Chapter Five

DROP FIGURES

WE HAVE spent quite a lot of space on muzzle velocities, but let's measure a quality of your rifle that is much more important for long range shooting. If we were to select a rifle and bullet for its muzzle velocity alone the 110 gr. bullet in the 06 would probably be very popular as a long range deer load. A quick check on remaining velocity and energy at 500 yards shows that this bullet is definitely inadequate for game at this range. The poor showing of this bullet at 500 yards is due solely to its poor sectional density. That remaining energy of about 400 ft. lbs. is hardly adequate even for the lowly coyote.

On the other hand, when we move into the heavier 150 gr. bullet class, with quite a little less velocity, the remaining energy at 500 yds. is more than doubled. The 180 gr. 06, though much slower at the muzzle, has almost three times as much energy left at the distant range of 500 yds. Barrel life is greatly affected by moving those light bullets out of a large capacity case at extreme velocities; especially with standard loading.

I chambered a new Aston 1-12 barrel to a 25-06 and with regular loading, as an experiment, that barrel washed 2″ of the throat out in 246 rounds. That is some barrel life. I then replaced this barrel with a 257 Winchester barrel and chambered it the same. This 1-10 twist Winchester barrel is still in that rifle and had over a thousand rounds through it, with regular loading, before it showed any very noticeable throat wear. This test was conducted as a comparison of barrel quality with regular loading.

I have not tested all the different make barrels under these conditions of a large capacity case and high velocity with regular loading, but I can report good results from all the Winchester and Buhmiller barrels that I have used. Weatherby's standard barrel blank that I chambered and tested on my 270 Gibbs case (1-12 twist) also did fairly well on life and accuracy. In fact, the 270 Gibbs case was the last of three case designs that I chambered that barrel to. Each time the barrel was cut off and set back at the threads to give a new throat and initial land section. I would say that I certainly got my money's worth in actual use of this barrel for experimental purposes. I cannot report any good claims for the free-bored magnums that Roy chambers on his rifles. All of these rifles that we have tested have been rather poor on accuracy with near maximum loads. We, of the range committee, have personally tested several of the new Weatherby magnums on drop and accuracy. 3″ to 5″ groups at 100 yds. and 12″ to 20″ groups at 400 yds. have proven to be about average with safe maximum loads, which are always 2 to 4 grs. under what Weatherby recommends for maximum. Undoubtedly there must be many Weatherby rifles that will give better accuracy than the ones we have tested. I have personally known and have checked into the history of the Weatherby products that we tested and was present when several of them fired their first shots. I feel that potential purchasers of rifles or the component parts necessary in the building of such are entitled to an unbiased report of my findings. Some of these reports are naturally not too favorable, but that being as it may, I feel that the average rifleman is entitled to know the actual results of my tests and experiments.

In the accompanying ballistic chart we can readily see that muzzle velocity does not necessarily make a good long range efficient and effective hunting rifle.

A rifle's efficiency for 400 and 500 yd. shooting must be measured in the performance of the bullet at those ranges. Muzzle velocity, although usually considered as the prime requisite for a given load, does not even enter into the computation of this "long range efficiency." The drop of the bullet, bullet weight and remaining energy are the three factors that I use in computing the figures listed in the Ballistic Chart under Long Range Efficiency. Another factor, though not mentioned, is the consideration of the weight of the game being hunted. This should carry extra emphasis if that game is larger than a good-sized deer. On the other hand when the game is of smaller caliber the expanding qualities of a bullet, such as the 180 gr. 30 caliber, may not be satisfactory to insure a clean kill on lighter game at the velocities that will be remaining at these long ranges. Here, more emphasis could be placed, not on remaining energy, but remaining velocity and flat shooting.

The controlling factors that determine the ability of a bullet to retain its velocity are the sectional density and the

construction of the wind-resisting forward area of the bullet. Sectional density is the relation of a bullet's weight to its cross sectional area. It is a well known fact that bullets with higher sectional densities will retain their velocities better than the same type bullet of lower sectional density. In the following chart the comparison of sectional density in the different calibers and weights of bullets can be readily made.

