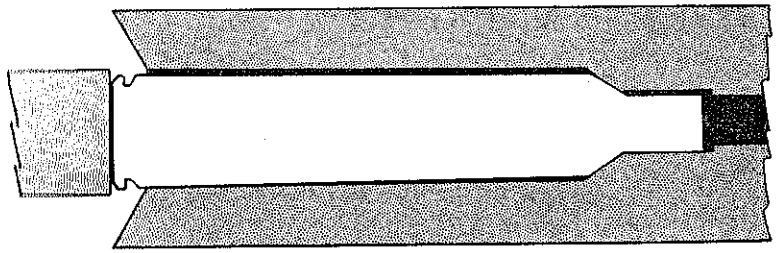


Diagram of a minimum case in a maximum chamber. (Exaggerated)

Head Space

For the sake of functioning, a cartridge must enter freely into the chamber. As there is a considerable variation in the dimensions of chambers of the same caliber, ammunition must be made small enough for the smallest of chambers and will usually be found to fit more or less loosely into the average chamber of its caliber. When seated it lies in the bottom of the chamber and the axis of the cartridge does not coincide with the axis of the chamber and bore. The neck of the case does not reach to the end of the chamber (except .45 auto). The chamber is made sufficiently long to allow for slight variations in the lengths of cases and to permit easy functioning when fouled.

The forward movement of the rimless case into the chamber is limited by the shoulder of the case coming into contact with the shoulder of the chamber. The distance from the shoulder of the chamber to the face of the bolt or breech block when closed, and the locking lugs are back against their supporting shoulder on the revolver, is called the head space. With rimmed and semi-rimmed cases, the cartridge rim bears, to the face of the bolt or breech block when it is forced to the rear as far as it will go in the closed position.

Another method of controlling head space is the so called belted type of case such as the .300 and .375 H. & H. Magnum. These are of the rimless head variety but have a belt or bulge a short distance ahead of the base; this controls the head space instead of the shoulder of the cartridge case.

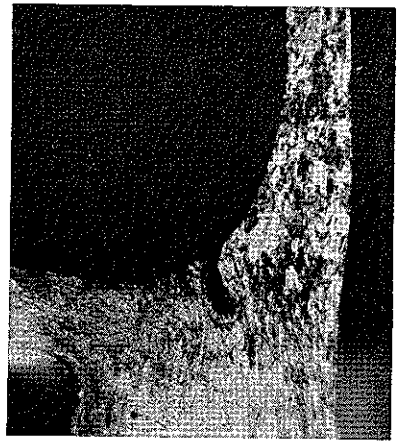
When the Cartridge is Fired

In our analysis we will first assume a condition where the chamber is not more than .005 in. larger than the cartridge case and the bolt supports the head of the cartridge. Later, we will see what happens to a case when it is fired in a loose chamber and with the head not properly supported by the bolt.

When the primer is struck by the firing pin, the primer cup is indented and the priming pellet is pinched violently between the indentation in the cup and the anvil, causing the pellet to explode. The flash of the explosion passes through the hole or vent in the bottom of the primer pocket and ignites the powder charge. As the powder burns, it changes from a solid substance into gases which expand rapidly. As the volume of the gases is many times the volume of the chamber, pressure is built up which must escape somewhere. As the pressure rises, the thin sidewalls of the cartridge case are expanded and pressed into firm contact with the chamber walls making it impossible for the gas to leak out between what was a rather loose fitting case and the chamber walls. The case now being supported on all sides by walls of steel, the only outlet for the gases is through the bore. As the neck of the case expands with less force and in less time than is usually required to move the bullet forward, some gas escapes ahead of the bullet but as the chamber pressure continues to rise, the bullet moves forward into the bore and to all intents and purposes seals the remaining gas behind it until it leaves the muzzle. The gas then escapes and the pressure drops to zero.

Expansion in Fired Cases

We have seen that the walls of the cartridge case have purposely been made springy which permits the case to spring back slightly from the chamber walls so that it can be extracted easily. The amount that the case will spring back depends upon the hardness of the brass. The amount of permanent expansion or enlargement of the case depends upon the hardness of the brass and the size of the chamber in relation to the size of the cartridge case. All commercial and military cartridges are slightly smaller than the chambers they are fired in, and fired cases expand to a size a little larger than new ones. If a chamber is very much larger than the cartridge fired in it, one or more of the following conditions may be found when the case is extracted: neck split, body of case split, brass torn inside of head or case near side walls. The first two conditions are readily detectable but the third is not. This tearing of the brass inside of the case is due to the expansion of the side walls, near the head, beyond a point that the brass crystals will stretch to. This condition is shown in the accompanying illustration but we know of no way that it can be detected by any ordinary examination. Cases showing a very marked degree of expansion near the solid head are apt to have this defect and while it is not at all dangerous to reload such cases with reduced loads we do not recommend their use with full charges.



Case fired in loose chamber
Solid head torn because of over-expansion

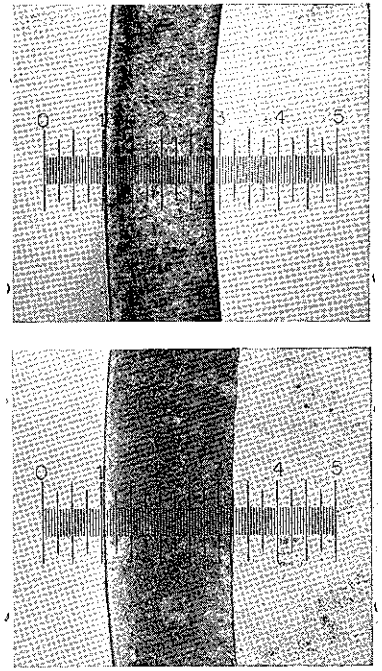
Such cases should not be resized full length. If they are resized, the cracks are ahead up, but when fired again, the brass is likely to tear further due to the violence with which the side wall is driven out against the chamber wall. On the other hand, if the case is not resized except at the neck, the side walls will practically be in contact with the chamber walls and there will be very little if any change in the cracks.

Where cartridge cases are only moderately expanded, as in good military and commercial chambers, resizing does no particular harm. There is not enough displacement of the metal (except in the neck) to change the grain size of the brass, consequently the case is not hardened or made brittle, but if there has been enough expansion to separate crystals in the solid head, the picture is changed. Therefore, we do not recommend the full length resizing of cartridge cases if it can be avoided.

Full length resizing is necessary when cartridge cases will not chamber in the arm they are to be fired in, or when the reloaded ammunition must be used in a number of guns of the same caliber as in military or police organizations.

Neck Resizing

The part of a cartridge case that must receive the most attention when reloading is the neck, because this part of the case must be resized each time the case is reloaded. In drawing cartridge cases, great care must be taken that the drawing punches are located centrally over the dies. If these punches are not centered the case will be drawn out on one side more than the other, causing uneven wall thickness all around. Such cases are scrapped and every effort is made to avoid the condition, but there will oftentimes be a very slight variation in wall thickness even in straight cases. This variation may be greater in tapered or bottle-necked cases for the following reason. These cases are first drawn in the form of a cylinder, after which dies are forced over them which reduce or taper them to the proper form. When the coning action takes place the brass follows the path of the least resistance. If one side of the case is the least bit softer or thinner than the other, that side will collapse more readily than the other and will be a little thicker. The two accompanying illustrations are photographs taken at two different points at the mouth of the same cartridge case. The variation in thickness shown is by no means an extreme example.



Variations in wall thickness of the neck of a bottle-neck case. Both pictures are of the same case

When a cartridge is fired, the neck of the case is expanded to the limits of the chamber. The brass will spring back more or less depending upon the chamber dimensions and the hardness of the brass, but except in special tight chambers the necks will be expanded so that bullets will not fit them tightly unless the necks are resized.

We are sometimes asked to supply muzzle resizers that will reduce the necks of this or that make of case just enough so lead bullets can be seated in them. This

is not possible because there is so much variation in the wall thickness and springiness of cases, not only of the same make but of the same lot, that a uniform inside diameter cannot be obtained by reducing the outside of the necks.

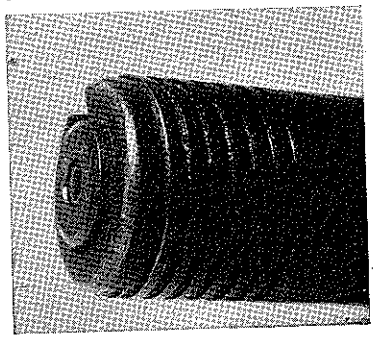
The one satisfactory way to resize the neck of a fired case is to reduce it slightly more than necessary with the Muzzle Resizer and then expand the inside to the correct diameter with the Shell Expanding Chamber.

Variation in Wall Thickness

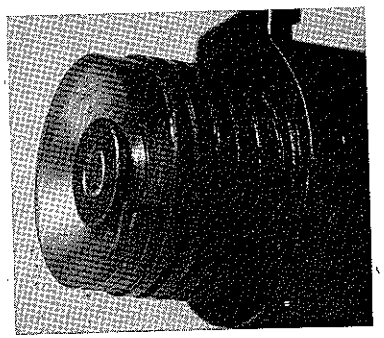
When the neck of a fired case is reduced in the Muzzle Resizer, the weaker side of the neck will collapse more readily than the stiffer side. If the variation in wall thickness of the neck is more than average, or if the necks are enlarged considerably in a loose chamber, this off-center resizing will be noticeable to the unaided eye. Two-thousandths of an inch is enough to make it noticeable. If the case is resized full length, the same thing will happen but cannot be detected with the unaided eye. Sometimes its appearance is due to excessive expansion of the case neck and severe reduction by the Muzzle Resizer. It is not of serious consequence, for as long as the variations in the form or dimensions of a cartridge are within the limits of the chamber the ammunition is to be fired in, the accuracy will not usually be noticeably impaired. The neck of the case will be expanded and forced against the chamber walls before the bullet moves forward into the rifling and there is always a brief instant during which the bullet is left free and unsupported to find its own way.

In any good commercial or military chamber the amount of space that the unsupported bullet has to move around in is very limited and there is little opportunity for the bullet to tip or go far astray. Slightly better accuracy can be obtained by seating bullets in such a manner that they fit into the throat of the barrel before they are fired. This method is treated in detail under the subject of Barrel Vibration in the chapter on Bullets.

In addition to expanding, cartridge cases lengthen more or less when they are fired. This lengthening is sometimes attributed to the pressing out of the cannelure that limits the depth of seating the bullets in smokeless powder cartridges but is really the least important of the three causes. The most important is head space adjustment.



Rimmed case. Solid head inside chamber.

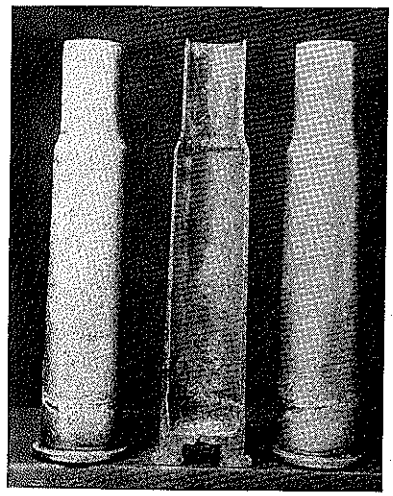


Rimless case. Part of solid head projects from chamber

Cases Lengthened or Stretched

We have already defined head-space as the distance from the point that stops the forward movement of the cartridge into the chamber to the face of the breech or bolt. The accompanying illustrations show the relation of rimmed and rimless

cases to their chambers. Observe that the former has the solid head seated well within the chamber while the latter (in bolt action rifles) has only a small part of the solid head within the chamber. There is a space between the mouth of the case and the end of the chamber to accommodate cases that may be a little longer than normal and to permit the easy entrance of the cartridge even when the chamber is dirty. The rimless case is supported against the blow of the firing pin by the shoulder, and the measurement from the head to the shoulder is a very important one. The shoulder of a rimmed case does not have to be located with precision and there is usually quite a little space between it and the shoulder in the chamber. If there is any play between the head of the cartridge and the face of the bolt or breech block, the cartridge will be driven forward by the blow of the firing pin, the walls will expand under the pressure of the burning powder and freeze to the chamber walls, and the head of the case will be forced back against the bolt, stretching and reducing the thickness of the side-walls near the head of the case.



Partial head separations due to excess head space

The illustration on this page shows a case in this condition. Naturally, this lengthens the case and if the space between the head of the case and the bolt is great enough, the head will be torn away from the body of the case necessitating the use of a broken Shell Extractor to clear the chamber. With a rimmed case, this condition is seldom dangerous because the solid head is well within the chamber and the remnant of the side wall remaining with the head is usually sufficient to stop the escape of gas to the rear. With a rimless case the situation is not as good and more or less gas may escape.

Effect of Full Length Resizing

Assuming that there is only a moderate stretching of the case due to head-space adjustment, the case will expand to fit the chamber perfectly when fired. If, when it is reloaded, the case is resized only at the neck, the head will be in contact with the bolt and there will be no appreciable further weakening of the case. On the other hand, if the case is resized full length, it will have the *appearance* of a new case with the same outside dimensions except for overall length, yet the weakened side wall will not be changed. The shoulder will be set back, giving the same space between the head of the case and the bolt that originally existed, and when the cartridge is fired again there will be a further weakening of the side walls near the head or possibly a complete separation of the head. This is another reason why we do not recommend the full-length resizing of cartridge cases.

Miscellaneous cases picked up on a range will often fail to enter the chamber of your firearm freely and may require resizing to make them serviceable. For this purpose you should use a full Length Resizing Die. The proper way to use the Resizing Die is to drive the cases into the die only far enough to reduce them sufficiently to enter the chamber of your firearm. The Full Length Resizing Die is manufactured with the most expensive type of reamer made in the United States and with a full understanding of the problems of reloading ammunition.

Another cause of lengthening of cartridge cases is the gas thrust which, in bottle-neck cases, actually drives the brass forward when the cartridge is fired, even though their heads are in firm contact with the bolt when the cartridge is fired. The stretching from this cause is not localized, that is, not confined to any one point and is quite evenly distributed throughout the entire length of the case. Cases that have lengthened so that they will not chamber satisfactorily can be used by filing back the mouths a little. Filing the mouths of cases will not injure them in any way nor will it have any effect upon the accuracy of the ammunition. It is a good idea to have a cheap caliper rule handy. The caliper can be set with a new case as a guide and the fired cases filed off to the proper length. Filing will leave a burr on the inside of the mouth of the cases which must be removed with an IDEAL Shell Chamfering Reamer or a knife, before seating lead alloy bullets.

Revolver Cases After Firing

The forgoing comments apply particularly to rifle cartridges. Revolvers must have some space between the heads of the cartridges and the breech in order to permit the free rotation of the cylinder but except with cases made of soft brass, the head space gives no special trouble. Straight cases do not lengthen to any appreciable extent from gas thrust.

Revolver cases are, for the most part, made with folded heads, although solid heads are making their appearance in .38 Special caliber. This change to solid head cases was made necessary by the new high speed loads and it would not be surprising if the demand for higher velocities in other calibers resulted in the disappearance of folded head cases in a few years. Solid head cases will last longer than the folded head type although the latter are amply strong and satisfactory for reloading and will often last several years.

The troubles most often encountered with reloaded revolver ammunition are head separations and broken webs. (The web of a case is the bottom or "floor" of the primer pocket.) Broken or blown out webs are encountered mostly in the larger calibers of revolver cases. Neither of these conditions is ordinarily due to any inherent weakness in the case, but to the use of primers containing fulminate of mercury.

Washing Cartridge Cases

We know of no good reason why anyone reloading ammunition for his own use should bother with washing cartridge cases except when they have been fired with black powder. Black powder leaves a heavy residue inside of the case that gathers dampness rapidly causing the brass to corrode. If this corrosion is not checked, the case will become weakened and may rupture when fired again or even buckle under the pressure of loading it. This is not apt to happen in dry climates, but as a general rule it is best to wash out the black powder fouling.

Drop the cases into water as soon as possible after firing which loosens the fouling and prevents it from hardening. Cases may be left in the water for a few days without harm. At the first opportunity they should be scrubbed out with a bristle brush and boiled in soapy water for several minutes. Oakite or a similar preparation in the water is even better than soap. Rinse in clean hot water.

There is no necessity of washing cases that have been fired with smokeless powder. Cartridge cases that have been reloaded without washing have shown a slight reduction in muzzle velocity after a year or so. Whether this was due to the presence of powder fouling, slight deterioration of the primers, or to absorption of a small amount of moisture by the powder (the ammunition was not water-proofed), we do not know. Whatever the cause, the falling off in muzzle velocity was negligible. However, there is no harm in cleaning cases.

The cleaning or washing of cases by police or military organizations that reload ammunition in large quantities is justifiable. Such ammunition is usually issued to men who know nothing of ammunition or reloading and discolored cartridges often create the idea in their minds that the ammunition is of inferior quality and they are reluctant to use it.

Cleaning Inside and Outside

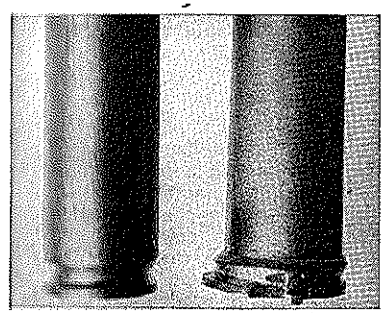
For those desiring to wash cases we recommend the following well tried method of cleaning cases to make them as bright and as clean as new, inside and out. Arrange four wide-mouth quart jars in a row. In the No. 1 jar on the left put one quart of water, add to this two ozs. of sulphuric acid and two ozs. of potassium bichromate. Fill jar No. 2 with clear water. Fill jar No. 3 with a solution made by dissolving one-quarter pound of sodium cyanide in water to make one quart. Jar No. 4 should be filled with clear water. The solutions in jars 1 and 3 are deadly poison and if mixed, will give off poisonous fumes.

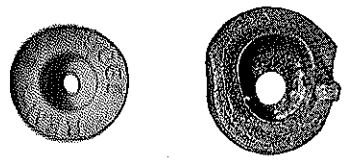
Take a piece of brass or copper wire, bend it double and bend the two ends up to form hooks for the cases. If iron wire is used, there will be an electrolytic action between the brass and iron, turning the cases copper color wherever the iron touches. This is not harmful. Iron wire is also eaten away rapidly by the solutions but it can be used except for these minor objections.

Hang two cases on the hooks and immerse them in Jar No. 1 for about five seconds. Rinse them well in jar No. 2 and immerse them for five seconds more in jar No. 3. Finally, dump them in jar No. 4. If these cases are not thoroughly cleaned, repeat the operations as described. The water in jars 2 and 4 will have to be changed from time to time as more or less of the solutions will be carried over into them by the cases.

To clean cases in large quantities, use earthenware crocks of suitable size to hold the solutions, and copper wire baskets for handling the cases. The baskets should be of a size that will enter the crocks easily and should be braced with rods so that they can be shaken vigorously in order to remove all the solution possible before they are rinsed. It is desirable to have running water in the rinse jars to permit constant change of water.

Drying Cases





The effect of overheating the head of a case

Cartridge cases should be dried promptly to avoid corrosion. Boiling them in clean water, then draining and shaking them in a towel, will remove a great deal of the water. The heat of the brass will cause most of the moisture to evaporate. But this procedure is seldom sufficient to dry cases thoroughly and when the cases are cool, water will usually be found inside of them and in the primer pockets. Standing them on a *warm* part of a stove top will dry them out but there is an excellent chance to misjudge the heat of the stove top. If there is any part of a case that we do *not* want to over-heat it is the head, for soft heads can be a source of serious trouble. Brass can be heated at 482 deg. Fahrenheit (250 Centigrade) without any change in physical characteristics, even if the temperature is maintained for some time. This is equal to the heat of a very hot oven. Many reloaders have gas or electric stoves in their homes with heat control devices in the ovens, and can use them to good advantage for drying cases. Set the indicator or thermostat at 250°. (The oven controls on stoves sold in the U. S. are marked in de-

grees Fahrenheit.) Never place the cases on the bottom of the oven or directly in contact with any heated surface. Put them up on a grating, spread out on newspaper. Leave the oven door open about one inch to permit a circulation of air.

If you have no thermostat or oven indicator on your stove, you will have to call in the cook and have her regulate the oven as she would if she were baking a sponge cake; then follow the directions above. Leave the cases in the oven until they are thoroughly dry. The oven can be hotter than necessary for sponge cake without doing a particle of harm, but the oven door should always be open. The newspaper under the cases will serve as a guide. If it scorches too rapidly, reduce the heat and open the door a little wider.

Grooved Cases

Revolver cases intended for use with smokeless powder, and some rifle cases, have a groove or cannelure rolled into them at about the location of the base of the bullet. In revolver cartridges, these grooves prevent the bullets from dropping or being forced too deeply into the cases in machine loading prior to their being crimped, but in rifle cartridges they serve a further purpose.