Another problem that often confronts the potential purchaser or builder of a certain caliber high velocity rifle is the selection of the proper barrel twist for the bullet weight he intends using. Assuming his bullet selection will be a Spitzer type and perhaps boattailed, the selection of the proper rate of barrel twist for his intended velocities is very important. Choosing a rate of twist that will satisfactorily handle all weight bullets is a very touchy problem. Drawing up a chart of proper rate barrel twist often leads to difficulties due to the factor of the velocities that will be encountered. I would much rather give the actual results of my findings and let you use them as you may.

First in the 25 caliber bullets of 87 and 100 gr. weight at velocities over 3300 f.p.s. I have found the 1-12 twist to be very good, but if you intend to use the heavier bullets, such as the 117 gr. Sierra boattail, at its naturally lower velocities, you may encounter difficulty getting the accuracy and performance you desire and would probably do better with the 1-10 twist. My findings on the 6.5 MM (.263) in a barrel chambered to my 67 gr. capacity case were that the 1-10 twist did very well on accuracy and flat shooting throughout the 400 yd. course with the 120 and 140 gr. bullets at their velocities which I have given. Perhaps there are riflemen who would rather shoot lighter bullets in the 6.5's and I am sure a 1-12 twist would handle these bullets much better, but I am afraid they would be wasting time trying to stabilize that long 140 gr. high sectional density bullet that gives such effective shooting in a 1-10 barrel at any range. This 140 gr. 6.5 bullet certainly warrants extra mention at this point. You will note in the sectional density chart that it competes with the best of bullets in sectional density. With that bullet leaving the muzzle in the 3000 f.p.s. neighborhood you will be surprised at its "long range efficiency." Even on game up in the bull elk class this bullet at these velocities will really do a lot of stopping. My personal preference in selecting the rate of barrel twist would be the 1-10 twist assuring stability for this, the best of the 6.5 bullets.

Now let's take up the ever popular 270 caliber on the larger capacity cases with velocities of 3400 f.p.s. with the 130 gr. bullet. With velocities in this neighborhood of the 1-12 twist works very well and also the case that is capable of giving these velocities with 130 gr. bullets will certainly give ample velocity to stabilize even the 150 gr. Sierra Boattail. Having chambered 270's on 1-10 and 1-12 twist barrels to this larger capacity case of mine, I found the 1-12 would be the best selection for the man who would like to use both weight bullets. The 1-12 twist did require a little heavier charge to deliver the same velocities. I did, as an experiment, make some 170 gr. soft point bullets and tried them in both rifles. The 1-12 twist gave me keyholes at 100 yds. while the 1-10 twist shot this 170 gr. bullet flatter at 400 yds. than a standard 270 with the 130 gr. factory Silvertips. This 170 gr. bullet was of the approximate same construction as the 150 gr. blunt nosed factory bullet.

The 7 MM, though sorely neglected by our rifle and ammunition manufacturers, has really gained the spotlight in the field of larger capacity cases. In this caliber the 7 MM enthusiasts have a selection of bullets second to none. Hornady did a lot to complete this picture when he came out with the 175 gr. bullet. This high sectional density bone crushing 7 MM bullet at muzzle velocities near the 3000 foot bracket makes this caliber about the best all around rifle for any man hunting in this country. This 175 gr. bullet at this velocity and the 140 gr. bullet at 3400 f.p.s. certainly rounds out the picture of a very versatile and efficient caliber. The recoil is not excessive for the average rifleman. He will certainly notice, especially in target shooting, that he is not shooting anything as light as a .22 caliber.

Finally we come to the most popular caliber of all the rifles, the thirty. The factories did very well in selecting the 1-10 twist for the 30-06, but if we step these velocities up both on the 150 and 180 gr. bullet the 1-12 becomes the best all around rate of twist. Roy Veale of Weatherby's informs me that this is their standard rate of twist and I certainly agree with them on their selection. With this caliber and these velocities of 32 to 35 hundred feet a second for the 150 and 180 gr. bullets too much effort should not be wasted in making these rifles into featherweights as we are now getting up into the heavy recoil class. The recoil of any of these larger capacity cases, such as the 30 Gibbs, 300 Mag. and the 300 Weatherby should by no means be considered as extremely mild. In fact, the 300 Weatherby is often considered slightly excessive for anything except actual field conditions; especially, when you may have an enraged moose or grizzly bear to contend with.