In the tubular magazines of rifles, the cartridges lie end to end. Under the shock of recoil and the pressure of the magazine spring the bullets might be forced back into the cases if there were no grooves to stop them. Such bullets require case necks expanded nearly to the bullet diameter in order to be seated without deforming their bases. After lubrication, thin film of lubricant is left between the bullet and the inside of the neck, causing lower resistance against the pressure of the magazine spring and the shock of recoil, than with a metal case bullet. Therefore crimping is required with cast bullets.

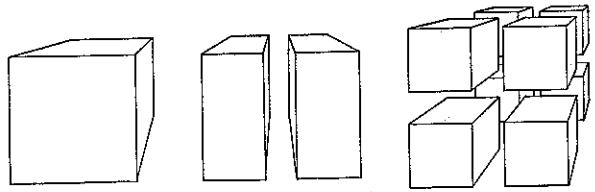
The grooves in revolver cases are of no consequence to the reloader except when the bases of bullets are forced beyond them. Under such circumstances the cases may be found bulged or expanded at the groove which prevents their entrance into the chambers. This bulge can be reduced by placing the imperfect cartridge on a flat piece of steel on a bench or table and rolling it with another similar piece of steel. Considerable pressure must be used, but the cartridge and the case can be saved and the operation will probably not have to be performed a second time.

POWDER

Gun powder, whether black or smokeless, is a solid substance which, when burned, gives off gases having a much larger volume than the powder charge itself. When powder is ignited in the chamber of a firearm, the expanding gases build up pressure and in seeking a means of escape, push the bullet, the only movable part of the closed chamber, out of the barrel. This action is very similar to that of an internal combustion engine where the vaporized gasoline (powder) is compressed in the cylinder (chamber) by the piston (bullet). At the proper time, the charge is fired by the spark-plug (primer) and the gasoline charge is converted into gas expanding at high temperature. The expansion develops pressure which drives the piston (bullet), the only movable part of the closed chamber, violently downward. Were it not for the connecting rod, the piston would be driven out of the cylinder just as a bullet is driven from a gun.

Gun powders are roughly of two kinds; black and smokeless. Each have further sub-classifications and the many varieties available to the hand loader have distinctive names or numbers. Before buying powder, be *sure* you have selected the proper powder for your purpose. Be equally sure that you get it, for the use of the wrong kind or quantity of powder may give unsatisfactory results and even may be dangerous.

Black powder is a mechanical mixture of charcoal, sulphur and saltpetre. The ingredients are ground together, pressed into hard cakes, and subsequently broken



Graphic illustration showing how the burning area of powder grains increases as the grain size decreases

up to pass through sieves of the proper mesh to obtain the desired granulation. The grains are then coated with graphite to retard the absorption of moisture, which gives the powder the black, shiny appearance from which it gets its name.

When a kernel or grain of powder is ignited, the outer surface burns first and as the grain is consumed the burning area constantly decreases until there is nothing left. Therefore, the more surface there is exposed in a charge, the more rapidly the charge will burn. For example, let us assume that the cube in the accompanying illustration represents a kernel of powder. Obviously the area of the burning surface is the total area of the six sides of the cube. Now, if we cut the cube in half, it will burn in a shorter space of time for there are two additional surfaces exposed. Further sub-division of the powder grain will expose more area to the flame with a further increase in the rate of burning. The total AMOUNT of gas evolved by the divided grain will be no greater than if it had been left as one piece, but the TIME required to convert the powder from a solid into a gas will be much shorter.

The time element is important. A ten-thousandth part of a second increase in the rate of burning of a powder charge can give some surprising and ever-dangerous results for one ten thousandth of a second is a long time as things go inside of the chamber of a gun. This brings us to the subject of pressures.

The Measurement of Pressures

In this country the radial system of taking pressures is used. A substantial steel housing is constructed around the chamber of the pressure gun to support an anvil. Below the anvil there is a hole through the barrel leading into the chamber to which a piston is carefully fitted. The method of use is as follows. The cartridge to be tested is placed in the chamber, with or without a hole drilled through the case to correspond with the location of the piston, depending upon circumstances. A gas-check cup filled with grease is inserted in the piston hole and the piston is pushed down on top of it as far as it will go. A carefully made cylinder of copper called a "crusher" is placed on top of the piston and the anvil is placed on top of the crusher. The anvil is supported firmly by a heavy set screw that is threaded through the top of the housing. When the cartridge is fired, the piston is forced upward compressing the crusher. The crusher is carefully cut to length and measured before the shot is fired and the amount of set or the decrease in its length is used as a measurement of the chamber pressure. The accompanying diagram will serve to give the reader a better idea of this method of taking pressures, a method simple and inexpensive to use and sufficiently accurate for all practical purposes.

Every laboratory has its own ideas as to the amount of initial compression, if any, that should be given the crusher. The amount of initial compression, along with a number of other variable factors, some of which cannot be pre-determined, leads to variation in the numerical results obtained by different laboratories. If five cartridges loaded exactly alike were to be fired for pressure by five different ballistic laboratories, the numerical results obtained would in all probability be different. The figures are considered as representing the pressure in thousands of pounds per

square inch but in reality *they are nothing of the kind.* They are numerical values the usefulness of which is largely dependent upon the knowledge and experience of the men taking the pressures.

Without this knowledge and experience, the figures representing pressures are meaningless. If you have read that your rifle has a safety limit of 50,000 lbs. per square inch and if you have read elsewhere that a certain load for your rifle develops a pressure of 40,000 lbs. per square inch, do not get the mistaken idea that that charge can be increased 10,000 lbs. with safety, for 40,000 of these units called "pounds per square inch" in one laboratory may be equal to 50,000 in another. The only object in taking pressures at all is to determine whether loads are safe in the arms they are intended for.

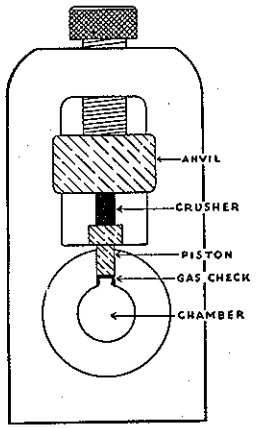


Diagram of a radial pressure gauge

From correspondence we receive and from articles appearing in shooting magazines, it appears to us that pressures hold a certain magic charm for many reloaders which we are unable to explain. If a load is safe, it makes little difference what the numerical value of the pressure is. On the other hand, if it is not safe, don't load it. The ability of an arm to stand several high pressure proof-loads is no indication of its ability to stand up under repeated firing of such loads.

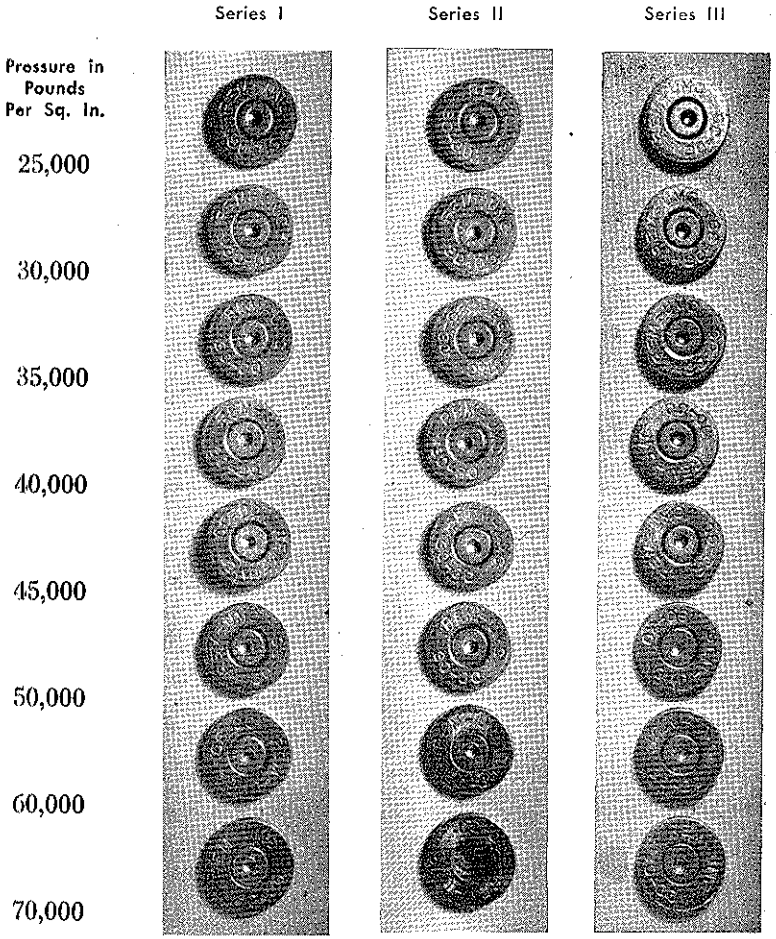
Primers Used for Estimating Pressures

In previous editions of the Ideal Hand Book, we have suggested using the comparative flattening of primers as a means of estimating pressure when working up a powder charge. Our own experience has shown this to be unreliable. In fact, noncorrosive primers explode with such violence that they will flatten considerably without any powder at all in the case.

To show how useless it is to try to judge comparative pressures by the primers, refer to the illustration following. The figures represent the pressures in thousands of pounds pressure per square inch. Series 1 was fired with a well-known potassium chlorate primer that has been on the market for many years. Series 2 and 3 were fired with two different types of non-corrosive primers. In series 2, the primer leaked at 60,000 lbs. and blew out at 70,000 lbs., but did not do so on a re-test. The reader can see for himself that there is in no case a sufficient variation in the flattening of any of these primers that might serve as an indication of the pressure. In passing, it may be of interest to know that with the temperature of powder at 70 deg. Fahrenheit, it required only an increase of .5 of a grain of powder to raise the pressure from 60,000 to 70,000 lbs.

However, excessively flattened or pierced primers, gas leakage around the primer, excessively expanded cases, reamer marks on the case or blown out primers should immediately be heeded as signs of excessive pressures. All of these things can be caused by conditions other than high pressures, but when they do occur, shooting with that load should be stopped until the difficulty is located. If the load is one that is recommended by a reliable source as being safe, pull the bullets from several cartridges and check the powder charges on a sensitive scale. Examine the bore for signs of excessive metal fouling, leading or rust. Measure the bore as described on page 138. Measure the diameter of your bullets. Jacketed bullets should not be more than .001 of an inch larger than the groove diameter of the barrel.

If the condition is limited to a flattened primer, with all other conditions appearing to be correct, try a different brand of primer. If that does not correct the difficulty, the powder charge will have to be reduced.



Note the slight variation in flattening of primers as compared with the wide variation in pressures

When a powder charge is ignited by a primer and the process of converting the powder into a gas begins, the bullet does not move forward into the barrel immediately and the chamber is practically closed on all sides. The bullet is of course movable, but a certain interval of TIME is required to overcome its inertia, the resistance offered to it by the rifling and the friction of the barrel. When the volume of gas exceeds the capacity of the chamber the pressure starts to rise. The rise in pressure causes the powder to burn faster, giving off more heat. The increased heat raises the pressure. Thus we have a vicious circle chasing the pressure skyward. But at last the bullet has had time to overcome the forces resisting its forward movement and it starts

to move down the bore. This increases the space in which the gases are expanding and while the gas may hold its own with the increasing space for a brief instant, it is a losing battle. When the bullet has moved down the bore a short distance, the pressure begins to drop until it reaches zero again after the bullet has left the gun. This is shown graphically in the diagram in which the A represents the normal pressure limit of the arm, B the margin of safety, and the space C D the TIME necessary for the bullet to start forward. The pressure curve Y is that of a normal full load. Obviously, this load is correct. We could use it with perfect safety and without any injury to the arm, but if we were to use the same bullet with a finer grained powder (you will remember that the smaller the grains the more burning surface there is exposed) the picture changes. By referring to the curve X, we find that the pressure starts up more abruptly with the fine grained powder because it burns or turns into gas FASTER than the powder we used previously. The pressure passes the safety limit before the bullet has had TIME to move forward and the action lets go. An overload of the right kind of powder could produce the same results because the more powder there is the more surface there is to burn and more gas is evolved in a given space of time. Furthermore, an overload of powder decreases the amount of space available in the chamber for gas expansion and this in itself will cause some rise in pressure.

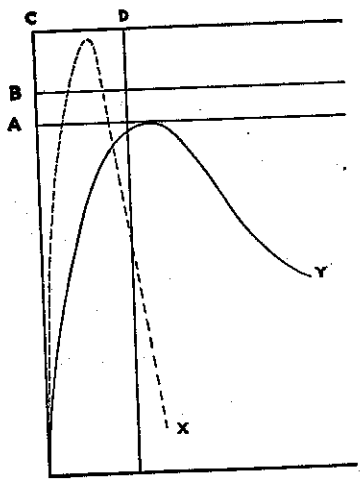


Diagram showing the effect time on maximum chamber pressure

Black Powder Pressures

The foregoing comments apply to both black and smokeless powders but black powder has certain limitations as to the pressure it can develop in any given cartridge. In the first place, the proper way to load black powder is to fill the case full enough so that the powder is packed tightly in the case when the bullet is seated to the proper depth. Therefore, it is impossible to get too much powder into the case. About the only way we can go wrong with black powder is by using powder of too fine a granulation for the cartridge.

Black powder for rifles and pistols comes in three different granulations. FFFg is the finest and is intended for use in the small revolver and rifle cartridges. FFg is the medium grain and serves best in the medium caliber rifle cartridges and the large caliber revolvers. Fg, the coarsest granulation is not suitable for revolvers, but intended for black powder loads in large caliber rifle cartridges.

Smokeless Powders

Smokeless powder, unlike black powder, is not merely a mixture of several ingredients granulated. It is a chemical product and the chemical actions and reactions that take place during its manufacture have a great deal to do with its ballistic properties. These can usually be controlled within fairly close limits but there is enough of an uncontrollable element to cause some difference between two lots or batches of smokless powder even though they are made exactly alike in so far as is humanly possible.

The uncontrollable factors in Smokeless Powder manufacture lead to a difference in the specific gravity in different batches or lots and a given volume of two different lots of the same kind of Smokeless Powder may not have the same weights. It is important to take this into consideration when using mechanical powder measures. As a general rule the powders that are put into canisters for reloading purposes are selected from lots that show very little variation from an established standard.

Bulk Powders

Smokeless powders are roughly divided into two classes: bulk and dense. The bulk powders get their name from the fact that they were first made so that they could be loaded bulk for bulk with black powder. In other words, ORIGINALLY, one could measure charges of bulk smokeless powder with the measure or scoop that was used for measuring black powder. This is no longer true and EXCEPT FOR DU PONT'S BULK SHOTGUN POWDER AND HERCULES E. C. SHOTGUN POWDER, THERE ARE NO BULK POWDERS BEING MANUFACTURED THAT CAN BE LOADED BULK FOR BULK WITH BLACK POWDER. Bulk powders are made from nitrocellulose and are usually of a yellowish color although dye is sometimes used to give them a distinctive color. The grains are somewhat irregular in shape and rather soft and porous as they are gelatinized only on the outside.

Dense Powders

Dense powders are of two general kinds known as single-base and double-base powders. Single-base powders are made of straight nitrocellulose while double-base powders are made from nitrocellulose with some nitroglycerine added to it. The basis of these powders is cotton which is nitrated and reduced to a colloid. The colloid, in the case of small arms powders, is squeezed through dies in much the same way as macaroni is made and comes out in the form of strings, often with a hole running through the center. These strings of powder are cut into short pieces and heated to remove as much as possible of the solvents that remain from the manufacturing process. The alcohol and ether used in manufacture cannot be entirely removed and a small percentage remains in the powder. The odor of ether is very noticeable when a canister of smokeless powder is opened. If a can of powder is kept in a warm place for sometime, these volatiles will evaporate, changing the burning characteristics of the powder. This condition should be avoided. It is unwise to keep smokeless powder in a hot attic or where the temperature is likely to run up over 85 to 90 degrees. It is far better to keep it in a cellar even though the place is damp. Of course, precautions should be taken to prevent dampness getting into the powder and, if necessary, cut small washers or gaskets from a piece of inner tube, slip over the opening of the canister and screw the cap firmly down.

The reader should not get an erroneous idea of the effect of a little warm weather on powder for no harm will result from the ordinary use of smokeless powder in a warm climate. However, if you have a variety of powders on hand and some of them are used infrequently, they will stand up longer and give better results if kept where the temperature does not exceed 90 degrees.

We have already stated that powder burns from the outside of the grain towards the center. If all powder grains were made solid, the greatest amount of gas would be evolved when the surfaces of all the grains in the charge were ignited and would constantly diminish as the grains became smaller. Under such circumstances the pressure curve would run up to its peak abruptly and immediately begin to fall off which would indicate that the bullet received more or less of a quick jab to send it on its way.

The "Textbook of Small Arms," official publication of the British War Office, gives a simple comparison between the normal burning of a powder charge and the

near detonation of a charge that develops pressure so rapidly that the bullet does not have time to start forward before the pressure exceeds the limit of safety of the arm: "An ordinary door stands open, and by placing one finger against it and applying gentle pressure the door begins to close, and after it is once 'on the move,' its inertia being overcome, little effort is required to close it completely. If, instead, we take a running kick at one of the thin panels, it is very probable that the panel will fly to matchwood and equally possible that the door will fail to close."

This principle applies to bullets as well as to doors and a powder charge should liberate gas slowly enough to permit the bullet to start down the bore before the maximum permissible pressure is reached in the chamber.

To maintain the volume of gas that accelerates the bullet after it has started on its way up the bore, most smokeless powder grains are made with a hole through the center. Pistol, shotgun powders and a few quick burning rifle powders have no holes. Instead, they are cut in small flakes for rapid burning. When a perforated grain burns, the inside area increases as the outside decreases, giving off a more or less sustained volume of gas.

The amount of gas evolved from a perforated grain of powder is not absolutely constant as the grain burns from the ends, the outside and the center and is also affected by pressure and temperature as before mentioned. But with powder grains so formed, and in suitable charges, the pressure curve does not reach its maximum point until after the bullet is on its way and the volume of gas is sufficient to exert an increased force on the bullet while it is moving. In other words, the pressure continues to rise after the bullet is in motion just as the pressure on the door was increased after it was in motion.

Progressive Burning Powders

The powder manufacturers have ever been trying to make powders that would build up pressures gradually until the bullet started to move, and to increase the amount of gas available for accelerating the bullet after it is in motion. Marked progress has been made along these lines by impregnating the powder grains with a substance that burns more slowly than pure nitrocellulose. Such powders are known as coated or progressive burning powders. Due to the coating, they are harder to ignite and require hotter primers than plain burning powders but they will develop much higher velocities than the plain burning varieties. They build up pressure more slowly and when the coating is burned away, increase their rate of burning, supplying gas more rapidly to give the much desired follow-through shove to the bullet while it is in motion.

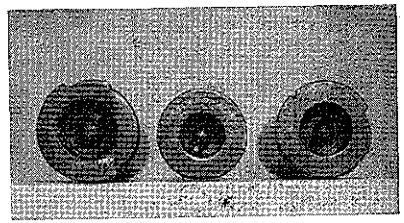
A concrete and rather striking example of the effect produced by progressive burning powder can be found in our cal. .30 Government 30-06 cartridge. At the time of World War I this cartridge was loaded with a plain burning powder and a 150 grain bullet. The muzzle velocity was 2700 f. s. This was the maximum velocity that could be obtained within safe limits of pressure. Today, with progressive burning powders, we can obtain an equal velocity and a much greater range with bullets weighing as much as 180 grains without any material increase in the maximum chamber pressure. This is accomplished by delaying the TIME in which the maximum pressure is reached until the bullet has moved a small fraction of an inch further down the bore.

We hope we have not over emphasized the time element but we believe that too many reloaders think in terms of maximum pressures without any reference to the manner and the time in which the pressures are developed. Pressures mean nothing so long as they are within the safety limits of the arm in which they are developed.

High velocities are not necessarily dependent upon high pressures. For example, we can drive a bullet from .30-40 cartridge with a velocity of 2800 f. s. and a pressure of around 40,000 lbs. per square inch. To give the same bullet the same initial

velocity with the same powder in the 0.30-06 cartridge we must run the pressure up four tons more per square inch, approximately.

To further show how high pressures do not mean high velocities, we refer the reader to the illustration of the three cartridge cases at the right. It will be noticed that the two end cases have their heads badly upset and the primer pockets enlarged. The case in the center is a normal fired case for comparison. These cartridges were fired in a gas operated machine gun. The center cartridge was a standard military cartridge while the deformed cases were loaded with Du Pont's No. 80 powder. Du Pont No. 80 powder has since been superseded by Du Pont No. 4759 which is an excellent, so called, "bulk powder" for use with lead bullets.



The pressure in the two end cases were excessive — the velocities were low

A gas operated gun has a hole through the barrel a short distance back from the muzzle. When discharged, the action is locked and remains locked until the bullet has passed the port in the barrel, when some of the gas escapes through the port and causes the breech to open, ejects the fired case, pulls another cartridge out of the feed belt, compresses the recoil spring and cocks the gun. The counter action of the recoil spring pushes the cartridge into the chamber and locks the action.

From the character of the brass in these deformed cases and their condition after firing, we would judge that the maximum pressure was around 75,000 or 80,000 lbs. per square inch, but by the time the bullet passed the port, some eight or ten inches from the muzzle, there was not sufficient remaining pressure to open the breech and eject the case. The breech bolt came back about half way and pushed the case back into the chamber again. If the pressure had dropped that much with the bullet not yet up to the muzzle, you may be sure that the bullet was not getting much acceleration, and that its velocity was low in proportion to the high pressure developed. The condition was similar to that shown in the curve X in the diagram on page 124. The overload of fast burning powder ran the pressure up almost to the point of wrecking the gun before the bullet had TIME to start forward and then fell off so rapidly that it could not continue to accelerate the bullet as the latter approached the muzzle.

How to Load Black Powder

The first precaution is to make sure that you are using powder of the proper granulation for your cartridge. The second is to avoid iron or steel scoops, containers or scrapers for leveling off the measure. Black powder is very easy to ignite and a small spark accidentally struck from a piece of iron or steel can do the trick. It is superfluous to warn against smoking or measuring near an open flame.

If a scoop or dip measure is used, it should hold enough powder so that when emptied into the case, the charge will come slightly above the line of the base of the bullet when the latter is seated to the proper depth. Seating the bullet should compress the charge very lightly. "Pack" would be a better word than "compress." If black powder is not packed tightly, it will foul the bore excessively. Do not compress the charge too much as there would be danger of crushing some of the grains and this would increase the rate of burning and run the pressure up. The slight packing of the charge should require no more force than the seating of the bullet alone.

The container from which the powder is scooped should be large and deep enough so that the scoop can be passed through the powder without striking against it. Any jar will cause the powder to settle more densely in the scoop and will give a slight overcharge. Do not try to jar the scoop uniformly each time. It can't be done, uniformly.

The best way to load black or smokeless powder is with the IDEAL No. 55 Powder Measure. This is a very accurate mechanical measure and is graduated in grains weight of black powder. For black powder charges it is only necessary to set the adjusting slide to the proper graduation, fill the measure and go to work. The handle of the measure is best left in the downward position. To charge a case, hold the mouth of the primed case against the drop tube of the measure, raise the handle to its uppermost position to charge the measuring cavity, turn the handle all the way down against its stop to dump the charge and flip the knocker smartly with the tip of the finger to insure that all of the powder is jarred down into the case. By leaving the handle turned down the chance of one charge being settled more densely in the measuring cavity than another, through an accidental jar, is eliminated.

Detailed directions for setting the IDEAL Powder Measure for any charge of any kind of powder will be found on page 16. These measures are graduated with sufficient accuracy to throw charges equal to factory loads with safety, when set according to our table. Due to variations in the density of different lots of the same kind of powder, the weight of charge may not be exactly that indicated in the table, but once set, the measure will throw charges with great uniformity. To set the measure for a charge or precise weight, a sensitive scale or balance should be used and the measuring slide or slides of the measure adjusted to give a charge of the precise weight desired.

Maximum Loads

Maximum loads should *always* be weighed on a sensitive scale such as the Redding Scale or Pacific Scale. Pour the powder onto the scale slowly with a dip measure or scoop until the scale just balances. Be sure that the scale balances exactly at the right point for each charge, for with high pressure loads, it sometimes requires only a few tenths of a grain increase in charge to run the pressure up five to ten thousand pounds.

PRIMERS

A SMALL arms primer consists essentially of three parts; a cup, an anvil and the priming charge. The cups are made of brass or gilding metal, the hardness and thickness depending upon the types of cartridges they are to be used in. For example, primers for revolver cartridges usually have cups of softer and thinner metal than those intended for use in high power rifle cartridges. The blow of the firing pin of a revolver is usually much lighter than that of a rifle and the primer must indent properly under the lighter blow. As revolver pressures are much lower than rifle pressures, thinner and softer metal can be used in the cups without danger of their being "pierced".

On the other hand, the cups of rifle primers must be heavier to support the blow of firing pins impelled by stiff main springs and they must be strong enough to support the higher pressures.

The anvils in all primers must be as hard as possible without being brittle, as their stiffness and shape have a great deal to do with the performance of primers. European cartridge cases are made with the primer anvils as an integral part of the case. The primer or "cap" proper is merely the cup with the priming compound pressed into it. This type is known in the United States as the Berdan primer. The Berdan anvil is certainly stiffer than the separate anvil but this type of case presents some disadvantages that offset the greater rigidness of the anvil and is not made by any of our commercial manufacturers. As the anvil is located in the center of the primer pocket, the flash holes must be off center and such primers cannot be expelled with IDEAL Reloading tools although these tools will perform all the other operations of reloading satisfactorily.

If a new primer is examined carefully it will be noted that the anvil projects slightly from the bottom of the cup. This construction is necessary to bring the anvil in contact with the bottom of the primer pocket which supports it. Therefore, when primers are seated, care should be taken that they are seated fully to the bottoms of their pockets, as otherwise the blow of the firing pin will be cushioned and the variations in ignition that are bound to result will be reflected in more or less vertical dispersion, that is, the shots will string up and down on the target. Regardless of the load used, the muzzle velocity will not be uniform unless the ignition is uniform.

Primers should be seated with a firm steady pressure sufficient only to press them home. This is an operation where speed should always be subordinated to precision, as a poorly seated primer, like a poorly made one, can set to naught the most careful work of reloading.

Another reason for care in seating primers lies in the nature of priming mixtures. Some of these mixtures when pressed into the cups make pellets that are quite brittle while others are rather tough. If necessary pressure is applied to a primer having a brittle pellet, the pellet may crack or break and hang-fire or even a misfire may result. The tougher compounds will stand a good deal of pressure and some primers so loaded *may* be seated with a pressure that actually deforms the primer cup without impairing their efficiency, except to slightly increase the sensitivity of the primer. However, there is no reason to use any such pressure in seating a primer.

The nature of priming mixtures is of considerable interest from a reloading standpoint as some primers, quite satisfactory from the manufacturer's point of view, are entirely unsuited for reloading.

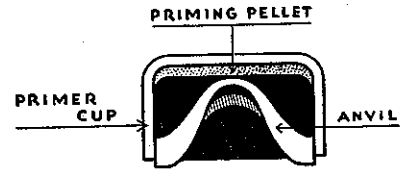


Diagram showing component parts of a primer

The first and most important function of any priming mixture is to ignite powder charges with certainty and uniformity. The first primers used with hand firearms appear to have been pieces of wire, one end of which was heated white hot and thrust into the powder charge through a vent hole. There probably has never been a better primer from the standpoint of positive ignition, as something is bound to happen when a white hot wire is thrust into a charge of black powder, but the hot wire lacked portability and was at a disadvantage in wet weather. This was followed by the slow match, a piece of string or towel soaked in a solution of saltpetre and dried, which smoldered when lit and afforded a portable but less certain means of ignition than the hot wire. The next important ignition system was the wheel lock, a device that produced a stream of sparks from iron pyrites which were brought into contact with a rapidly revolving steel wheel actuated by a clock spring. The sparks ignited a priming charge of fine black powder, the flash from which passed through a vent hole and ignited the charge in the barrel. In principle the wheel lock was not unlike our present day pocket cigarette lighters, but it was cumbersome, fragile, expensive and never came into popular use. We find in it the first adaptation of the elements of our present day primer; a means of producing fire, a fuel that will give a flash of sufficient heat and duration to pass through a flash hole and ignite the main powder charge.

The next important step was the flint lock in which a piece of flint carried by a hammer, struck a steel plate or frizzen in such a way as to cause the sparks produced

by the blow to be guided into a priming pan charged with fine black powder. Just as with the wheel lock, the flash from the priming charge passed through a vent igniting the main charge. Because the flint lock was fairly efficient and superior to its predecessors, it remained in common use for over 150 years.

In 1799, fulminate of mercury was discovered by Edward C. Howard. Fulminate detonates when struck or when subjected to friction. Alexander Forsythe, a Scotch clergyman, conceived the idea of adapting this substance to the ignition of powder charges in firearms and many novel and ingenious kinds of locks were tried. However, no great progress was made until the fulminate was incorporated in a copper cup called a percussion cap. The percussion cap was fired by placing it over the end of a nipple attached to the barrel or powder chamber of the arm, this nipple having a vent hole that passed through it and into the chamber. When the hammer struck the cap, the resulting explosion created a flame which passed through the vent firing the charge. The cap by its nature prevented the entrance of water into the vent in inclement weather and was much superior to the flint lock, but the flint lock was well established and percussion locks did not come into popular use until after 1830. It remained the principal type of firing mechanism for about forty years, when the metallic cartridge was developed and breech loading arms became practical.

Early Metallic Cartridges

The first metallic cartridges were of the rim fire type. They were not particularly satisfactory as the priming compound would sometimes break or jar away from the rim and a mis-fire would result. This resulted in the primer being incorporated in a separate cup placed in the center of the head of the cartridge. As cartridges were very expensive, practically everybody who used firearms reloaded their fired cartridge cases and the cases were designed with this idea in view. In their early days the ammunition companies were occupied principally with the manufacture of components for reloading but as the frontiers disappeared and firearms ceased to be tools of every day use, shooters could afford to buy the few cartridges they needed and the production of cartridges increased. Despite the convenience of buying ammunition ready-made, thousands of shooters continued to reload their fired cartridge cases, either for reasons of economy or because they wanted ammunnition that would fit their particular needs better than a standardized factory product.

Since the development of the center-fire cartridge, primers have changed but little in form, although there has been an unceasing effort to improve their performance. Fulminate of mercury does not make a good primer by itself for it is too quick and violent in its action. It must be mixed with a fuel that will give a flame of sufficient volume, heat, and duration to accomplish the purpose of a primer. It is also necessary to mix a hard gritty substance with it to produce friction when it is struck. Forsythe used potassium chlorate with ground glass and up to a few years ago commercial primers were still made with these ingredients in them and were known as fulminate-chlorate primers.

Unfortunately fulminate of mercury loses its explosive properties if stored for a long time or if kept in too warm a place. For this reason manufacturers have been seeking some satisfactory substance to take its place. Ammunition sometimes remains on dealers shelves a long time before it is sold, especially in out-of-the-way places, and when finally used, if the primers do not explode properly, the blame is placed on the manufacturer of the ammunition and the reputation of an otherwise good product suffers. Fulminate of mercury, in common with other mercuric compounds, will attack and weaken copper or brass. Thus nickel plated primers found in most commercial ammunition today had their origin in an effort to protect the primer cups from the action of the mercury.

Potassium chlorate will also explode when struck, without combining with fulminate of mercury. It is used in some military primers which must often be kept in storage for long periods before there is occasion for its use. Such primers are known as "non-mercuric primers." The term non-mercuric applies to any primer that does not contain fulminate of mercury regardless of any other properties it may have. These primers are also called chlorate primers.

Non-Corrosive Primers

But potassium chlorate has its disadvantages too. It makes a good primer and a good fuel for a mercuric primer but when fired it turns to a chloride. This substance coats the inside of the bore and gathers dampness from the atmosphere or from the steam, which is one of the products of combustion of the powder charge, and causes rusting if the gun is not cleaned shortly after firing. Along with their efforts to replace fulminate of mercury, the ammunition manufacturers have been trying to eliminate potassium chlorate and thereby eliminate rusting. A few years ago non-corrosive or non-rusting primers made their appearance under various trade names. These primers contained fulminate of mercury without exception and some of them did not do any too good a job of ignition. They were all subject to deterioration in storage and some makes would lose their strength in a fairly short period of time. But the development work did not cease and soon *non-corrosive, non-mercuric* primers were produced. THESE PRIMERS CONTAIN NEITHER FULMINATE OF MERCURY NOR POTASSIUM CHLORATE AND ARE THE KIND THAT SHOULD BE USED FOR RELOADING PURPOSES. The non-corrosive properties of these primers depend a good deal upon the nature and quantity of priming mixture and also upon the quantity and kind of powder used in order to obtain the non-corrosive feature, the manufacturers have to use a great variety of primers some of which contain fulminate of mercury. Therefore, the handloader should not put too much faith in the non-corrosive qualities of non-mercuric primers. The ammunition reloaded with them will usually be non-rusting and the fouling will be far less corrosive than if chlorate or fulminate-chlorate primers are used.

Three Sizes of Primers

There are three sizes of primers in common use in the United States. The large size is for the larger rifle cartridges and the small size for the smaller ones. Primers of the same outside dimensions are made for the large and small size revolver and pistol cartridges but these primers are of thinner or softer metal than the rifle primers so as to indent properly under the relatively lighter blows of hand gun mechanisms and are charged differently than rifle primers. Furthermore, pistol primers do not have to support such high pressures as rifle primers. Pistol primers should not be used in rifle cartridges as they are too weak for the purpose and do not carry sufficient priming mixture to ignite rifle powders properly. On the other hand, rifle primers, as a rule, will not give the best results in pistol or revolver cartridges. Their cups are too thick and hard for revolvers which may cause variations in ignition although the cartridge may *appear* to fire all right. The priming charges in rifle primers are intended to ignite large charges of powders that are more difficult to ignite than the fast burning pistol powders and when used in pistol cartridges, pressures will be increased somewhat. In some loads they may even be dangerous. Due to the large amount of priming compound in them and their violent nature they should not be used in revolvers or pistols. The new non-corrosive primers, even when loaded into revolver cases and snapped without any powder in the case, will set back violently. Their continued use will drive the recoil plate back and the gun will have to be returned to the factory for repairs.

The third or special size primer is made for the .45 government military pistol cartridge and is not adapted for any other caliber. The .45 automatic pistol cartridges of commercial manufacture take the large size pistol primers.

Because of the violence of the new non-corrosive non-mercuric primers, they will cause some increase in pressure when used with loads that have been developed with older types of primers. From a practical standpoint, this increase in pressures can be ignored in reduced loads or full loads up to and including normal factory loads. MAXIMUM LOADS IN .30-06 CARTRIDGES, WHEN USING COMMERCIAL PRIMERS, SHOULD BE REDUCED FROM 3 to 5 GRAINS.

FOR TABLE OF Primers see page 10. This table is the latest primer list available. The normal diameter of each primer is given immediately after each number. If you are in doubt as to the size of primer you should use, measure one of the fired primers with micrometer caliper. It is a good idea to use primers of the same make as your cases but it is not necessary, as all makes are uniform in size.

Barrels

Rifle and pistol barrels are made by drilling a hole through the length of a bar of steel, reaming the hole smooth, and rifling it by cutting spiralled grooves. The process is quite a lengthy one as several reamers are used to bring the bore to size, and the barrel has to be straightened each time any metal is removed from the inside or the outside of it. In rifling, the cutter removes a small amount of metal at each stroke, the barrel remaining in the rifling machine until all grooves are cut to the proper depth. This leaves the original bore in the form of ridges called *lands*. The diameter measured from the top of one land to the top of the opposite land is the *bore diameter*. The diameter from the bottom of one groove to the bottom of the opposite groove is the *groove diameter*. The depth of grooves in barrels made in the United States varies from .002 of an inch to .005 of an inch depending upon the caliber.

Accuracy

The accuracy obtained with any bullet depends to a large extent upon the way it fits the barrel. As a general rule a metal cased bullet should not be more than .001 inch larger in diameter than the groove diameter of the barrel it is fired in. It may be one or two thousandths of an inch smaller than the groove diameter without appreciably affecting the accuracy but match ammunition will usually be found to be loaded with bullets that are within .001 inch of the standard groove diameter of the rifles they are intended for.

If metal cased bullets are too large, the extra force required to start them into the rifling will delay their forward movement permitting the chamber pressure to rise higher than with a bullet of proper diameter.

Cast bullets can be sized as much as .003 inch larger than groove diameter without detriment to their accuracy. Any slight increase in pressure due to a cast bullet being a few thousandths of an inch over size can be ignored for two reasons. The pressures developed behind such bullets are relatively low and cast bullets are so much softer than metal cased bullets that they are forced into the rifling with comparative ease. The disadvantage of a cast bullet more than about .003 inch over size lies in the formation of fins on the base of the bullet.

When a bullet is forced into a rifled barrel, the lands must displace some metal. Some of this is displaced laterally into the grooves but most of it is forced back. If the bullet is much over size this displaced metal will form fins on the base of the bullet of greater or less strength. If this displacement of metal were always uniform it would be of little consequence but its distribution is a matter of chance and as the powder gases act upon these fins as the bullet leaves the muzzle, the unavoidable variation in their length is bound to result in some variation in the direction the bullets take.

All barrels of the same caliber are not of the same internal dimensions. Different manufacturers sometimes have different standards that they work to and there must always be reasonable manufacturing tolerances. These variations seldom exceed .003 inch in any caliber and in order that reloaders may get satisfactory accuracy from their IDEAL bullets, most IDEAL Bullet Moulds are made to cast bullets large enough to be sized as much as .003 inch larger than the *standard* groove diameter of the barrels they are intended for. This has led to the belief that cast bullets *must* be over size which is not necessarily true.

There is some question as to the advisability of sizing revolver bullets to the groove diameter of a barrel. The forward part of the cylinder just ahead of the chamber is supposed to guide the bullet straight into the barrel. Actually this guiding portion is slightly larger than the normal bullet diameter but it serves a useful purpose and lines the bullet up fairly well with the bore. We have examined many fired revolver bullets and know of others who have examined many more, without finding a single example where a revolver bullet had entered the barrel precisely centered. The reader will readily understand why reducing revolver bullet to groove diameter may make it possible for the bullet to tip more than usual as it passes from the cylinder into the barrel. Under such circumstances, any slight advantage that might be gained from a bullet of groove diameter would be lost by the greater angular entrance into the barrel.

Upsetting of Bullet Bases

In the chapter on POWDERS we have referred to the time element in the burning of a powder charge and the influence of time on the chamber pressure. This time factor also influences the upsetting or expansion of the bases of bullets. As the powder gases expand they act on the base of the bullet, causing it to move forward but the point of the bullet does not begin to move at the same time. This causes the base of the bullet to upset or expand but its expansion is limited by the barrel surrounding it. After it has passed a short distance through the bore the point or forward portion attains the same velocity as the base and the bullet leaves the muzzle in approximately its original form. This is just the reverse of a bullet that is fired against a steel plate or other solid obstruction. In this case the point of the bullet *stops before* the base and whether the bullet bulges at the point, flattens or flies to bits is a matter of relative motion between point and base.

The base of a bullet starts to move before the point and upsets

The illustration at the left shows very clearly how the base of a bullet is driven faster than the point as it leaves the chamber. This metal cased bullet was fired from a Cal. .30 barrel cut off just ahead of the chamber so the bullet projected from the muzzle before it was fired. It will be obvious to the reader that the gases were driving the base faster than the point *after* the bullet left the short barrel causing the decided upsetting of the base.

This upsetting of bullet bases is confined to flat base bullets. Boat-tail bullets do not expand. On the contrary the gas acts as a wedge between the boat-tail and the barrel and if the pressure be great and sudden enough the bullet will actually be constricted. To resist constriction boat-tail bullets must have hard, thick jackets and hard cores.

The principal factors governing upsetting are the inertia of the bullet and the resistance offered to its forward movement by the rifling, the hardness of the bullet, the chamber pressure and the time in which the pressure is developed. Obviously a soft bullet will expand more readily than a hard one and all other things being equal, a high chamber pressure will cause the base of a bullet to move more rapidly than a low one but probably the most important factor is time. Black powder burns fast and

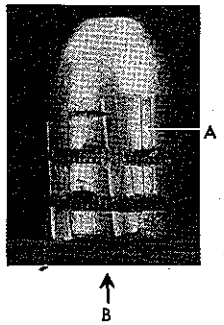
the maximum pressure is reached so quickly that the base of a bullet receives an impulse similar to a blow. Most smokeless powders when used in proper charges do not develop pressures as abruptly as black powder, consequently the base of the bullet receives more of a push than a blow. With Smokeless Powders the interval of time between the flash of the primer and development of the maximum chamber pressure, is usually not reached until after the point of the bullet has started forward. The upsetting of bullet bases is not as violent nor as great as when black powder is used but it happens in some degree with most loads.

We sometimes receive orders for bullet sizing dies from well meaning customers with the dimension given as .30943 inch or something equally ridiculous, a little gadget that would cost between fifty and one hundred dollars to make accurately and which would be worth, from a practical standpoint, as much as one of our stock sizing dies. The reader only need look again at the illustration of the upset metal cased bullet to appreciate the insignificance of a variation of a ten thousandth of an inch or so in the diameter of a bullet.