As a final comment in this chapter on drop figures these last few lines will be used in quoting results obtained in conjunction with Dick Hart in testing several 7 x 61 rifles on our local 400 yd. range. Dick and some of his compadres brought out several of the sporter weight 7 MM's chambered to his case and the most accurate of these rifles, which was the 1-12 twist, in the hands of its owner, George O'Connor, was used in the actual drop and accuracy test. This was only one test and not necessarily final and conclusive proof of the flat shooting ability of the 7 x 61. I will merely mention the loads, the velocities as given by Dick Hart, and the actual results obtained.

The first load used in these tests was with the 160 gr. Sierra boattail bullet, 64 grs. of 4350, 1-12 barrel twist, with velocity given to me as 3248. From 100 yd. zero the five shots at 400 yards measured exactly 19" low. Four of these five shots were in a 6-1/8" group. This drop of 19" would probably conform very close to any additional tests that may be run at this range. The accuracy I am sure could naturally be improved on with a little adjustment and practice at this type shooting. Dick Hart was evidently anxious to set a new record for this "long range hunting rifle event." The 140 gr. Sierra bullet pushed by 60 grs. of 4350 and quoted as near 3300 feet per second was then tried. Why these fellows brought out this mild mid-range load to use in this event I am sure Dick Hart nor I will ever know. Instructions had been to the effect that this was definitely a test of flat

shooting coupled with accuracy. This 140 gr. load did deliver very good accuracy at 400 yards, but the drop figures were comparable to factory ammunition of 130 gr. weight in a standard 270. Drop at 400 yds. was 24-1/2" and the five-shot group measured 4-5/8" overall (measuring widest spread from bullet hole centers). ●

BALLISTIC CHART
ZEROED AT 100 YARDS

Cartridge	*Bullet*	*Muzzle Velocity*	*Muzzle Energy*	*300 Yd. Velocity*	*300 Yd. Energy*	*Drop at 400 yds.*	*Vel. at 500 yds.*	*Energy 500 yds.*	*Long Range efficiency**
220 Swift	48 SP	4140	1825	2570	705	21"	1815	351	22.3%
30-06	110 SP	3420	2850	1970	945	32"	1312	418	24%
257 Roberts	100 ST	2900	1870	1920	820	36"	1470	476	23.25%
300 Sav.	150 ST.	2670	2370	1890	1190	45"	1510	750	31.6%
270 Win.	100 SP	3580	2840	2400	1280	25"	1858	765	40.6%
300 Sav.	180 ST.	2370	2240	1770	1250	51"	1465	795	33.6%
270 Win.	150 SP	2770	2560	1970	1295	43"	1555	803	33.6%
270 Win.	130 ST.	3140	2850	2260	1470	30"	1830	965	45.1%
30-06	150 ST.	2970	2930	2130	1510	37"	1721	984	41.6%
30-06	180 ST.	2700	2910	2040	1660	47"	1680	1176	43%
300 Mag.	180 ST.	2920	3400	2220	1970	33"	1854	1377	59.7%

SP—Soft Point ST.—Silvertip Compiled from factory ballistics. ***Be alert -- Publisher cannot accept responsibility for errors in published load data.***

SECTIONAL DENSITY CHART

.257	.264	.277	.284	.308	*Bullet Weight*
1673					87
1923		1640			100
		1803			110
2250					117
	2192	1967			120
		2131			130
	2539	2295	2209		140
		2459		2027	150
		2557	2463		156
		2623	2526	2155	160
				2284	170
			2762		175
				2412	180
				2668	200