Chambers

The chamber is the recess reamed in the rear end of a barrel or in a revolver cylinder to accommodate the cartridge. Chambers are made slightly longer than a normal cartridge case to accommodate cartridges that are longer than normal, and in the case of military chambers, to accommodate dirty ammunition. At the same time the chamber is reamed, a small amount of metal is reamed away from the lands, just in front of the chamber, to form a seat for the bullet. This seat is called the *throat* or *leed* and is an important one from the reloader's point of view as explained later. The shape of the throat must be suited to the longest and bluntest bullet that is likely to be used. Throats are made a little longer than is actually necessary for the same reasons that the chamber itself is made longer than necessary. The bullet must jump forward a short distance before it comes into contact with the rifling. If a short or pointed bullet is fired in a barrel having a throat for a long round-nosed bullet, the short bullet will have to jump further before it hits the rifling.

In a revolver, the bullet must jump a considerable distance before it strikes the rifling. When it does strike, it delivers a considerable blow. The relatively soft bullet coming in contact with the rifling at a rather high velocity, resists the rotating influence of the rifling for a brief instant and moves straight forward against the rifling. The distance traveled in this way depends upon the energy of the bullet and its hardness. This slippage is not detrimental to accuracy so long as it does not result in upsetting or causing serious irregularities in the base of the bullet. If the barrel was only a fraction of an inch in length, slippage would be ruinous to accuracy, but once the resistance of the rifling overcomes the forward movement of the bullet and begins to rotate it properly, it will take true flight. This applies equally to rifle and revolver bullets. The blow delivered by a bullet when it jumps through the throat of a rifle or the cylinder of a revolver has an appreciable effect upon the vibrations of the barrel.



A.—Note how the bullet started straight forward in the barrel before following the rifling. B. — The angular entrance of the bullet into the barrel is also apparent

Barrel Vibration and Recoil

When a firearm is discharged, the barrel vibrates in the same manner as the tine of a tuning fork and this vibration causes the barrel to move considerably and with violence. This is easily proved by shooting a rifle with the muzzle in contact with a solid object. This contact will interfere with the normal vibration of the barrel, and the shot, except by chance, will strike away from the normal center of impact.

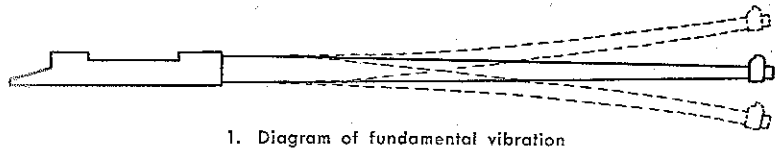
The vibration of a barrel is divided into two parts: the fundamental (Fig. 1) which is the angular movement of the barrel from one end to the other, and the overtones (Fig. 2), which are the oscillations that travel along the length of the barrel. Both happen at the same time and the muzzle may move in any direction through 360 deg. The terminations of the overtones or the points where the oscillations cross are called "nodes," and the movement of the muzzle proper is in the first overtone. The movement between the node of the first overtone and the muzzle is usually quite marked. The Springfield service rifle, for example has an angular movement of the muzzle due to vibration equal to more than 40 feet at 1000 yards.

Accuracy is dependent upon uniformity of vibration. Heavy or stiff barrels vibrate more uniformly and the vibrations are less easily affected than those of light or slender barrels. Barrels of take-down rifles, because of the rather loose fit in the receivers, vibrate more erratically than rifles with solid frames and consequently seldom develop as consistent accuracy as the latter.

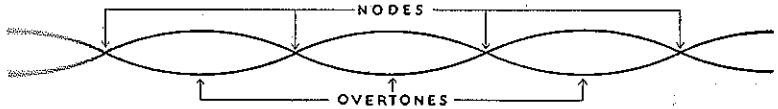
We have seen that, due to the tolerances in the throats of barrels, bullets must ordinarily jump forward unsupported for a short distance. Being unsupported, it is a matter of chance as to just how the bullets strike the throat. They will not strike exactly the same, introducing small variations in vibration that tend to enlarge the group.

We hope that these brief comments will make it clear to the reader that in order to get the best accuracy it is necessary to eliminate variations in barrel vibration as far as possible. To accomplish this result, load the bullet far enough out of the case so that it will be in contact with the throat when fired. This method insures a more constant vibration from shot to shot although it sometimes gives an overall length of cartridge too great to work through magazines and such ammunition can only be used for slow fire.

The proper manner to determine the correct depth to seat bullets is to load a bullet well out of the case and try the cartridge in the chamber. If the action cannot be closed without undue force, turn in the bullet seating screw of the Double Adjustable Chamber a little further, seat the bullet a little deeper into the case and try the cartridge again. Repeat this procedure until your cartridges are of an overall length that will cause faint marks of the rifling to be left on the bullets when seated in the chamber.



1. Diagram of fundamental vibration



2. Diagram of secondary vibration

Do not leave the bullets projecting so far that force is required to close the action. You will be using your rifle for a bullet seater and some bullets will be forced into the rifling further than others and some pushed back into the cases deep, thereby introducing variations of another nature.

As for revolvers, there is no way to bring the bullet in contact with the rifling when fired. Seating bullets as far out of the cases as possible is not always a good

idea. Smokeless powder charges usually occupy a small space in the case and seating bullets out as far as possible will increase the air space which sometimes affects the burning of the powder adversely, so that any small advantage gained from decreased jump may be offset by poorer ignition of the charge.

Bullet Rotation and Yaw

Bullets in flight have been aptly likened to spinning tops. When a top is spun, its initial rate of spin is so high that it first "walks" around a bit, then slows down to spin steadily. As it loses its rotational velocity, it begins to wobble and finally ceases to turn fast enough to remain upright. A bullet behaves in much the same manner although a bullet has two velocities: (1) a forward velocity, and (2) a rotational velocity imparted to it by the rifling in the barrel. When a bullet starts on its flight it encounters resistance from the atmosphere which is highly compressible. The work of compressing or pushing the atmosphere aside slows up the forward velocity of the bullet but does not slow up the rotational velocity to the same extent. The rate of spin or the rotational velocity of a bullet is determined by the pitch of the rifling and the velocity of the bullet while in the barrel.

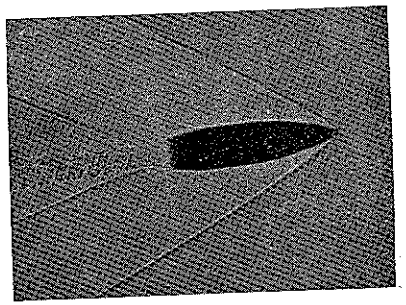
For example let us take the cal. .30 Model 1906 cartridge in the Springfield rifle. This rifle has a pitch of rifling of one turn in ten inches. The bullet leaves the muzzle traveling at the rate of 2,700 feet or 32,400 inches per second. As it revolves one turn for each ten inches of travel, its rotational velocity is 32,400 divided by ten or 3,240 revolutions per second at the muzzle. Due to the resistance of the atmosphere, the forward velocity of the bullet falls off quite rapidly, but as already stated, the rotational velocity does not. If a bullet was fired vertically into the air it would still be spinning when it reached its highest point.

The rotation of an elongated bullet or projectile is necessary to keep it from tumbling end over end, just as it is necessary to spin a football to keep it from tumbling when thrown some distance. The speed of rotation necessary depends upon the shape, length and distribution of weight or the location of the center of gravity of the bullet. Long bullets must be spun faster than short ones.

When a high velocity bullet is fired, it is usually spinning too fast to be steady in flight. It is like a top "walking" when it is first spun. As the velocity of the bullet falls off, it settles down or "goes to sleep," flying steadily until it slows down to a point where it is no longer stable. Then it commences to wobble, increasing the air resistance and slowing up rapidly.

Bullet Flight With Maximum Loads

We know that these comments may appear like pure theory and of little practical value to the reloader, but it is necessary to understand these fundamental principles if we are to vary our loads or get the most accurate results from our hand loaded ammunition. Long range target ammunition is loaded to the highest velocity safety will permit. The most accurate loads for 300 meter shooting are not loaded as heavily, and still lower velocities give the most consistent accuracy at 100 yards because the remaining velocities of these loads are such that the bullets are "asleep" or maintaining true, steady flight at the ranges for which they are used.



Sparkograph of a bullet shortly after leaving the barrel. Note oscillation of the bullet

COURTESY OF PETERS BALLISTIC LABORATORY

Due to the fact that the rotational velocity does not fall off in direct proportion to the forward velocity, the period in which the bullet flies steadily is a considerable part of the trajectory over target shooting ranges. For the best accuracy, ammunition should be loaded to permit the bullet to fly steadily when it goes through the target.

The exception to this rule is where it is desirable to get the bullet to the target as quickly as possible to avoid its being affected by the wind. It may be desirable to sacrifice a little intrinsic accuracy and risk getting a nine once in a while rather than to have a low velocity bullet blown out for an eight or worse. It is also necessary at times to increase the velocity of a hunting bullet to give it the proper killing power. Under such circumstances the small loss of accuracy that may result is of little consequence from a practical standpoint.

While maximum loads are given in our tables of loads, we do not recommend such loads except for long range target shooting and big game hunting. The intelligent reloading of a cartridge does not consist of loading the heaviest charges possible without any consideration of the purpose the ammunition is to serve, and usually better results can be obtained with a moderate load than with the maximum. Loads with flat trajectories, good accuracy and killing power—that cause open point bullets to go to pieces to avoid ricochets in settled communities—can be obtained well short of the maximum loads.

Caliber

"Caliber" originally meant the inside diameter of the bore previous to rifling. Hence, a .30 or .300 caliber would measure .30" diameter. Later many variations in this designation grew up such as 30/30 which was a .30 caliber rifle originally designed for 30 grains of powder then in use. The 32/40 was a similar idea. Later such calibers as .250 which is actually a .25 caliber were designed and 250/3000 to indicate the velocity of the original load. In recent times we have had such calibers as .218, .219 and .257 Roberts. The .257 Roberts actually being a .25 caliber gun but the .257 indicating the groove diameter. Also there are a number of designations which do not correctly indicate the actual caliber such as 32/20 which is actually a .30 caliber and 38/40 which is actually a .40 caliber. This all seems a little bit confusing and it is actually necessary for the hand loader to be certain what his caliber is before attempting to reload.

Bullet Weight and Recoil

Practically all rifles have sights that are adjustable for elevation by one means or another and the differences in trajectories of light and heavy bullets can be compensated for by changing the sight adjustment. On the other hand, many revolvers have fixed sights. If it is desired to change the center of impact of loads using lighter or heavier bullets than the arm is sighted for, this can be done by "holding off." Holding off is nothing more than aiming a sufficient distance from the normal point of aim to make the shots strike the desired point.

The recoil of a firearm depends upon the relation of the weight of the arm to the weight and velocity of the bullet. If the arm and the bullet were of equal weight they would leave each other at equal velocities. But arms are much heavier than bullets, therefore their velocity of recoil is only a fraction of the velocity of the bullet. As revolvers are supported by the hand, and the hand is below the line of recoil, the barrel raises under the influence of recoil. The recoil commences about

the time that the bullet starts forward and by the time the bullet leaves the muzzle, the barrel has raised somewhat from the position it was in at the instant of discharge.

The front sights of revolvers are made sufficiently high to compensate for this upward movement when bullets of standard weight are used, so that at the instant of discharge, the bore is pointing slightly below the target.

If a bullet materially lighter than the one for which the gun is sighted is used, it will be found to shoot low. This condition cannot usually be overcome by increasing the powder charge of the velocity of the bullet, because the lighter bullet does not make the gun recoil as much as the heavy bullet. True, if the velocity of the lighter bullet is increased, the recoil will be increased but the bullet will get out of the barrel quicker and before there is time for the barrel to raise to its normal position. Any increase in velocity will be offset almost exactly by the shorter barrel time.

The reverse is true of heavier bullets than standard, except that if the powder charge is reduced enough, such bullets can be made to strike lower. It still holds true that the decreased recoil is offset by the longer barrel time, making it necessary to reduce the velocity to a point where the bullet will drop sufficiently from the force of gravity while on its way to strike the center of the target. Reducing the powder charge sufficiently to accomplish this usually results in a squib load with the bullet unstable in flight.

To Find Bore Diameter, Pitch or Twist of Rifling

To find the bore diameter, carefully cut away the raised portions of the slug and measure across the surfaces formed by the bore or what were the grooves in the slug.

To find the pitch or twist of rifling, make a slug as indicated above. Solder it or otherwise firmly attach it to a rod long enough to reach through the barrel. Pass the rod through the bore from the muzzle and carefully enter the slug in the bore. Make a scratch mark on the upper side of the rod even with the breech. Push the slug and rod down the bore until the mark on the rod comes up on top again. Make another scratch mark on the upper side of the rod exactly even with the breech. The pitch of rifling will be one turn in the distance between the two marks on the rod.

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The National Rifle Association and The American Rifleman

The National Rifle Association of America is our oldest (1871) and largest (300,000 individual members, 7,000 clubs) national sportsmen's organization. Its official journal is The American Rifleman, a monthly magazine sent to each member and club secretary.

To supplement the material in this Hand Book the handloading enthusiasts will find The American Rifleman most helpful. All of the newest developments in handloading equipment and technique are reported currently both in "The Dope Bag" and in feature articles.

N. R. A. headquarters and publication offices of The American Rifleman are located at 1600 Rhode Island Avenue, N.W., Washington 6, D. C.

Part IV
BENCHREST SHOOTING
by Al Barr

Modern Benchrest Shooting

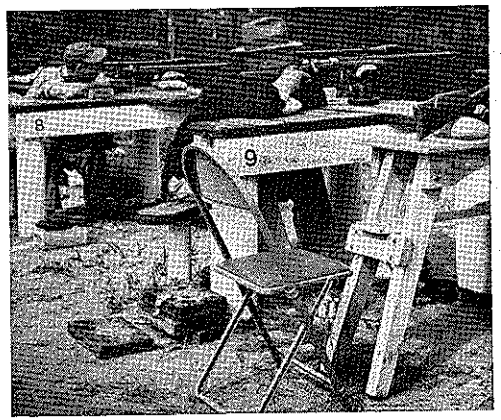
The revived game of benchrest shooting has taken on new aspects within the last two or three years. Many years ago the benchrest shooting game was extremely popular among quite a few shooters. Today though, many changes have been made. We have more modern powder and highly developed cartridges and rifles than were used many years ago. For those who have indulged in the benchrest game, even moderately, most have found it to be an exciting and extremely interesting game. Instead of so much depending entirely on the shooter, a lot depends on the equipment and the preparation of ammunition for the benchrest rifle.

Within the past few years we have learned that many individual rifle clubs have found they can increase their interest and membership, even locally, by holding benchrest matches. One real advantage of benchrest shooting is that most any caliber can be used and most any rifle weight, within reason, of course. The game is not strictly limited to the use of jacketed bullets. Only recently we had a report of a benchrest shoot whereby handloads with gas-check or cast bullets were used and there seemed to be considerable interest in the match. The nice part about the game is that it is almost unlimited in scope.

Requirements

It is true that in order to even come within reach of a winning group at some of the highly refined benchrest matches a very accurate rifle, preferably a heavy one, is required. We do though have reports of even light weight hunting rifles making many phenomenal groups. A lot depends not only on the rifle, but on the handloads and also somewhat on the shooter. The worst combination imaginable for a benchrest shooter is a temperamental shooter, a temperamental rifle and a temperamental load combination.

It is important to point out though that a person doesn't necessarily have to have a special benchrest gun in order to obtain fine results. Some record groups have been made with regular varmint type rifles weighing around 10 to 10½ pounds. If the right combination is achieved, even a light rifle will perform beautifully. The combination, though, is sometimes a little difficult to realize. It is not possible for anyone to recommend an absolute combination of bullet make, powder charge or caliber or rifle for a shooter to win in the benchrest game. There is to some extent a little matter of luck to get everything just right for a real winning combination.



Benchrest competitive shooting

Popular Cartridges and Bullets

So far, the .22-caliber high-velocity cartridges with jacketed bullets have proven to be the most accurate combinations. The most winning combinations have been the .219 Wasp, the .219 Donaldson, the .22-250 and the .220 Swift. We should also include the .220 Wilson Arrow. Not to be overlooked, is the Improved .219 Zipper. These cartridges, when loaded somewhat under maximum, will all give extremely fine accuracy with the right bullet and right powder combination.

During the benchrest matches held over the past few years it has been learned that bullets are a very important factor for the best accuracy. It is not possible for anyone to recommend a specific bullet for any individual rifle. It has been learned that home-made bullets using RCBS, MGS and other bullet making dies will perform exceptionally well in some rifles, but not necessarily in all of them. Many of the records have been made recently using commercial bullets, and the outstanding is the Sierra make, although the Sisk bullets have been used quite a few times, and some very fine results have been made with bullets supplied by other commercial manufacturers such as the Kenru Reloading Service, 166 Normandy Ave., Rochester, N. Y. and J. W. Baldwin, 5 Milk Street, Westboro, Massachusetts, only to name a few.

Getting Started

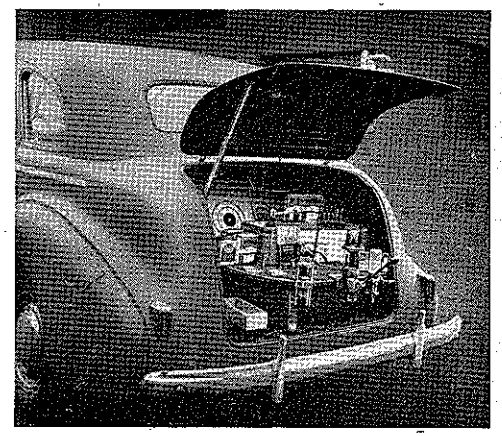
For the beginner who hasn't had any experience in benchrest shooting it would probably be advisable for him to select one of the popular calibers just mentioned and have any of the good barrel makers fit and chamber a barrel for him. It would also be advisable to get the reloading tools made by the same gunsmith if at all possible so that they could be fitted to that particular rifle. Otherwise, it would be advisable to send fired cases from a rifle to a reloading tool maker and have the dies made accurately for that gun. One of the reasons for this requirement for the finest in benchrest shooting is that the cartridge case should be sized just right in order to hold the bullet in the case neck without too much neck tension. All benchrest shooting is done without use of the magazine so the bullet doesn't have to fit extremely tight in the case. Uniformity of bullet fit seems to be one of the greatest and most important factors for benchrest shooting. Other items which cannot possibly be overlooked is that primer pockets should be cleaned after each firing and the cases should be selected according to flash hole diameter. The exact diameter is not too important. In one lot of cases we may find the flash hole will be near .078 inch and again we may find it nearer .081 inch and sometimes even up to .086 inch. The importance is to have the flash hole diameter the same for all cases and then develop a load for that particular lot of cases. Where there is a great variation in flash hole diameter it is advisable to use a numbered drill just under the size for the maximum flash hole in a given lot of cases. Then all other flash holes are made to that same diameter. Otherwise selecting cases with uniform flash hole diameter will be necessary.

It is not advisable to mix cases from different lots, even of the same make and manufacture. That is, unless each case has been checked for powder capacity or volume. There are several ways to check the volume of a case. One of the simplest ways with fired cases or those having primers in them is to use a fine-grained powder and sift each case level full to the mouth and weigh the powder charge. In that way a close approximation of the volume variation can be obtained. Naturally the best way would be to fill each case with water and then weigh the amount it will hold. Even these suggestions may help to improve the accuracy and performance of varmint and hunting rifles where fine accuracy is necessary.

Tolerances

It has been learned that cartridge cases should not be an extremely tight fit in the chamber or, in other words, there should be a slight neck tolerance between the case neck and chamber. A good average, measuring outside, would be .002 to .003 inch.

When the cases vary in thickness at the neck they can be reamed inside or trimmed outside using tools which are already on the market. Uniformity of neck tension on the bullet is really an important factor.



Many bench-rest shooters equip the trunk of their cars with complete reloading supplies for "on the spot" reloading.

Cases should be all trimmed to a uniform length, approximately .005 inch shorter than the chamber. The case should be beveled slightly on the inside at the mouth so the bullet will enter freely without deformation. A good example of what can happen with a deformed case is as follows. Having used a .219 Donaldson rifle weighing around 17 pounds, the average group size with a very fine load would go under ½ inch regularly at 100 yards. The same lot of fifty cases was used regularly in this particular rifle. After some use, though, three of the cases became damaged in the way of the case mouth being folded slightly only when jammed against the decapping pin and expander punch in the sizing die. As later learned, these three cases caused three unaccountable fliers and extremely bad fliers. To prove the point, the same cases were loaded again, and again the bad fliers appeared, but it never did with any of the same lot of cases which were not damaged in the reloading process. It is indicated, therefore, that cases should be checked carefully and those with any irregularities should be discarded immediately. The same thing though could, of course, happen in a hunting rifle and cause an unaccountable miss.