Chapter Six

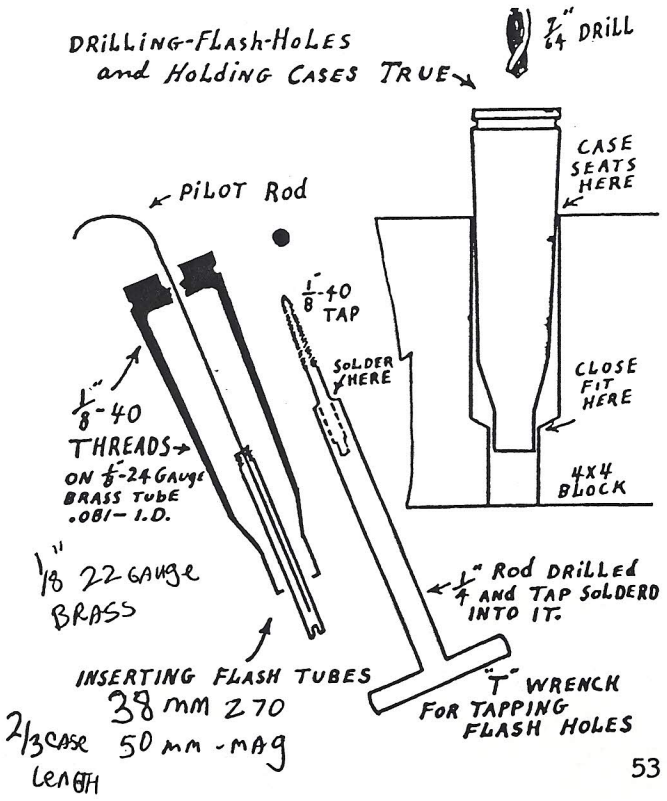
CASE PREPARATION

CASE PREPARATION for front ignition loading, is not difficult. The main purpose in mind is to drill and thread the old flash hole and insert the threaded flash tubes; thus extending the flash hole up into the front area of the powder column. For drilling out the flash holes I took a 4 x 4 block and drilled holes down into it to fit several type cases. The holes, in the block, should only be drilled deep enough to let the case go down about two-thirds of its length. The bottom of this drilled (illustration) hole should be with a bit that is just a little larger than the case neck. Now when you insert a case, neck first, down into this block the hole near the top should hold the case body firmly and the smaller hole in the bottom can go right on through the block. This will allow you to use a knock-out to remove any cases that may become stuck. This 4 x 4 block is very useful for holding the cases for drilling the flash hole so it can be tapped and I also use it to hold the cases while I am reaming G.I. pockets. I simply remove the handle from my hand type pocket reamer and chuck it in my drill press. Reaming and drilling can be very speedily done by this method.

I use a 7/64 drill for the flash holes and a 1/8" -- 40 thread tap for threading. The threading of the flash holes is done down through the neck of the case; thus assuring a straight alignment for the flash tubes. You can make a "T" wrench out of your tap assembly by drilling a hole in a 1/4" rod and soldering the base of the tap in this. Then cut a short piece of the same rod and solder it across the other end for the "T" handle. (See illustration) .098 FROM MCCUINS

You could also do this with your 7/64 drill but leave the "T" off and chuck this in an "egg beater" drill for hand drilling the flash holes. Flash tube stock is 1/8" in diameter (O.D.). This brass tubing is rated in gauge for wall thickness, 24 gauge being .081 I.D. and 22 gauge gives you an inside diameter of .069. I would suggest that for your own benefit in learning to use the different combinations available in flash tube loading that you try both the 22 and 24 gauge flash tube stock. For me to tell you that one size flash hole extended into the forward area of your powder column will give you greater benefits than the other size would probably deny you the satisfaction and experience of testing both I.D. sizes and finding out for yourself which will work better in your given cartridge. I will make one statement as a hint to you and that is that both the .081 and .069 will give good results. Saturation of a long extended powder column is not our aim or purpose with front ignition. Our primary purpose is to ignite the powder that lies in the area immediately in front of the flash tube and behind the bullet. Good complete ignition naturally is required, but I am sure you will find that primer saturation as encountered with standard loading will not be the main requisite.