In benchrest shooting some of the good shooters weigh every powder charge accurately, but many others merely throw them from the powder measure. It doesn't make much difference which powder measure is used, but the method of using it is important. Uniformity and consistency are the important factors for using any measure. Careful use will give accurate charges from any of the measures and even some shooters weigh their bullets, but most of them do not. As previously pointed out, the most important factors seem to lie in the type of bullet which fits the individual gun, uniformity of case necks and uniformity of bullet fit in the case neck, which should not be excessive. Each individual rifle though may require a little different treatment and it does take some experimenting in order to get the finest out of any rifle.

Since benchrest shooting will unquestionably include matches held using lead-alloy or cast bullets, it is important to point out that the lead bullet should be a nice smooth fit inside the case neck. If the case is oversized or the expander plug is not large enough bullets will be deformed as they are seated in the cases and that will definitely affect accuracy. As has been pointed out by H. Guy Loverin, who knows considerable about performance of lead bullets, the inside of the case neck should be polished out using steel wool on a dowel rod or a stick. The case neck should not be sized all the way down to the shoulder. Only about ¼ of the neck should be sized, starting at the mouth. That is, when the loads are to be used for benchrest shooting single loaded in the rifle. This method of leading naturally wouldn't be practical when used through the magazines.

Powder and Primers

Seemingly the best powder to use in the .22 high-velocity cartridges for benchrest shooting is IMR No. 3031 and the Government IMR No. 4895 powder. That goes for most all calibers such as the .219 Wasp, .219 Donaldson and all the way through to the .220 Swift. Naturally most benchrest loads are most accurate when the velocity is not too high. Another powder which is used quite frequently is IMR 4320 in the Wasp and similar cartridges. For the moderate loads usually the Winchester 115 primer was preferred, but it is no longer available so now it is necessary to use primers such as the Remington No. 9½, Winchester 120 or Western 8½.

The Rifle

The benchrest rifle usually is made up with a very heavy stock on a bolt action and the barrel is frequently a straight one, measuring 1¼ inches at the breech and also the same measurement at the muzzle. Quite frequently these barrels are 28 to 30 inches long. Such a rifle complete with scope will weigh around 18 to 19 pounds. It has been learned, though, that not always do the perfectly straight barrels shoot best, so many gunsmiths prefer to give them at least a little taper from around 1¼ inches at the breech to 1 or 1.1 inch at the muzzle. This type of barrel seems to shoot fully as well as the straight one. For a somewhat lighter barrel which can be used to a certain extent in the field one tapered to ⅞ inch at the muzzle will usually give about as good accuracy. With a barrel of this contour, 26 inches long and not too heavy a stock, the rifle will weigh about 13 pounds complete with scope.

One important factor for the best benchrest accuracy is proper barrel bedding. The difficulty is that it is impossible to tell exactly how to bed each and every individual barrel. Recently we have had very good luck bedding the barrel snug for about 8 to 9 inches forward of the receiver and then leave it floating from there out. Another general practice is to leave the barrel bedded snug at the fore-end tip giving about 5 to 10 pounds pressure between the barrel and forearm. Recently we have learned that a lot of the benchrest shooters have had exceptionally good success leaving the barrel full floating all the way. The best suggestion is to start out with a barrel bedded tight and if it doesn't shoot with good developed loads then start relieving the wood in the forearm and then without changing the load, check for accuracy again with the barrel bedded tight. Then if the gun doesn't shoot properly the forearm can be relieved.

Gunstocks

Many benchrest gunstocks are made up special in that wood has not been cut out of the stock to accommodate the magazine. This makes a stronger more rigid stock and it is believed that a quite heavy and rigid stock does many times help improve the performance of the benchrest gun.

Supporting the Rifle

Some don't even put their face to the cheekpiece of the stock and some do not even let the buttplate rest against the shoulder. This may be all right for the really heavy guns in .22 caliber where recoil is light, but it has been learned that a firmer hold with the butt snug against the shoulder is necessary in order to get the best out of the heavier calibers, starting at least with the .25 and from there on up. Just the best way to hold a rifle for each individual will have to be determined by the shooter. We do know that a good light trigger pull is extremely important for benchrest work. Double set triggers on bolt-action rifles are the favorites, although any of the special triggers available where the pull can be adjusted down to several pounds will work very well. It has been proved by experience, though, that the method of holding the rifle uniformly from shot to shot and a uniform trigger let-off are two vitally important factors in order to shrink groups from a rifle which we know will make very small groups. It is not always possible to blame a rifle or load combination for not making small groups, as quite frequently the shooter is responsible for fliers. That has been demonstrated many, many times at the bench. Even the slightest variation in cheek pressure on the stock will cause high and low shots. An uncomfortable position and improperly supported rifle will also give fliers from an otherwise very accurate outfit. Complete relaxation of the shooter is vitally important for consistent results.

Winning in Competition

One interesting part of the benchrest game is that in competitive shooting everyone who can hold good and has a good outfit has a chance, because there seems to be no consistent winners from year to year. That makes the game more interesting for the beginner, because he may get lucky and have just as good chance as an experienced bench shooter. However, the experience gained at benchrest shooting when developing loads and testing ammunition will stand anyone in good hand, because it gives him a good chance to let him find out the best way to get acquainted with his rifle and loads. In fact, the only real way to develop accurate loads is to shoot them from a benchrest or from a supported prone position. In other words, the regular sandbags and shooting pedestals normally used can be used also to very good advantage in the prone position for testing loads. Some of the best groups we have seen have been made from this position, but with the shooter lying on the ground.

The Rifle Telescope Sight

Since the benchrest position is quite steady, a very high power scope can be used to good advantage. Many of the shooters use scopes having 15X to 25X. In fact, new scopes, including the Lyman Super-Targetspot have been developed in 25X almost especially for benchrest shooting and they are proving their worth. The higher power scopes show up the effect of mirage far more noticeable than the lower power scopes, and mirage is a very important factor to be considered for close group shooting.

Some Fundamentals

Benchrest shooting is somewhat of a specialized game and it does take some practice in order to get the most out of it. There is no effort to make it sound extremely impossible, but some of the basic fundamentals should be known and followed in order to be able to get most that is possible out of a gun or load combination. It is possible that some shooters think the benchrest position is so steady that anyone can sit down with a good combination and do good work, but that kind of thinking is misleading. It's the little apparent incidental things which are so frequently overlooked that cause poor grouping. This leads to the shooter thinking that possibly his load is not right or that the rifle is not accurate.

For a permanent bench from which to shoot, it should be built in triangular shape with the top of the bench at least 4 feet wide by 5 feet deep. There is one leg in the back and the two other legs in front. The top of the bench should be about 34 inches above the ground and the seat, which is an independent part set also on very heavy legs, is 18 inches high. The legs should be well planted in the ground at least 3 or 4 feet and they should preferably be about 6 inches diameter.

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For further information on organized bench-rest shooting, write: Bench Rest Shooters Association, William Van Nostrand, Secretary, 58 Walnut Street, Gloversville, New York.

PART V

SHOOTING THE MUZZLE-LOADERS

by

Susie and Jerry Hirtle

A great up-surge in interest for the early flint and percussion arms has taken place in the past dozen or so years. This interest has been the means of uncovering many fine old military and sporting pieces, Kentucky and handgun types. The art of loading and making these black powder arms had largely disappeared, but now, with a host of enthusiasts working to stand high in matches and in hunting, much that is essential is being dug up and given to the fans. Many of the original arms were and are capable of fine accuracy once they are properly loaded, held and fired. However, many need reconditioning. To meet this need a goodly number of old—and new—gunsmiths are known who can work over a rusted and pitted bore as well as did the early gunsmiths. A few men specialize on stocks and some few are expert in lock and trigger work. The great need, now that the metal angle is more or less solved, is for wood-workers who will repair and make new stocks. Even this difficulty seems on the way to a solution, now that good mechanics are being released from military duty.

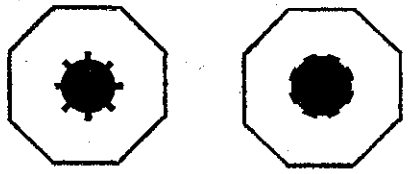
The many calls for bullet moulds for muzzle loading arms indicate to us that there are still many shooters to whom the smell of black powder is sweet and for whom the hickory ramrod hath charms.

Due to the almost total lack of uniformity of calibers in these old rifles, as well as diversity in depth of grooves and twist of the rifling, detailed instructions for loading them cannot be given. The following brief comments are intended only to serve as a guide toward the selection of proper balls and the experimentation necessary to find the proper load for a particular rifle.

Many of the military muskets had only three lands and grooves. The driving surface of the lands is hardly sufficient for the large heavy projectiles—either .58 round or .575 Minie bullets—that must be used, and the degree of accuracy depends on the patience and perseverance of the owner . . . and he must be the type that loves to do what "can't be done." Some groups that have been produced in the past few years show that a "perfect" combination of man, bore, load, patience, and skill can truly develop some top-grade groups.

The rifling of muzzle loading arms intended for accurate work is of several types, but the two produced below are typical.

Type 1 indicates the need for a thick patch, while a patch of thin material should be used with the shallow rifling as seen in Type 2.



Type 1 Type 2

Diagrams of the two general types of rifling usually found in muzzle loading arms.

First of all, if you're going to shoot a muzzle-loader, bear in mind that most muzzle-loading guns are at least seventy-five years old, and many are older. Consequently, they should be taken apart and examined by a competent gunsmith, if you don't feel capable of doing that job yourself. Special note should be taken of the condition of the breechplug threads, nipple threads, and drum threads. The condition of the bore should also be ascertained at this time. Few muzzle-loading rifles survive the years with the bore in good condition, but all is not lost, for some men make a business of recutting—or freshing out—old muzzle-loader bores. If the threads are bad anywhere, these same men will rectify them also. Their names may be found among the advertisers in "Muzzle Blasts," the magazine devoted to muzzle-loading gun enthusiasts. Anyone interested in the old guns should join the National Muzzle Loading Rifle Association. Subscription to "Muzzle Blasts" is included in their modest membership fee.

Almost all the old light rifles were hunting rifles, with sights adapted to use in the woods and field. These sights are wholly inadequate for target shooting, and precision shooting is next to impossible when using the old type sights. The barleycorn front sight and open "vee" notch rear were excellent for use where a quick sight, in poor light, might be necessary, but it is a difficult job indeed to line these old sights on a black bull with a light background. So, in endeavoring to attain fine accuracy with the old guns, give them a chance to show what they're capable of by using modern sights adapted to target shooting—such as those made by the Lymans. After all, adjustable peep sights were used frequently on cross bows, long before the Pennsylvania rifle, and we wouldn't think of handicapping a modern motor car with Model "T" steering mechanism. Nor would we use the barleycorn and vee on a modern target rifle. Let's give the old rifles a break, let them show what they can do by buying adequate sighting equipment, and they'll prove that many of the stories handed down by our grandfathers weren't as far-fetched as many would have us believe.

A word about the bore. In a muzzle-loading round ball rifle, a perfect bore is not necessarily a must. Naturally, we all like to look down shining lands and grooves, but many an old rifle will shoot surprisingly well with the bore a little rough. Now, it must be smooth enough so that it does not tear the patches when fired, and it must be capable of cleaning from the muzzle—that is, the cleaning patches should not come off the snobble on the ramrod. If either of these misfortunes occurs, the rifle should be recut.

Incidentally, brand new muzzle-loading rifles, both sporting and match types, are presently being manufactured, as the advertisements in "Muzzle Blasts" will testify.

Bullets used in average muzzle-loading rifles are round balls, patched with cloth of one kind or another. Elongated bullets, which are called slugs, are used in precision match rifles and the use of these requires specialized loading equipment not suited to use in hunting. Either type bullet is generally cast by the shooter, in a commercial mould such as those made by the Lymans, since the variety of bore sizes of muzzle-loading rifles is not conducive to the use of commercial balls. For any degree of accuracy at all, a proper fitting bullet is a must, but a rule of thumb to determine the proper size is not possible, since the accuracy depends upon the relationship of bore (depth of rifling), thickness of patch, ball size, and powder charge.

To start somewhere, the bore should be measured by pushing a soft lead slug through from the breech. Muzzle measurements will often be inaccurate, since the muzzle is likely to be funneled in an old rifle, due to ramrod wear. Having found the bore diameter, it is well to begin with a ball several thousandths of an inch undersize, because if it happens to be too small, the mould may be lapped a little larger without too much trouble.

A variety of cloth, suitable for patching, should be acquired. This should be new cloth, washed to remove sizing, and should be available in several different thicknesses. Linen is supposed to be best, but is not too often used because of the expense. Indian head, muslin, shirting, bedticking, and pillow ticking will serve. In fact, any closely woven, tough cloth which will stand the abuse of being shot out of a rifle will do the job. Some outing flannel, of the water absorbing type, should be procured for use as cleaning material.

The powder used in muzzle-loaders should always be black powder, never smokeless, because the old barrels were made of iron, welded, and will not stand smokeless powder pressures safely without bursting. Both FFg and FFFg granulations should be at hand. In percussion rifles, FFg granulation is generally used in rifles over .40 calibre.

Those rifles under .40 calibre will usually handle FFFg to better advantage. In flintlock rifles, where there is considerable lag in ignition time, FFg powder is frequently used in rifles up to .50 calibre. These statements on powder granulations are not meant as rules of thumb, but are advanced simply to give the newcomer some idea where to start. Frequently, individual rifles do not stick to the rules at all, and to attain good accuracy much experimentation will be necessary, with the final load used depending upon which components shoot best for that particular rifle.

For priming the pan of a flintlock, FFFFg granulation should be used. FFFg is often employed for that purpose, but the finer granulation will take fire much more quickly, and it is desirable to shorten ignition time as much as possible. Also, when firing a "flinter," the art of "holding through" is very important. The flash in the pan is disconcerting, and an involuntary flinch almost always occurs, which will affect the flight of the ball. It has been written that, "He who can shoot a flintlock well, can shoot anything!"

An adjustable powder measure should be used when working up the load. A fair rule for ascertaining a charge to start out with is the old-timers method whereby the ball was laid on the slightly cupped palm of the hand, and enough powder poured out to cover the ball. This was the load used. In general, round balls require more powder to drive them than elongated bullets do. For charges for various calibres, reference may be made to the old designations for black powder rifles, such as .25-35, .38-55, .45-70, and .50-90. Here the first figures represent the calibre, and the last figures indicate the load in grains of black powder. For instance, the .45 calibre bullet used 70 grains of black powder. Now, since these were elongated bullets, slightly more powder, say five or ten grains, would not be too much to drive the round ball, in most cases.

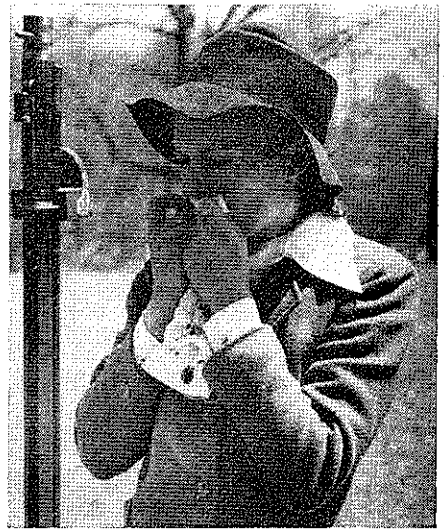
In the above paragraphs, approximations only are given because the muzzle-loaders are fully as temperamental as our modern rifles where load is concerned. Each is an individual rifle, and each load must be worked out painstakingly with respect to ball size, patch thickness, and powder charge. Given a muzzle-loader in first class condition, in fair weather, with proper load, and with decent sights, and it will shoot right along with modern high power deer rifles up to one hundred yards. But, in any rifle, modern or muzzle-loader, first class performance depends upon working out the proper load for that individual rifle.

The bore is wiped before loading to remove fouling of previous shot.

Charge of black powder is measured and then poured into the muzzle.

Several loading accessories should be mentioned. Details of their construction may be ascertained from accompanying pictures. The short starter, the long starter, the combination starter, the ramrod, and loading block are shown. All will be useful and are simply made in the home workshop.

Now, let's load her up. We'll use the percussion type for discussion purposes, since that type is by far the most common. Place the hammer at half cock, snap a cap or two on the nipple, and wipe the bore so as to remove any oil. Then snap two more caps—this should insure that no oil has been pushed into the drum by the wiping operation. Measure out the powder and pour it into the muzzle. Then smack the side of the rifle with the palm of the hand to settle the powder into the drum. Select a piece of patching, wet it well on the tongue, and place it over the muzzle. Lay a ball on the patching, and, when starting the ball, start it the same way each time. That is, line up the seam the same way, and place the ball with the sprue either up or down, as you like, but do it the same each time. Uniformity throughout the loading operation is one key to accuracy. Now, place the short starter on the ball, and start it into the muzzle with a sharp blow of the hand—sometimes a mallet will be necessary in the case of a tight fitting ball. Cut off the patching around the muzzle with a sharp knife or old-fashioned straight razor. This leaves the ball flush with the muzzle and encased in a neat circular patch of cloth. If the ball is tight, the long starter should be used to push the ball a few



Accuracy is obtained by use of cloth "patch" which makes ball rotate in the rifling as it is fired. The patch must be moistened with saliva.

After centering ball in the patching, the ball is started into the muzzle by using the short starter.

inches down the bore. Complete the job by using the ramrod to push the ball the rest of the way to the powder, where it should be just seated on the powder, not crushing the grains in the process. With a little practice, you'll be able to feel the ball contact the powder, whereupon the ramrod is given a little extra pressure so as to seat the bullet firmly. Now, place a cap on the nipple, and she's ready to beller. Remember that in loading the muzzle-loader, uniformity of loading is just as important as it is when hand-loading for the modern rifle.

After ball has been seated in muzzle of gun, encased in its cloth patch, excess is cut off. Most muzzle loaders use old-fashioned straight razor. Ball is then pushed down onto the powder, using long starter and ramrod.

When placing percussion caps on the nipple, push them all the way down for uniform ignition. In case of misfire, try another cap. If that fails to fire the piece, the passage is either clogged or the charge is affected by oil or moisture in the breech end of the barrel. Drop all the fine grained powder possible down the hole in the nipple and try again with a fresh cap. If this does not fire the charge, use a nipple wrench (one should be carried by all who shoot with muzzle loaders) to remove the nipple; now pick some FFFg powder into the drum and into the chamber if possible. Replace the nipple and try another cap. This is often necessary when the shooter has failed entirely to put down his powder charge . . . a small charge "picked in" will suffice to expel the ball and make it possible to properly load the piece. A "Wormer" is sometimes employed to remove a ball and the powder when ignition cannot be secured by normal means. But it is easier to have the nipple wrench—the "T" type or a small "S" wrench that fits the nipple snugly—for this expedites the correction of whatever is wrong. If you have no worm for this purpose you will have to remove the breech plug from the barrel and push the charge out through the rear end.

A safety precaution here. Always wear shooting glasses when firing any gun, especially percussion guns. The small bits of cap fly about in all directions when fired, and will burn fast to flesh if they happen to strike it. Play safe, and be happy.

After firing a shot it is well to wipe the bore with a damp patch followed by a dry patch, so as to soften the fouling, and also in the interest of safety. Most match shooters clean after each shot and are exceedingly fussy about it. When hunting, the wiping operation is frequently dispensed with in the interest of getting another load down without delay. Incidentally, when hunting, the patch is not moistened with saliva, but greased with some heavy grease like Ideal Lubricant or tallow. This being because the rifle is often carried loaded for some time, and the moisture from the "spit" patch might rust the bore. No harm is done in using the wet patch for mark shooting, since the load is rarely in the rifle long enough to do any damage. Also, the spit patch seems to shoot more accurately.

A few tips to be used when working up the load. There should be enough powder used so that the rifle "cracks" when fired. A hollow "boom" indicates not enough powder, or that the ball is not down tight on the powder. Another indication of insufficient velocity is the lack of clean cut holes in the tagboard target. When holes are ragged, good groups are usually lacking. Use the same range when working up the load, and mark the targets with the loading data so that it may be studied at a later time. Start with a powder charge sufficient to make the rifle crack, then experiment with different

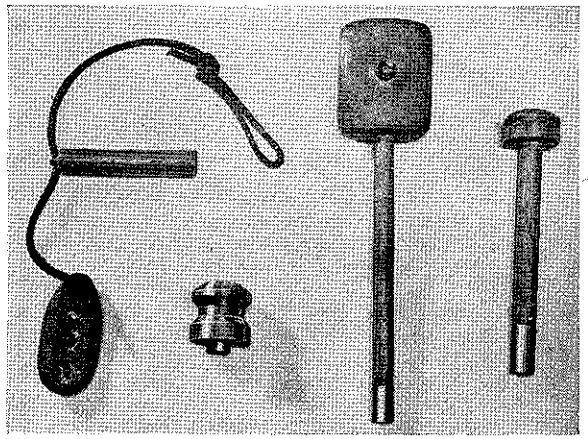
patching until the best groups are obtained. Sometimes better groups may be attained by using the best patching, then varying the powder charge a few grains one way or the other. Frequently different granulations of powder will affect accuracy. For the best groups, all possible variations should be tried. A good hunting rifle should group all bullets into an inch and a half, center to center, at fifty yards, and a first class match rifle should group into a half inch or three-quarter inch, center to center, at fifty yards.