I personally cut all of my flash tube stock with a tubing cutter and naturally I use extreme care in cutting them all to the same length. You will need a 1/8" -- 40 die for the threading. I have found that 2-1/2 turns of threading is just about right to bring the tube through flush with the bottom of the primer pocket. A screw slot can be cut in the front end of each flash tube to allow a means for installing the tubes.



After your cases are drilled and tapped and after your tubes are cut, threaded and the screw slot sawed you are now ready to install each tube. You will naturally need something to guide the threaded tube to the now-threaded flash hole. This can be done by first shoving a pilot rod through from the base of the case until it protrudes past the neck (illustration). Now slip the threaded flash tube up over this pilot with the case in a slightly inverted position. Now engage a finely ground screw driver in the screw slot and push the whole pilot rod and tube assembly up toward the flash hole. As the tube reaches the flash hole, from the inside of the case, the threaded end of the flash tube will naturally engage in the case threads. Now tighten the tubes snugly but not too much as you may break the "ears" off the slotted end of the flash tube. In case this ever happens, take the case back over to the block and run the 7/64 drill through from the base end again and you will easily remove the flash tube. This will ruin the threads on the tube but will not hurt the case.

One other thing that I should have mentioned in regards to cutting flash tube stock with a tubing cutter is the fact that each end of the tube will be slightly restricted from this cut. With a little reaming at each end of the tube this restriction will be relieved. This insures an even and uniform passageway for the primer flash to travel through on its way toward the front of the case. ●

Chapter Seven

FRONT IGNITION LOADING TECHNIQUE

FRONT IGNITION is not a new type of loading. It has been done for years by our military arms manufacturers. Back in the early forties there was a lot of interest in this type of loading but none of the loaders could reveal an easy, practical way of preparing cases and de-capping their primers. Neither of these phases of handloading with front ignition are difficult, as you will learn.

It does not require machine shop facilities nor a tool and die maker to perform either task. The average handloader, in the confines of his garage or basement, can do just as good a job as the most elaborately equipped man. He can also do all the operations required with a minimum amount of expense.

To have a thorough understanding of what he is doing or trying to do, I would recommend that he become completely familiar with all the facts mentioned herein and if he cannot absorb these statements he would probably be better off shooting factory ammo than any type of his own handloads.

Handloading of ammo in any fashion requires care and caution. The danger is there and don't you forget it! Still, it is nearly as dangerous as driving your car to work, if caution is used in both.

The beginner in handloading should definitely start out with the "Ideal" and "Belding and Mull" guide books and thoroughly study these books before starting. He should never load or shoot loads from someone's hearsay. His best policy would be to work up all his loads cautiously. By doing this he will gain an education of how to assemble loads of his own for maximum performance. He should learn that maximum loads are very temperamental and are greatly affected by using different cases, different primers, different bullets and different bullet seating depths. Also he will learn that loads worked up in cool weather may be excessive if used in hot weather.

As a safety measure he should always "mike" a few bullets from each newly opened box before they are seated in the case. This will help eliminate any unexplainable and sudden signs of pressure in a proven load. When using a powder scale the setting of the scale should be triple checked as it is very easy to make a five grain mistake in those charges. To prevent getting the wrong powder back into a can there should never be but one can set out on the loading bench at a time. This is one place that even our experienced loaders slip up but this simple precaution will prevent any chance of this occurring. Shooting glasses are a prime requisite and should always be used.

Signs of excessive pressure are many and to disregard these signs is very foolhardy. In front ignition you can look for the usual signs but in this type loading we have one more sign that will help the shooter to be cautious. This sign makes experimental loading safer with front ignition, as it is limited strictly to flash tube loading. When flash tubes are threaded into the flash hole for the first firing they will always stand a little tightening after they have been subjected to the first firing. If the load was too hot, whether it be first firing or third, the flash tubes will be very loose in their threads and will rattle around. This is a usual indication of excessive pressure and if the standard indications such as difficult extraction is associated with the loose flash tube then don't go any higher on those loads. In fact, you will naturally have to back off. Further verification will be had when new primers are seated in these cases: NOTE: Excessively loose flash tubes *always* indicate -- caution!