In the interest of time, three shot groups will serve to show whether or not you're on the right track. If all three shots are spread apart badly, it's obvious that something is not right, so try another thickness of patching, or some other variation. When the three shots show signs of grouping together, then fire several more, so as to make sure.

One thing frequently overlooked by the novice muzzle loading fan is the effect of wind upon the round ball in flight. Because of its shape, the round ball presents a very large part of its surface to the wind, much more, proportionately, than a bullet. Ballistics men call this "having less sectional density", and it means simply that the air is able to act upon more bullet area with relationship to its weight in a round ball than is the case with an elongated bullet. Consequently, the round ball will be much more sensitive to wind drift than a bullet. So, when shooting for accuracy, watch your wind, and try to fire all shots with the wind at the same velocity and coming from the same direction.

MUZZLE-LOADING REVOLVERS

The Colt, Remington, Rogers & Spencer, Savage, Starr, and other early cap and ball revolvers are capable of much better grouping than most moderns will believe. They give the shooter pleasure at little cost. In loading, use FFFg black powder . . . never any modern explosive if the owner wants to go home "in one piece." Start by pouring in half a chamber full of powder, then seat a ball that is friction tight . . . DO NOT USE A PATCH! In the .31 Colt a .32 ball is proper, in the .36 use a .375, in the .44 use a .454. The top match shooters with these guns advocate the use of sufficient heavy grease on top of the ball in all the chamber. This serves to keep the bore from caking and makes cleaning easy. Little if any advantage is found in using the conical or wad cutter type projectiles in these early firearms. Do not fire these old arms until you have checked to see that the nipples are in good condition; "snapping the hammer" on them often breaks out a portion and so causes the cap to seat poorly . . . very possibly burning the shooter by escaping gases.



1 2 3 4

1. Loading Block containing three patched balls. Also attached to thong is powder measure. 2. Short Starter. 3. Combination Starter. This starter and Loading Block and measure are hunting equipment. 4. Long Starter.

Always fire five to ten shots with one charge before changing. Note groups and consistency. But keep experimenting until uniformity is achieved . . . then stick to that combination. An adjustable charger makes the task easier than cutting off cartridges cases or arriving at known charges by some other method. Be certain of reasons and results in each stage of your efforts.

The best pistol shooters seem to agree that the old revolvers give their finest accuracy with full charges, that is, enough powder so that when the ball is firmly seated with the loading lever, the top of the ball is just flush with or a little below the end of the cylinder.

Single shot pistols are loaded and fired with a patched ball, just as are the rifles, the same recommendations for working up the best load applying here also.

MUZZLE-LOADING SHOTGUNS

This old arm was the standby and workhorse gun of our forefathers, and stood ever-ready in the barn or by the kitchen door, loaded and ready for business. Unfortunately, its use by modern shooters has been largely neglected.

When used in the field or at the traps, the muzzle-loading shotgun offers unlimited fun and exceptionally economical shooting. An entire afternoon of shooting with one of these guns may be accomplished at the expense of several rounds of skeet, with a good deal more fun. The patterns delivered by the black powder shotgun cannot be excelled by our modern smokeless arms, although it must be agreed that the modern shotgun shooter gets much less dirty than the user of the muzzle-loader.

Here again, the condition of the arm is important. A modern shotgun with bores all pitted and rusted would hardly be expected to shoot good patterns, and neither will the muzzle-loader. Good men are at hand who will bore and choke the old guns to any pattern desired, and at a reasonable fee. Reference may be made to "Muzzle Blasts" for their names.

Loading the muzzle-loading shotgun is simple, for the proportions are—equal measures of powder and shot! The simple adjustable shot dipper sold with shotshell reloading equipment serves for both powder and shot when loading the muzzle-loading shotgun.

When shooting these guns, it seems to matter not whether a twenty gauge is fired in a ten gauge gun—it seems to work just as well, and is a great deal easier on the shoulder, as well as saving considerable powder and shot. Wads may be cut from solid carton pasteboard, not the corrugated variety. Such cartons may generally be had for the asking. Measure the bore size, and apply to the local hardware store for a "hole punch" of the correct size. Commercial wads may be purchased, but most shotgun shooters prefer to punch their own, because of size variations in the old guns. It is better to cut wads somewhat oversize, so that they will fit friction tight, especially in a double gun, so that firing one barrel will not disturb the load in the other barrel. In loading the shotgun, two card wads are placed over the powder, pushed home, and "whanged" with the ramrod until it bounces. Then the load of shot is inserted and one card wad over that. This wad is simply pushed down, and not whanged, since it is not desirable to deform any shot. Then cap the nipples, and she's ready to go. If only one barrel is fired, and it is desired to reload, the cap should be removed from the other nipple on the unfired barrel, in the interest of safety.

Different sizes of shot will often affect the pattern, so a little experimenting may be in order here also.

Powder granulation for shotguns is usually FFg (always black powder) although Fg is occasionally used in the larger bores like the 10 gauge. The FFg will serve well in all shotguns, but any finer granulations should not be used.

Cleaning the black powder guns is best accomplished with cold water, followed by hot water to dry the bore. If the arm is of the hooked breech variety, it is dismounted and the breech placed in a bucket of cold water, the water being forced in and out of the nipples by using a wiping patch on the cleaning rod. When the cold water flows clean, hot water is resorted to, to warm the barrel, whereupon it is removed from the water and dried with several dry patches and immediately oiled. If the gun cannot be dismounted, it is inverted so that the nipple is down, and cold water poured down the bore. Then it is swabbed well with several patches, until all fouling is removed. Hot

water is then poured down the bore until the barrel is quite warm, then dried and oiled as before. It is well to oil first with a light oil, such as sperm oil, and then follow with a patch well saturated with a light rust preventing gun grease. Wipe down the outside of the barrel and stock also, so as to remove all fouling, with special attention to the area around the nipple, since the residue from the caps is somewhat corrosive.

PERCUSSION CAPS

Percussion caps are made in a variety of sizes by the Remington Arms Company of Bridgeport, Conn., or the Winchester Repeating Arms Company of New Haven, Conn., or can be obtained through Sporting Goods Dealers. Through the courtesy of these companies we were able to print the list (next page) which gives the length and inside diameters at the top and bottom of all the percussion caps manufactured by them. By measuring the diameter at the top of the nipple and at the bottom of the taper, it will be possible to determine the size of percussion cap to order for any given arm with reasonable accuracy.

(The National Muzzle Loading Rifle Association and its official publication, "Muzzle Blasts", are a great aid to the muzzle loading enthusiast. For information, write Juanita Steed, Secretary, N.M.L.R.A., P.O. Box 1150, Portsmouth, Ohio.)

Table of Percussion Caps

REMINGTON

	Length	Inside Diameter Top	Bottom
No. 9 F. C.	.200	.1595	.152
No. 9 Hicks F. L.	.200	.1595	.152
No. 10 F. C.	.200	.1695	.1635
No. 10 Hicks F. L.	.200	.1695	.1635
No. 11 F. C.	.200	.1695	.1635
No. 11 Hicks F. L.	.200	.1695	.1635
No. 10 UMC	.235	.1715	.1635
No. 10 Hicks E. B.	.235	.1715	.1635
No. 11 UMC	.235	.1715	.1635
No. 11 Hicks E. B.	.235	.1715	.1635
No. 12 F. C.	.200	.1775	.172
No. 12 Hicks F. L.	.200	.1775	.172
No. 13 F. C.	.200	.1775	.172
No. 13 Hicks F. L.	.200	.1775	.172
No. 12 UMC	.235	.1795	.172
No. 12 Hicks E. B.	.235	.1795	.172
No. 13 UMC	.235	.1795	.172
No. 13 Hicks E. B.	.235	.1795	.172
Hicks Musket	.220	.2315	.223

WINCHESTER

Spanish Ribbed Musket Cap	.236	.220
No. 4 Split Musket Cap	.236	.220
No. 6 Split Musket Cap Foil Lined	.236	.220
No. 6 Split Musket Cap Varnished	.236	.220
No. 10 F. L. Goldmark	.173	.159
No. 11 F. L.	.179	.165
No. 12 F. L.	.183	.168
No. 13 F. L. Goldmark	.189	.174

NOTE: The Winchester Repeating Arms Company advise us that the No. 12 Percussion Cap is the number that they have the greatest call for and appears to meet most requirements.

In the preparation of these comments on Muzzle Loading, we are indebted for technical data to The Winchester Repeating Arms Co., Division of Olin Industries, Inc. and Remington Arms Co., Inc., text by E. M. Farris.

NOTE: Valuable free pamphlet "Suggestions on Shooting The Colt Cap and Ball Models." Address: Colt's Manufacturing Co., % Charles H. Coles, Curator, Colt Museum, Hartford 15, Conn.

Round Balls

The following list shows Round Balls by Number or Gauge for which we can supply moulds, also the diameter of each ball and approximate weights. Ball as cast may be .002 to .005 undersize or oversize. Moulds other than those shown can be furnished, subject to a delay on delivery.

Caliber	Number or Gauge	Weight Grains	Diameter Inches
6 m/m	244305	18	.244
25 cal	25728	26	.257
7 m/m & 28 cal.	285227	35	.285
30 cal	30826	43	.308
30 cal	31113	45	.311
32 cal	31358	47	.313
32 cal	31951	49	.319
32 Colt, 32 Ideal & 8 m/m	32363	55	.323
	345428	59	.345
35 & 36 cal	35866	71	.358
36 & 36 cal.	36074	72	.360
38 cal	37587	75	.375
410 gauge	389405	88	.389
40 cal	40091	91	.400
40 cal	40397	96	.403
	420444	100	.420
41 & 40 cal.	424101	114	.424
44 cal	429108	116	.429
	440552		.440
	451118	140	.451
	45469	143	.454
45 cal. & 44 Colt	457129	146	.457
	465550	148	.465
	470551	163	.470
	490303	178	.490
	498304	149	.498
	500406	183	.500
50 cal	509136	198	.509
50 cal	512140	198	.512
50 cal	515143	200	.515
	562407	257	.562
	575		.575
	635408	350	.635
	662310	427	.662
16 gauge		630	.760
14 gauge		510	.715
15 gauge		465	.678
16 gauge		390	.648
18 gauge		300	.600
20 gauge		193	.564
28 gauge		210	.526

Part VI

Reloading of Shotgun Cartridges

Advantages of Reloading

While the loading of shotgun cartridges or shotshells is usually undertaken for motives of economy, the economy of reloading this type of cartridge is not as great as that that may be realized from reloading metallic cartridges. This is due to the relatively low cost of paper shotgun cartridges and the relatively high cost of the components that go into these cases. Reloading provides a means of bringing out the best shooting qualities of a particular gun by "fitting" the ammunition to it.

The reloading of shotgun cartridges or shotshells as they are more commonly called, is safe, economical and enables the reloader to load ammunition that will give as good or better results than the factory product in his particular gun. IDEAL Tools will be found to be the most satisfactory. They are carefully made of the best of materials and are in no way comparable with the cheap tools found on the market. We believe that reloading tools should be made to accomplish their purpose in an efficient and satisfactory manner and that quality of workmanship or materials should not be skimped to save a few pennies in the cost of the tools. Our shotshell reloading tools will be found described fully elsewhere in this book.

Cartridge Cases or Shells

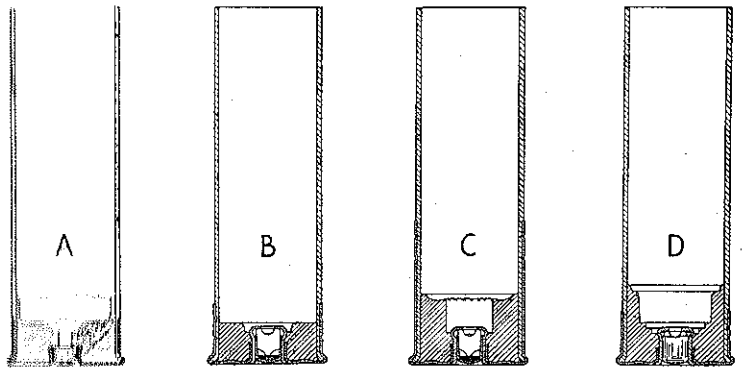
In common with other types of ammunition, the first requirement of a reloaded shotgun cartridge is an empty cartridge case. As the way the case is constsucted has a great deal to do with the way it must be reloaded, some information regarding the way shotshells are made will be necessary.

The paper body of the case is usually made by rolling a sheet of thin paper on to a steel mandril to form a tube of the proper diameter and thickness. This paper is impregnated with a water-proofing substance. The tube is cut into sections of the proper length and must be assembled to the brass head, which is a thin brass stamping, in such a way that the powder gases can not escape to the rear when the cartridge is fired. This is accomplished by inserting the paper cylinder or tube into the brass head and, with the two supported in a die, forcing a rolled paper or composition base down inside of the tube so as to squeeze or lock the tube securely by rolling cannelures into the brass or an impression of the manufacturers name can be used to serve a similar purpose.

The inside paper base is of importance to the reloader for its height determines the space available for the powder charge and consequently, the type of powder that may be used. The distance that the brass head extends up the side of the case has nothing to do with the height of the inside base which we will refer to again.

The accompanying illustration shows four general types of shotshell construction but the reader should bear in mind that the manufacturer varies the height of the bases to suit the particular lot of powder he is loading and that some variation in the bases will be found in cases of the same make and the same load, purchased at different times.

If in analyzing a shot cartridge, we start at the mouth or front end and work back, the reason for the variation in the heights of the bases will be readily understood. A certain amount of the shell must be left exposed for the crimp which holds



Shotshell Construction

the charge in and offers necessary resistance to make the powder burn properly. Next comes the shot charge which occupies a definite amount of space. Back of the shot are the filler wads. They serve a double purpose; to seal as much of the gas as possible behind the shot and to fill the space between the shot and the powder charge so the latter will be under some compression. The filler wads are made of felt or other resilient material and expand under the gas pressure sealing the bore against the leakage of gas into the shot charge, a condition that can cause erratic shooting and poor patterns. These felt wads are impregnated with grease and to prevent this from seeping into powder charge, an over-powder or grease-proof wad is loaded between them and the powder charge.

We have now left a limited amount of space for the powder charge. If a bulk powder is to be used, space for it can only be available if a low base is used in making the shell. Therefore, a high base shell must be reloaded with dense powder because there will not be enough room to accommodate a normal charge of bulk powder.

All the ammunition manufacturers make several brands of shotgun cartridges designated by trade names such as, Arrow, Ranger, Super-X, etc., and often these brands can be obtained loaded with different kinds of powder which means that they have different heights of bases, depending upon the load. When reloading shotshells it is necessary to separate cases into lots according to the heights of their bases and the following simple method will serve to do this.

Sorting Cases

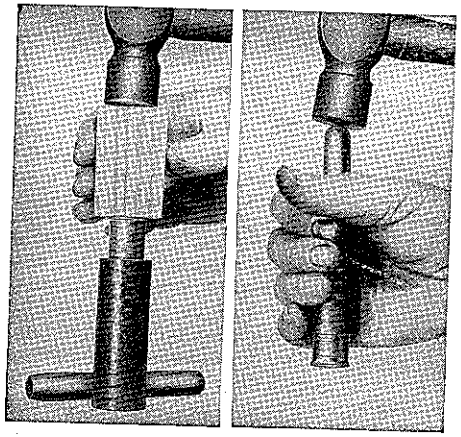
First separate your cases according to make and brand, then further divide them according to over-all length. Take a case from one of these "lots" and insert the ramrod of an IDEAL Straight Line Hand Loader or a stick slightly smaller than the inside of the case, until it comes in contact with the base. Make a mark on the ramrod or stick even with the end of the case and use this mark as a reference point. Now go through all of the cases in the lot in the same way, separating the high from the low bases. There may be some variation in the height of the high bases but this will not be great in any one brand.

The same thing can be done by visual examination if you have a low base case for reference. It goes without saying that if any cases are found to have the paper

badly torn or frayed at the mouths, they should be discarded. The mouths of the cases should be straightened out with the fingers or with a tapered stick of suitable size which can be whittled out and sandpapered smooth.

Resizing Cases

The chambers of shotguns, in common with chambers in other types of arms vary somewhat in dimensions due to manufacturing tolerances. Regardless of these variations, all chambers are made larger than the cartridge intended for them to permit ease of loading.



Method of resizing cases

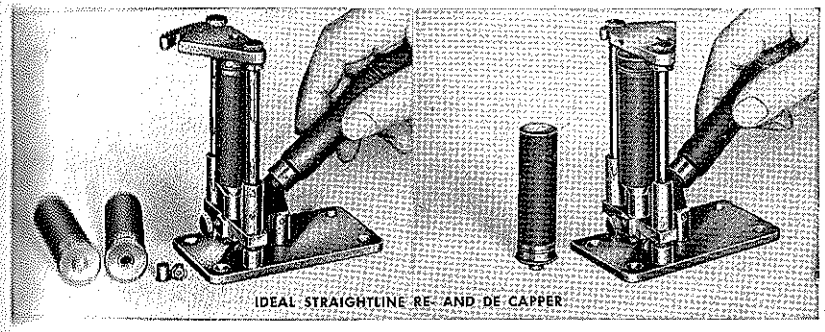
When a cartridge is fired, the case expands to the limits of the chamber. Brass cases, because of their springy nature, spring back from the chamber walls slightly and due to their ductility can be resized and returned to their original dimensions. Paper shot shells lack this resiliency and once expanded, the paper part of the case can be reduced in diameter only to a limited extent. Expansion of the brass head is usually responsible for the lack of interchangeability of shot shells and the brass head can be reduced by resizing in an Ideal Shell Resizing Tool. Fired cases will usually rechamber in the same chamber they were fired in. They will not always chamber in other guns or even in the other barrel of a double gun, so it is advisable to try all fired cases in your gun before reloading them, resizing those that show any tendency to stick. To resize expanded cases, wipe them off with a slightly oily cloth, insert the case in the IDEAL Shell Resizing Tool, place a block of wood on the head of the case and strike the block a sharp blow with a hammer or mallet driving it fully into the die. Never strike the head of the case with the hammer. Drive the case out using the wooden knock-out punch that accompanies the die. Do not strike the knock-out punch hard, as you may bulge the head of the case. Several light blows will expel the case.

De-Capping and Re-Capping

The IDEAL Straight Line Re- and De-Capper is the most satisfactory tool available for performing these operations, but before describing the method of procedure it is necessary to consider the two general types of primers that are used in shotgun cartridges. As we have already indicated, paper cases for shotguns have their heads made of thin sheet brass and the structure is not nearly as solid as that of a brass rifle case. In order to get good ignition of the powder charge it is necessary that the primer be firmly supported against the blow of the firing pin. To give this support, a separate piece of brass in the form of a cup is inserted into the heads of shotgun cases. This is known as a battery cup. The primer proper, although different in shape from a rifle primer, is made in much the same way with a primer cup which contains the priming compound and an anvil against which the explosive mixture is driven when the cup is indented by the firing pin.

In some cases the battery cups are upset or expanded on the inside so as to fix them permanently in the cartridge case heads and the fired primers must be expelled independently of the battery cups. For this type of primer, the Ideal Straight Line Re- and De-Capper is supplied with a decapping stud having a pin on the upper end that will pass through the vent or flash hole to force the primer out. The cross head that supports the head of the case has a hole sufficiently large to permit the expelled primer to pass through but small enough to bear upon and support the edge or flange of the battery cup. The plain or regular type of primer is now in the minority and most modern shotgun cartridges are loaded with battery cup primers.

The battery cup primer differs from the regular primer in that the primer proper and the battery cup are a unit and are supplied assembled together. To expel fired battery cup primers a different stud and cross head are necessary. The stud has no pin but the upper end forms a large punch that bears on the battery cup. The cross head has a much larger hole to permit the battery cup to pass through. These studs and cross heads are interchangeable as are the guide bushings that guide the outside of the case so that one tool can be used for all gauges of shot shells and for all types of primers provided the necessary extra parts are purchased. The Straight Line Re- and De-Capper will be supplied for battery cup primers unless otherwise ordered.

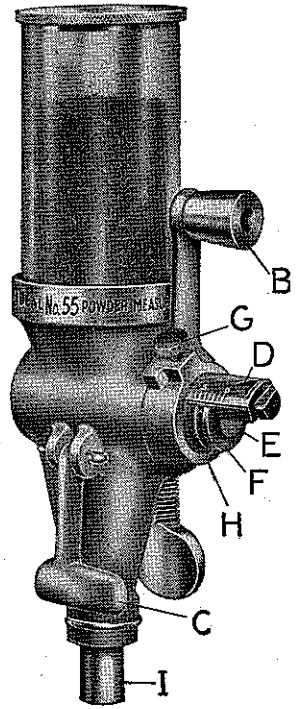


Expelling fired primers — Seating a battery cup primer

The operation of this tool is very simple. Insert a case in the guide bushing, swing the cross head over the head of the case and press down on the lever. No great amount of force is necessary and if the battery cups do not come out easily the chances are that you have some cases that are intended to be used with the regular type of primer.

To reprime cases, invert the decapping stud so that the base or large end is uppermost. Insert a case in the guide bushing and place a primer in the primer pocket with the fingers, pressing it in as far as it will go easily. Swing the cross head over the head of the case so the priming punch is over the primer and press down on the lever. The arrangement of this tool is such that whether plain or battery cup primers are used, the primers will always be seated to a uniform depth. This is not true of other types of shotgun priming tools and is a very important consideration for shotgun primers *must* be seated to a uniform depth or hang-fires or even misfires may result. Care should be taken that the primers are pressed all the way home and do not project above the level of the case head. The plain type of primer may be fired prematurely by the closing action of an automatic or repeating gun if left projecting above the level of the head and we recommend that all cases be inspected for this defect before they are loaded. *NEVER* try to seat a primer deeper after the cartridge is loaded.

Ideal No. 55 Universal Powder Measure



Shipping Weight 4 lbs.

The IDEAL Universal Powder Measure No. 55 with regular adjustable slides is in wide use today throughout the world. It is very accurate for use with all kinds of powder.

The continual progress in the manufacture of smokeless powder and the frequent appearance of new types on the market has made a large variety of these powders available to the hand loader. Each of these powders differs from the other in the shape or size of grain and in specific gravity. In loading ammunition with them it is necessary to measure charges uniformly and accurately for the best results. This necessitates the use of an accurate mechanical powder measure or a pair of sensitive scales. The Universal Powder Measure, when properly set, will throw charges with great uniformity, the variations being much less than those that are permissible in factory loaded ammunition. To measure smokeless powder in any other manner is likely to result in variations that will have an adverse effect on the accuracy of the ammunition and under some circumstances may actually be dangerous.

The table on page 16 gives the comparative weight of various charges of all the popular rifle and pistol powders that are furnished in canisters to reloaders as compared to a given charge of black powder which is used as a basis to figure from. By referring to the table, you will note that when the powder measure is set to 40 grains of black powder, to which the graduations on these measures refer, a charge of Du Pont No. 4759 that will fill this cavity weighs 24.6 grains, while that of Du Pont No. 3031 is 35.0 grains and Hercules Hi-Vel No. 2 is 33.6 grains.

While compiled from information furnished by the powder companies, the table on page 16 is only approximate, yet as close as one can determine without actually weighing the charges. Variations from lot to lot of one number of powder are liable to cause variation in the charge thrown, while the unavoidable variation in manufacture of the measure will cause a certain amount of difference as well. The Ideal Powder Measure, when set, however, will throw charges uniform to between one-tenth and three-tenths of a grain as a general rule, depending upon the particular powder that is being used.

Complete instructions are enclosed with each powder measure.

Note: Lyman Ideal No. 55 Powder Measure operates identically to No. 5.

The improved Powder Measure (No. 55) makes use of the time tested principle of the Ideal No. 5 Powder Measure.

Improved methods of manufacture make possible closer fitting and longer wearing parts.

The drop tube is now held in place by a set screw, eliminating the former difficulty of having the tube drop out during operation.

The transparent plastic powder chamber enables the operator to see the powder level at all times.

Charging Cases With Powder

The IDEAL No. 55 Universal Powder Measure or the IDEAL Loading Machine will be found most satisfactory for charging shotgun cartridges with powder. They are graduated in both drams and grains and will throw charges very uniformly. When loading dense powders, it is necessary to check the setting of the measure with scales. Some dense powders must be used in maximum charges and a slight overcharge might be dangerous. On the other hand, if the charge is insufficient due to improper setting of the measure, the ammunition will be unsatisfactory. The operation of the No. 55 Powder Measure is described elsewhere in this book. The IDEAL Pocket Powder and Shot Measure is graduated in drams for measuring powder and in ounces for measuring shot. This measure is practical and satisfactory for measuring bulk powders and may be set by the graduations.

When dipping powder charges, avoid jarring the measure and strike the charge off flush with the top of the measure.

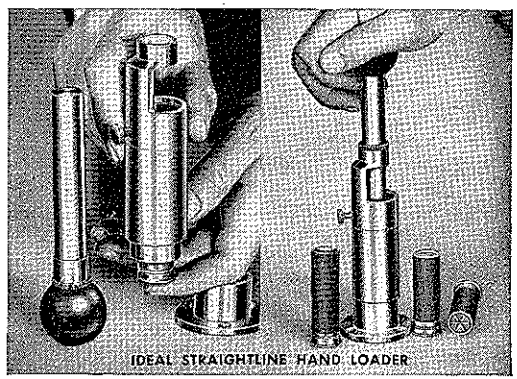
The hand loader should adopt a systematic method of charging cases with powder. The empty cases should be kept on one side of the operator and the charged cases on the other. If the practice of inverting each case before it is charged is followed there will be no danger of getting a double charge. This possibility is rather remote as even with the most dense powders the volume of a double charge would make itself apparent when the filler wads were rammed and the shot charge loaded.

A loading block is a great convenience for holding cases that have been charged with powder and one can easily be made by boring a series of holes of suitable size in a board and tacking a thin piece of board to one for a base.

The Ideal Straight Line Hand Loader

In the absence of an IDEAL Loading Machine, this tool is indispensable to the reloading of good ammunition. As will be seen from the illustration, this tool consists of four principal parts: The base receives and supports the Shell Receiver which is of steel accurately chambered for the shell or case. The Rammer Guide attaches to the top of the Shell Receiver by means of a set screw and guides the Rammer centrally into the Shell Receiver. This tool is heavily and accurately constructed to ram wads in a straight line and the steel Shell Receiver supports the case perfectly preventing any possibility of its bulging from the heavy pressure that must be applied to the wads and powder. Inside of the Shell Receiver there is an arrangement of brass Spring Fingers that hold the mouth of the case back, permitting the wads to enter without possibility of their catching on the mouth of the case and deforming it.

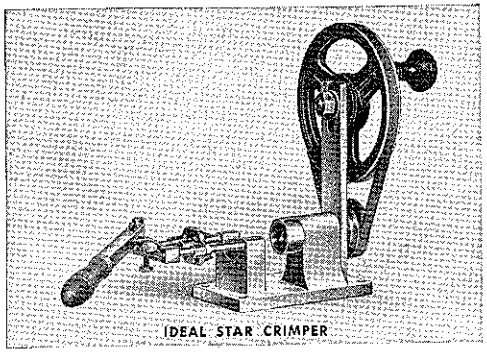
The operation of this tool is as follows. A case, charged with powders, is entered in the Shell Receiver which in turn is placed in the base. An over-powder



Insert a primed case in the base of the shell receiver

Use a uniform pressure when seating the wads

definitely stated. The paper in cases of different makes varies in thickness and the thicker the paper, the less of it will have to be left for crimping. You will have to experiment a little with this, but the objective is to leave enough paper so that it will, when doubled over, be squeezed firmly between the follower in the center of the crimping head and the surface opposing it. It is desirable that the crimp be as hard as possible as it performs the double purpose of holding the shot in and offering the resistance to the forward movement of the shot charge necessary to promote combustion of the powder charge.



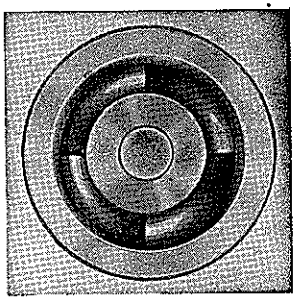
Straightline action forces case into crimping head

The loaded case should be inserted in the crimping head and the grip engaged with the head of the cartridge. With the crimping head rotating away from the operator, gradually increase the pressure on the lever until the crimp is completed. Excessive pressure or crimping will compress the shot charge and the shot will cause small lumps to appear on the outside of the case. This will ruin the cartridge as these lumps will prevent its entrance into the chamber of the gun. A little practice and experience will tell you just how hard and how far to force the case into the crimping head.

The Ideal Crimping Head

IDEAL Crimping Heads were formerly made with separate steel crimping pins, the original idea being that the pins could be turned around when they became worn. The idea was commendable and the heads gave general satisfaction, but occasionally, difficulty was experienced in getting the pins adjusted properly. We have, after extensive experiments, discontinued the old style head with separate pins and follower and have developed a new solid steel crimping head. This new head operates on the same principle as those used by the ammunition manufacturers and will turn a crimp that is perfection itself. It not only works better but will last longer. It is interchangeable on all IDEAL Star Crimping Machines.

Having completed the loading operations there remains only the gauging of the cartridges. The ammunition manufacturer must inspect and gauge all cartridges carefully before they are shipped out and the hand loader can not afford to neglect this detail. As we pointed out in the first part of this section, the paper in a shotgun case lacks resiliency and can only be reduced to a limited extent in a resizing die. Even though your cases chambered easily before you reloaded them, there is always the possibility that the pressure of loading has enlarged them so that the cartridges will not slip into the chamber of your gun as easily as the empty cases. Therefore, we recommend that you run the cartridges through your gun and segregate those that do not chamber easily. You will probably find many, if indeed there are any at all but an expanded cartridge can be very embarrassing when shooting doubles at Skeet or when a partridge gets up in your immediate vicinity and the only way to be *sure* that there are none such among your cartridges is to do what the manufacturer has to do—gauge them. The few that you may find need not be thrown away. They can be kept in a separate pocket and used for the first shot at "doubles" or loaded into the chamber before you fill the magazine if you are hunting.


The IDEAL Crimping Head turns a perfect crimp

Shotgun Powders

(Refer to Table of Shotgun Charges Page 165)

DuPont Smokeless (Shotgun Powder.)—This powder is a true bulk powder. It is an excellent one and an old standby. It is loaded by volume and all IDEAL measures can be set by their graduations (drams) without the necessity of checking the settings with scales. Because of the space it takes up, it must be loaded in low base cases. Working pressure 30 to 50 Lbs.

Hercules E. C.—Identical to DuPont Smokeless powder mentioned above.

DuPont MX.—A progressive burning dense powder that is ordinarily loaded in high base cases. It can be loaded in low base cases in which event the thickness of wads must be increased. In common with other dense powders, MX should not be used in cheap guns designed for black powder. Can be measured with the IDEAL Loading Machine or the IDEAL No. 55 Powder Measure provided the settings are checked with scales. It should *not* be measured with a dip measure or scoop. Loading pressure is the same as for DuPont Oval.

Hercules Red Dot.—A dense powder but one that occupies a fair amount of space in the case. Low base cases should be used but some loads can be used in high base cases. It is a progressive burning powder and higher velocities can be obtained with it than with E. C. Can be loaded with IDEAL No. 55 Measure, but the adjustment of the measure should be checked with a scale. Loading pressures are as follows: 10 and 12 gauges, 70 Lbs.; from 16 to 32 gauges, 62 Lbs.; .410 gauge, 64 Lbs.

Hercules Infallible.—A dense powder that should be loaded in high base cases. Charges should be weighed or measured with the No. 55 Powder Measure. When these measures are used, the settings should be checked by throwing several charges onto a sensitive scale. Do *not* set the measure by the graduations alone. It must *not* be measured with the Pocket Powder and Shot measure or other dip measure. Loading pressure about 25 Lbs. Do not compress the charge heavily.

Remarks on Shotgun Primers

The development of non-corrosive priming mixtures has led to several changes in primer sizes and it may occasionally be found that the sizes listed in the following table are not correct.

It is not advisable to use primers of one make in cases of another make. This can be done in some instances but there have been too many recent changes in primer sizes for us to recommend the practice.

Shotgun Primers

Remington No. 57.—This is the battery cup primer which superseded No. 53 and is used in current production in 8, 10, 12, 16 and 20 gauge with a .224 pocket diameter.

Remington No. 55—A battery cup primer for 28, 32 and 410 gauge shotshells with .207 pocket diameter.

Remington No. 2—A corrosive mercuric primer made for shotshells with .209 pocket diameter and will interchange with Winchester No. 2.

Peters No. 4—A battery cup primer for use in Peters "Victor," "Target" and "High Velocity" shells.

Peters No. 35.—A plain primer for .410 gauge.

Peters No. 2—For Peters "Referee" and "Black Powder" shells.

Western No. 209.—A battery cup primer for Winchester and Western shells except 28 and .410 gauge.

Western No. 3.—A battery cup primer for use in Western and Winchester 28 and .410 shells.

Winchester No. 33.—For 28 and .410 gauge shells.

United States Ammunition is now loaded with the same numbers and sizes of primers used by Winchester.

Table of Shotgun or Smooth Bore Gauges

In the days of old, before arms were rifled, missiles were round. They were shot from a barrel that had a smooth bore like a shotgun. The gauge or caliber was numbered according to the quantity of round lead balls contained in a pound. Thus, a 50 gauge rifle was bored for a ball that took fifty of them to weigh a pound, a 20 ga. twenty to the pound, 16, 14, 12, 10, etc. The following table reduces the standard shotgun or smooth bore decimally to thousandths of an inch, also to millimeters.

Diameter in decimals of inch	Gauge or bore	Diameter in millimeters	Diameter in decimals of inch	Gauge or bore	Diameter in millimeters
.835	8	21.8	.571	25	14.4
.775	10	20.0	.550	28	14.0
.729	12	18.6	.537	30	13.6
.693	14	17.8	.526	32	13.2
.662	16	16.8	.488	40	12.4
.615	20	15.6	.453	50	11.4
.579	24	14.7	.410	410	10.5

Round Balls

Round Balls are only relatively accurate in shotguns, but some reloaders load them for emergency use on deer and other large animals. In a cylinder bore gun the round ball can be the full bore diameter, but if the barrel is choked at all the ball must be small enough to pass through the choke without forcing. It is a good plan to use balls one gauge smaller than the gauge of your shotgun, if the barrel is choke bore, that is, a 14 gauge ball in a 12 gauge gun; a 20 gauge ball in a 16 gauge gun. **Use a ⅜ in. felt wad under the ball or two ¼ in. felt wads and hold the ball in place** by the crimp of the cartridge case alone, without any top wad. Never load more than one ball in a cartridge. To do so will decrease the accuracy and will increase the pressure to a point that may cause injury to the gun and possibly the shooter. (See Chart of Round Balls, Muzzle Loading section).

★ ★ ★

(For those interested in skeet, reloading for skeet, or organized competitive shotgun shooting in general, membership in the National Skeet Shooting Association is invaluable. For complete information write: Secretary, National Skeet Shooting Association, Route 5, Box 595-E, Dallas 9, Texas.)

Table of Shotgun Charges

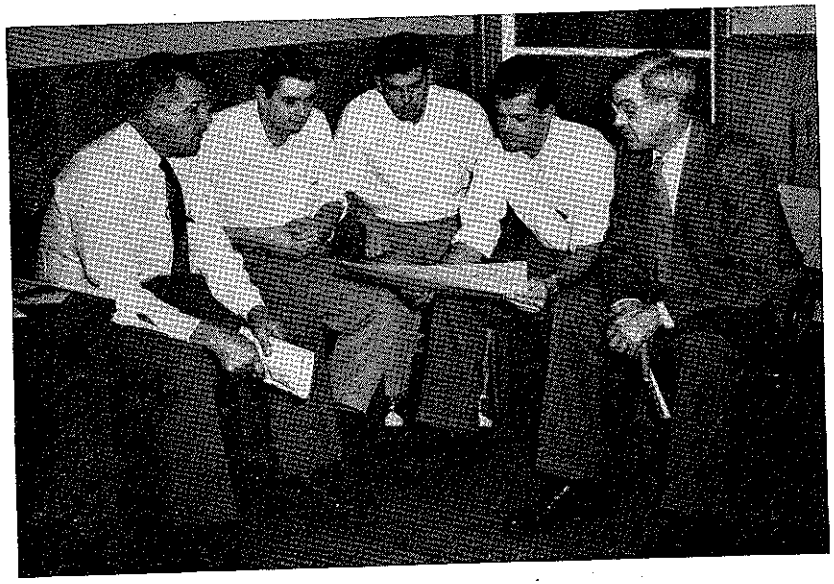
The following tables of charges will provide a means for the handloader to prepare loads for almost any purpose. Space does not permit listing the various purposes that all of these loads can be used for, but the reader should bear in mind that the charge is listed or calculated on the basis of using No. 6 or No. 7½ Shot.

Empty Case Length in Inches	Shot Charge in Ounces	DuPont Bulk Smokeless Bulk Measure	DuPont MX	Hercules Red Dot	Remarks
10 GAUGE LOADS					
2½	1¼	3½	29	28	Use any shot size.
2½	1¼	4¼	36	34	Standard load. Any size shot.
Max.	1⅜	.....	.....	.....	
Max.	1½	.....	.....	.....	Large shot sizes for ducks, geese, turkeys.
Max.	1⅝	.....	.....	.....	
12 GAUGE LOADS					
2	1, 1⅛ or 1¼	3	25.5	24	No. 8 or No. 10 shot for woodcock, snipe, plover
2¼	1, 1⅛ or 1¼	3¼	.....	26	No. 6 or No. 7½ for squirrel, rabbits.
2½	1, 1⅛ or 1¼	3½	.....	28	No. 4 to No. 6 shot for duck loads.
Max.	1¼	.....	.....	.....	BB or No. 2 Shot for geese and turkeys.
Max.	1⅜	.....	.....	.....	No. 6 shot and larger for ducks and geese.
16 GAUGE LOADS					
2½	⅞ or 1	2½	21.5	20	Standard normal load. Use any shot size.
2¾	⅞ or 1	2¾	.....	22	No. 9 shot for skeet.
Max.	1	.....	.....	.....	No. 6 or No. 7½ ducks.
Max.	1⅛	.....	.....	.....	Use No. 6 shot or larger
20 GAUGE LOADS					
2½	¾ or ⅞	2¼	18.5	18.0	⅞ oz. shot normal load.
2¾	¾ or ⅞	2½	.....	20.0	Skeet with No. 9 shot.
Max.	⅞	.....	.....	.....	No. 6 or No. 7½ shot for ducks.
Max.	1	.....	.....	.....	Use No. 6 shot or larger.
28 GAUGE LOADS					
2	⅝	.....	16	16	No. 9 Shot for skeet or quail.
Max.	¾	.....	.....	.....	Use No. 6 shot or larger.
410 GAUGE LOADS (2½" Shell Only)					
2½	⅝	.....	.....	7.0	Use No. 6 shot or smaller.

Note: Information on loads other than those listed, not available at this time.

LYMAN

Ideal Catalog



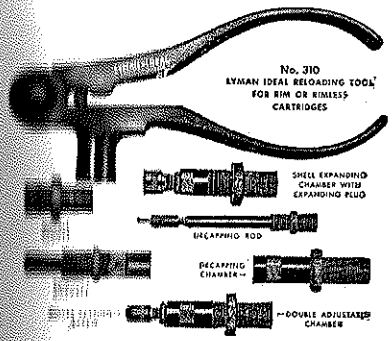
"Superb Products made for shooters by shooters" l. to r. C. Elihu Lyman Jr., Richard Lyman, Charles E. Lyman III, Robert Lyman, Henry H. Lyman.

The Lyman Gun Sight Corp.

Middlefield
Connecticut

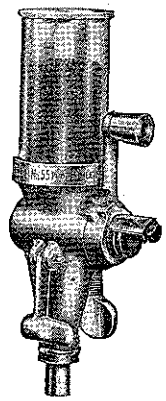
"ECONOMY" SET

No. 310 TOOL



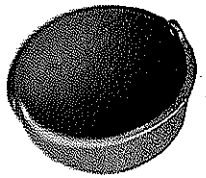
The long type tool (No. 310) with new expanding chamber, utilizes the same tools for both rimmed and rimless cartridges. This tool is available for most popular cartridges and will do all reloading operations on them.

No. 55 POWDER MEASURE

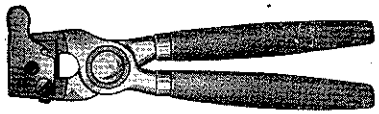


The No. 55 Powder Measure is adjustable for measuring desired powder charge accurately. Transparent magazine reveals powder level. Precision durable parts assure long life.

MELTING POT



SINGLE MOULD



POT HOLDER

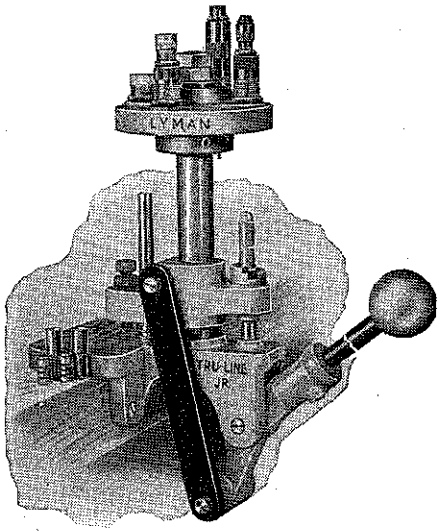
IDEAL KAKE KUTTER

DIPPER

BULLET SIZING CHAMBER

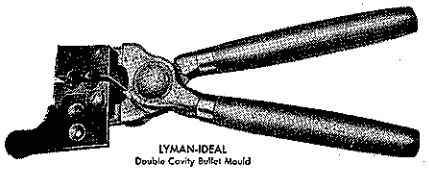
"QUICK LOAD" SET

JR. TRU-LINE PRESS



The TRU-LINE JR. is sturdy and compact with straightline, easy operation. Uses same tools as ideal tong reloaders. With or without dies. For producing good ammunition quickly and easily.