A lot of fellows ask me if a new flash tube has to be inserted with each additional firing. They do not! The flash tubes, after being inserted, usually last the life of the case. In other words, they become a permanent part of the case itself forming a long extended flash hole enabling the powder charge to be ignited right behind the bullet.

The flash tubes are not removed when the cases are sized. I de-cap the old primer with a 3-1/2 or 4" piece of drill rod of about .062 that has been tempered and fits very nicely down through the flash tube from the front of the case. All that is needed to temper this drill rod is a flame and some salt water. Get the rod a nice cherry red and quickly dip it in the cold salt water. Set the case on a solid object that has a hole plenty large for the primer to clear, insert the tempered drill rod, hold the case neck and drill rod between the thumb and forefinger and by using a very light hammer the primer is tapped out very easily and in very short order.

For resizing your cases you must remove the long expander plug and rod assembly. You can either make up a shorter expander plug and rod assembly, without a de-capping pin or you can check your cases sized without an expander plug and see how close they "mike" at the neck to a resized case of the same make that has a bullet seated in it. If your sizing die without the expander plug brings the neck down only .002 less than the loaded case "mikes" you do not need inside expanding at all and your brass will last longer if this is the case. Excessive working of the brass at the critical neck area will often cause, in fact invariably, cause splitting of the necks.

I have made short expander rods by simply reversing the rod (in Pacific and R.C.B.S.), removing the de-capping pin and merely shorten the expander plug. Now you screw this reversed rod and plug down into the die so it will be short enough to clear the flash tube, but it still must go down into the case enough to let the walls of the case neck pass over the expander plug before the case neck starts up into the die neck. The unused portion of the expander rod will stick up above the die quite a bit but don't let this worry you as you will still always be able to remove this rod and revert it back to its original relation for regular loading and sizing operations. Another way is to polish out the neck of your die, *a little at a time*, until it will only bring the case necks down two or three thousandths less than the same cases "mike" at the neck when holding a bullet. One important thing to remember here is that some makes of brass are thinner than others. So do this die altering when using the thin necked cases. If you don't, you will find that some of your re-sized cases will not hold the bullets tight enough.

Personally, I use both methods and find them both very satisfactory. This polishing of the inside surface of the die neck is done with a wooden dowel that is split down the center so it will hold a strip of fine emery cloth. Rotate this in the die neck and slowly grind this inside surface larger, but check it after very little grinding on another of your fired cases. This can be done by full length sizing the fired case and carefully "miking" it at the neck. When you get the inside surface of the die neck area ground out to where it will only bring these case necks down to two or three thousandths less than a loaded case you can then change this fine emery cloth to crocus cloth and polish this neck area of the die to a smooth mirror finish. You will not only be rewarded by much longer case life but you will find it is very easy to re-size and prepare your front ignition cases. You will find that with this method applied you will be able to size your front ignition cases without an expander plug at all. ●

Chapter Eight

SIZING DIES

THE CASE sizing die, which any handloader uses, is too often accepted as a perfect piece of equipment. I have, surprisingly, found that none of our most competent handloaders have ever checked the inside dimensions of their dies. In fact, I have yet to see one who even knows how. The purpose of a precision sizing die is to bring the fired brass back down, not to factory ammo specifications, but to bring it down just small enough to feed freely in the chamber of *your* rifle. Overworking of the brass at the neck will greatly shorten brass life. Just as excessive sizing at the pressure ring at the rear of the case will cause inside cracking here.

Die manufacturers instruct their customers to screw the sizing die down till it locks firmly against the case holder. How do you know this is not crushing the case shoulder back and causing head space? How do you know how much the brass at the neck is worked from its fired unsized position to what this inside neck of the die brings it down to? How do you know what your maximum chamber dimensions are? Is your expander plug smaller or larger than your bullet's "mike"? Will a sizing die set for someone else's loading tool automatically be O.K. for your same make tool? How do you get stuck cases out of a sizing die? Do you use graphite on the inside and outside neck surfaces of your brass? How would you back off .010 of an inch with either of your dies?

The answers to these questions are not too difficult but you just ask them of any of your handloading friends and see if they know them all.