IDEAL DOUBLE CAVITY MOULD



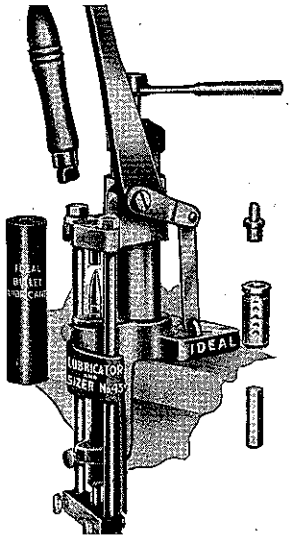
No. 55 POWDER MEASURE

The No. 55 Powder Measure is adjustable for measuring desired powder charge accurately. Transparent magazine reveals powder level. Precision durable parts assure long life.

POTTER ELECTRIC FURNACE

The Potter Improved Electric Furnace is a self contained unit which may be plugged into any electric outlet. Capacity 2½ lbs. of bullet metal.

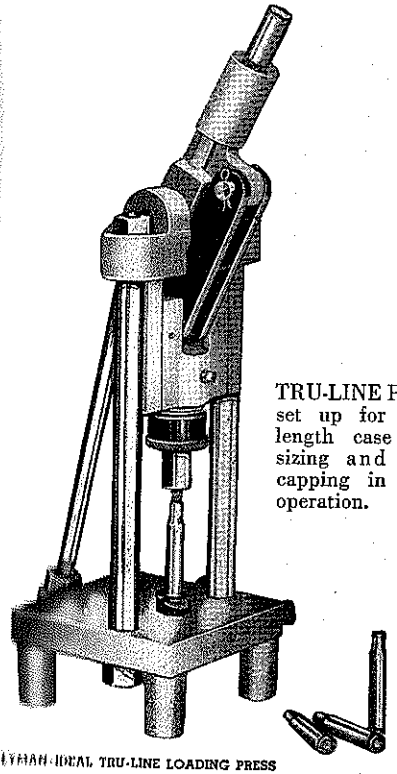
No. 45 LUBRICATOR AND SIZER



No. 45 Lubricator and Sizer is designed with increased leverage for easy sizing and lubrication of bullets. Equipped with steel grease tube and large guide rods for perfect alignment.

HEAVY-DUTY SET

SR. TRU-LINE PRESS



LYMAN-IDEAL TRU-LINE LOADING PRESS

TRU-LINE Press set up for full length case resizing and decapping in one operation.

Ideal TRU-LINE SR. Press does a clean and accurate job of resizing, decapping, priming and mouth expanding of metallic cartridges.

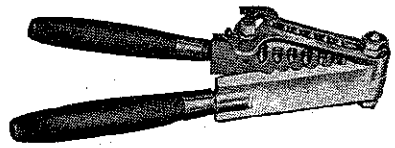
No. 45 LUBRICATOR AND SIZER

No. 45 Lubricator and Sizer is designed with increased leverage for easy sizing and lubrication of bullets. Equipped with steel grease tube and large guide rods for perfect alignment.

POTTER ELECTRIC FURNACE

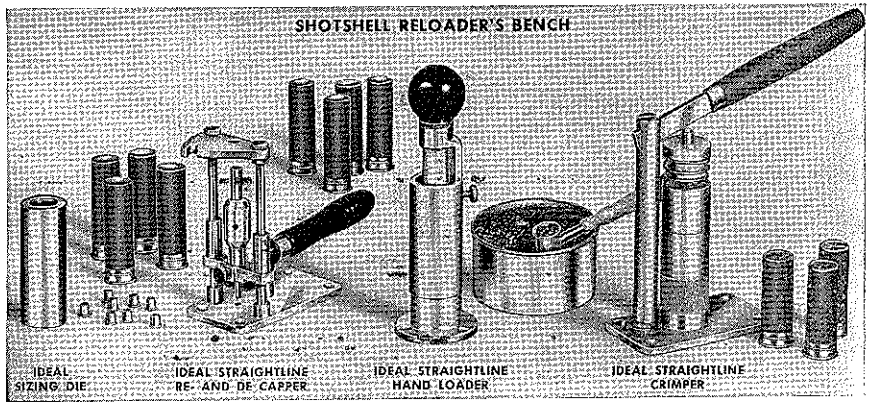
The Potter Improved Electric Furnace is a self contained unit which may be plugged into any electric outlet. Capacity 2½ lbs. of bullet metal.

IDEAL ARMORY BULLET MOULD



SHOTSHELL SET

STRAIGHTLINE TOOLS



IDEAL SIZING DIE resizes shotshell cases to original size; IDEAL STRAIGHTLINE RE and DECAPPER removes and seats primers; STRAIGHTLINE HAND LOADER loads shot and wads uniformly; IDEAL STRAIGHTLINE CRIMPER restores original "New Style" crimp to cases; IDEAL STAR CRIMPER turns a perfect round "Old Style" crimp on shells. A complete job, reloaded for one's own needs.

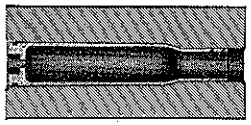
The IDEAL STAR CRIMPER

(not illustrated) operates by hand or by power but is not recommended for continuous power drive. Works in a straight line and turns a perfect round crimp.

WAD CUTTER

The Ideal Wad Cutter is a simple and precise tool for cutting perfectly round, uniform shotshell wads.

ACCESSORIES FOR METALLIC CASES



FULL LENGTH RESIZING DIE

IDEAL SIZE-EZY

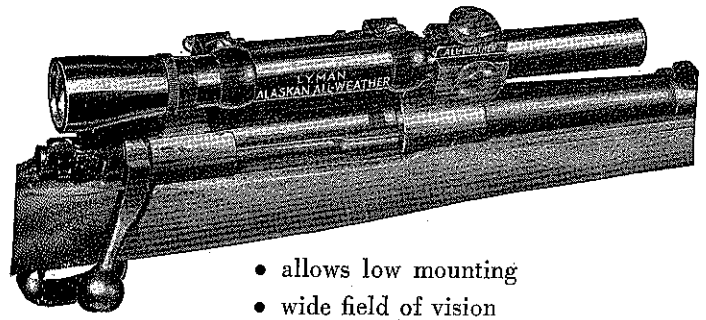
Newest development in lubricant designed for cartridge case sizing. Cuts oil bulges and eliminates strain on cases.

PRIMER POCKET REAMER

SHELL CHAMFERING REAMER

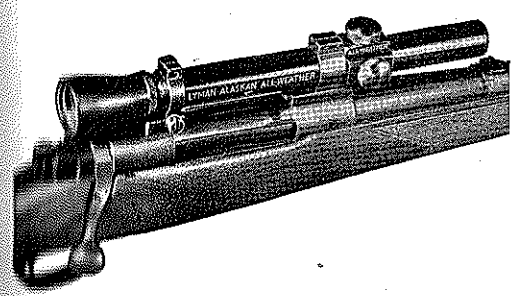
ALASKAN

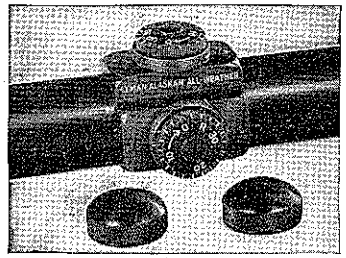
2½ POWER



- allows low mounting
- wide field of vision
- fully enclosed adjustments

The Alaskan has a world-wide reputation for being the finest 2½ power All-Weather scope made. The brilliant coated lenses, fine internal adjustments and overall good workmanship go to make a wonderful rifle scope.





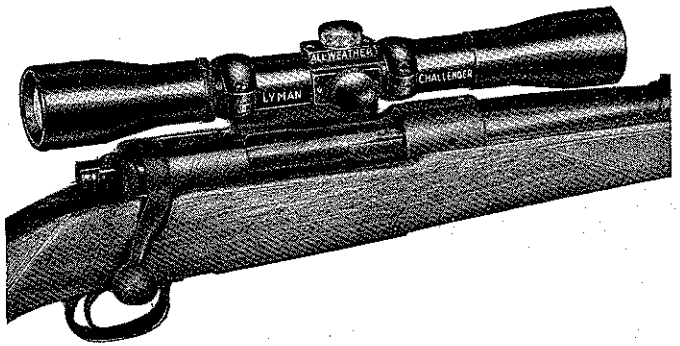
Many different styles of mounts are available for both the Alaskan and Challenger. Varying price ranges and mechanical features are designed to suit every shooters needs.

Alaskan and Challenger All-Weather internal windage and elevation adjustment is patented. The screws are marked for direction. Shown with caps removed.

Complete Lyman Catalog 10c

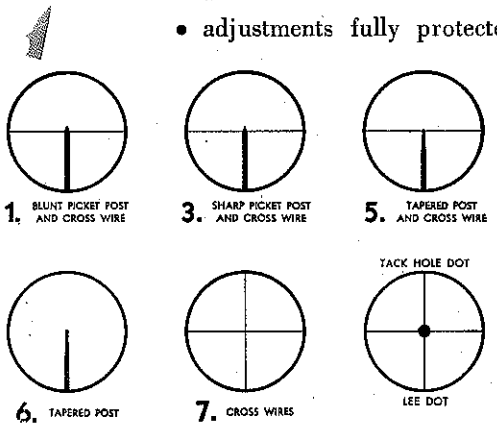
CHALLENGER

4 POWER



The perfect 4X scope which gives a clear bright image and dead-center accuracy for hunting. Finest coated lenses and All-Weather adjustments. Especially recommended for long-range, big game hunting.

- wide field of vision
- available with or without mounts
- adjustments fully protected



HUNTING SCOPE RETICULES

Both the Challenger and Alaskan hunting scopes are available with any of these reticule styles. Lee Dot reticule equipped at extra cost.

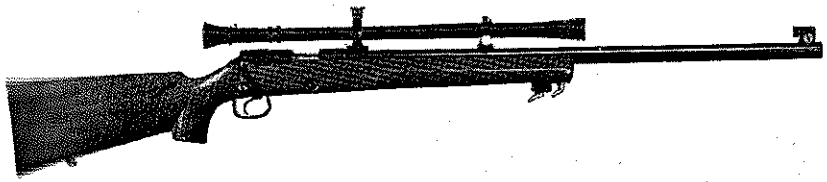
Complete Lyman Catalog 10c

JUNIOR TARGETSPOT

6, 8, 10 POWER

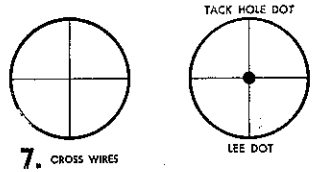
An ideal scope for varmint shooting or target work. Combines lower power with high luminosity and large field of vision. 3 point micrometer rear mount with ¼ minute clicks. Adjustments for range and individual eye are simplified by using graduated sleeve for range, and special ocular lens adjustment for exact focusing. Precision made by craftsmen.

- 19 mm objective gives wide field of vision
- Fine for target shooting or hunting
- Super-fine, hard coated lenses
- Weight: 22 ounces
- Length: 21½ inches



TARGET SCOPE RETICULES

No. 7 Crosshair reticule is considered standard equipment. The Lee Dot reticule can also be had at extra cost.



Complete Lyman Catalog 10c

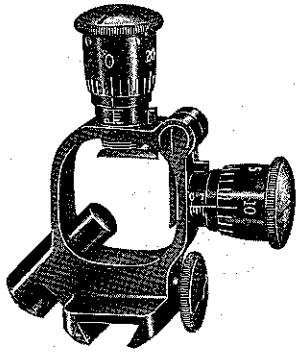
SUPER TARGETSPOT

10, 12, 15, 20, 25 POWER

The finest target scope in the world designed for exacting shooters. Every known improvement in scope manufacture has been combined with the best lenses made to give maximum light-gathering power for sharpness of image, and extremely fine and accurate adjustments for top scores. Large field of vision and choice of reticules.

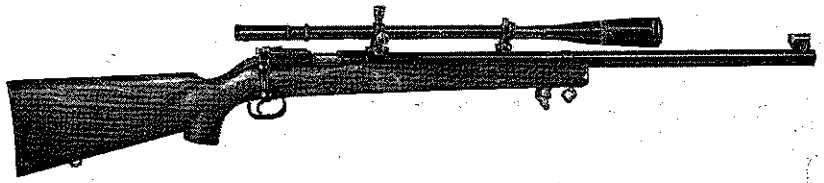
- Super-fine, hard coated lenses
- Spots shots to 200 yards
- Objective lens 34 mm, wide field of vision
- ¼ min. micrometer rear mount
- Weight: 25 ounces
- Length: 24 inches
- Fine wooden carrying case supplied

3-POINT REAR MOUNT



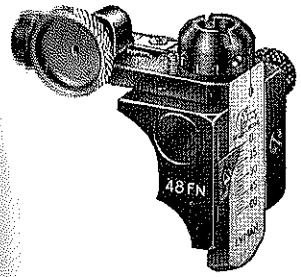
The Lyman Micro-Click Mount gives extremely accurate ¼ minute adjustments for windage and elevation.

SUPER TARGETSPOT ON WINCHESTER 52

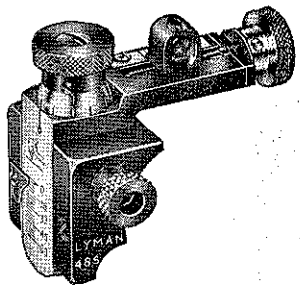


Complete Lyman Catalog 10c

48 SIGHTS



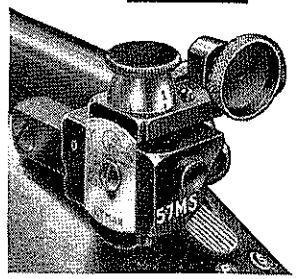
Lyman 48 Sights, superbly designed, accurately constructed for game and target shooting. ¼ Minute Clicks. Positive Adjustments. Quick Slide Release. Stayset Knobs for Hunting.

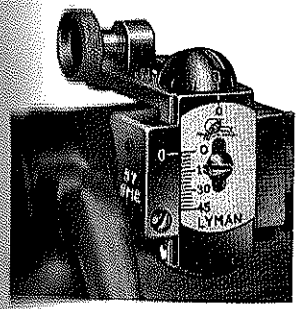


LYMAN 48 Sights for: WINCHESTER 52, 54, 70. REMINGTON 30A, 30S, 301, 721, 722. ENFIELD 1917 U.S., 1917 British. MAUSER all models. SPRINGFIELD 1903, M1, M2, .22 cal., '03 .30 cal. KRAG all models. BRITISH LEE ENFIELD and SPORTER.

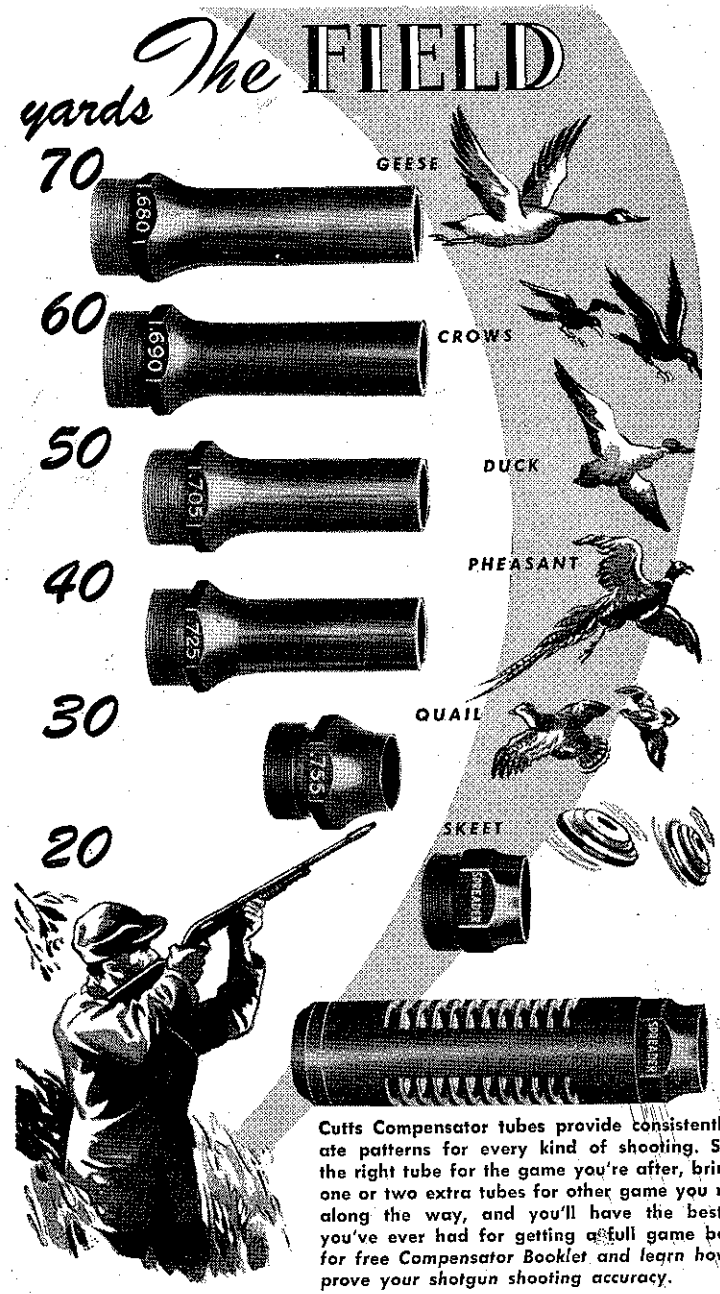
57 SIGHTS

Custom designed for: SPRINGFIELD, MAUSER, ENFIELD, KRAG, WINCHESTER 54, 70 and others. REMINGTON 514, 521, 721, 722 and others. MARLIN, MOSSBERG, SAVAGE, STEVENS, many models.





Lyman 57 Sights are precision micrometer receiver sights in the popular price field for well-known target and hunting rifles. These accurate sights have ¼ min. Clicks for both elevation and windage, and a quick release slide. Available either with large target knobs or coin-slotted Stayset Knobs for hunting. No stock cut necessary.



Cutts Compensator tubes provide consistently accurate patterns for every kind of shooting. Screw on the right tube for the game you're after, bring along one or two extra tubes for other game you may find along the way, and you'll have the best chance you've ever had for getting a full game bag. *Send for free Compensator Booklet and learn how to improve your shotgun shooting accuracy.*

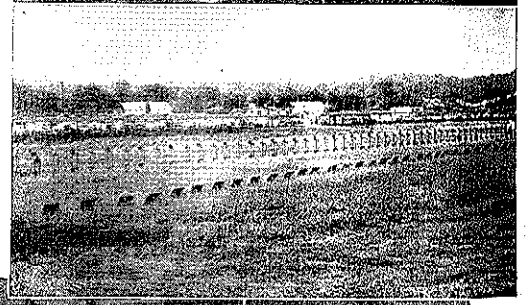
INDEX

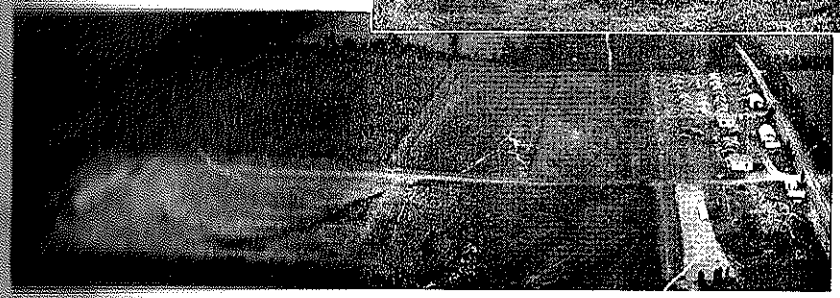
The Blue Trail Range

East Wallingford, Connecticut

The Blue Trail Range is the largest and most attractive rifle range in New England, open to any safety-conscious shooter.

The Lyman Gun Sight Corporation, builders of this range for the Connecticut Rifle and Revolver Association, invites all jobbers, dealers and shooting enthusiasts to plan to visit the Blue Trail Range when in this area.





Complete rifle shooting facilities are offered at the Blue Trail Range. There are 130 small bore covered firing points for 50 and 100 yards, 50 and 100 meters. There are also 50 firing points at 200 yards, used primarily for big bore competitive shooting.