One of our more eminent rifle authorities once led me to believe that the factor of head space was less critical with front ignition loading. Don't you believe it! And don't load your maximum loads, with front ignition, in brass that you are not positive of in regards to filling your chamber at the shoulder. There is a very sound and logical reason for front ignition showing pressure signs when head space is too great. When the firing pin falls it naturally shoves the case forward. The primer flame squirts through the flash tube completely bypassing the main body of the powder column.

The first thrust on the case itself is in the immediate area of the shoulder and extreme forward section of the case. This pressure immediately expands the shoulder, slamming the unexpanded remainder of the case back against the bolt face. The unburned column of powder in the main part of the case body has acted as a cushion for this pressure and the walls of the case have not expanded out to the chamber walls where this brass tends to cling and retard this backward thrust. As an example, I maliciously sized some once fired UMC-06 brass to give several thousandths head space. I loaded several of these with 180 gr. Speer bullets and 8-1/2 primers. Ten were with regular loading, 57 gr. of 4350, and the others were front ignition loads that I had tried and had *proven* to be much milder than the standard load of 57 gr. 4350. The regular loads did give pressure signs, as far as extraction and excessive flattening of the primers was concerned, and I am sure anyone not knowing the conditions of excessive head space which existed here would have condemned this load as being a bit on the hot side. The proven milder load with front ignition duplex really went all out as far as flattening of primers was concerned and it most certainly would have been condemned as being too hot because of this extreme excessive flattening of the primers. The base powder used in this 06 duplex load was 6 grs. of 3031. In my previous tests conducted on this 180 gr. bullet in the 30-06, I was able to go up to 30 grains of 3031 as the base powder without getting pressure indications. Here we will emphasize the importance of head space tolerances and their critical reactions in conjunction with front ignition loading. If this last mentioned load of 30 grs. of the fast burning powder was used with excessive head space, as I had set it up in this experiment, I am afraid the results would have been a bit on the unpleasant side. For me to make these experiments with excessive head space or extreme excessive pressures is part of my job and by so doing I am naturally able to enlighten my readers on the actual and probable results. However, I would not recommend or encourage you, or any other handloader, to conduct tests of this nature unless they thoroughly know and understand all the phases of internal ballistics and are also conscious of the dire results they could incur.

As a summary of this last comparison, you should make a definite and strong mental note that excessive head space is much more dangerous with front ignition loading and precaution should always be taken to control this extremely important factor in your front ignition loading.

Checking dies for head space setting is relatively simple. With a long slanting shoulder such as the standard 270 or 06 the resized cases for your rifle do not need the shoulder moved back in the sizing operation. In the long straight bodied sharp shouldered cases excessive sizing of the forward area of the case has a tendency to move the shoulder forward and if your die does excessively size the body down and does not shove the sharp shoulder back to correct head space length, you will probably notice difficulty in closing your bolt on these larger capacity straight bodied cases. Naturally, it is important that your die does not excessively size this forward area of the body as this does not call for good accuracy, but will shorten case life. A perfect custom made sizing die should resize a case fired with a maximum load to where it will "mike" about .0015 less throughout the entire body. This minimum amount of sizing assures perfect feeding and definitely helps in attaining consistent accuracy. Excessive sizing beyond this amount only shortens case life. When purchasing a new sizing die, I *always* thoroughly check and make corrections until the dies come up to these standards.

One of the most important sizing operations to check is the neck itself. We all know that brass has a springy quality, but these dimensions are gathered from one of your fired cases that is "miked" before and after sizing. Along with "miking" this fired case at the base and the forward area of the body also very carefully "mike" the neck. Here, as an example, we will use the standard 270 for an illustration of neck dimensions. If your fired cases "mike" over .308 to .309 this neck area is a little on the sloppy side and someone should have checked their reamer before they used it in your barrel. If your fired case necks run much over this figure your chances for good case life and pinpoint accuracy are not too great. The supporting inside wall of the case neck acts as a guide for the heel of the bullet as it starts through the throat and into the lands of your barrel. Minimum sizing of this neck area is also an important requisite for case life.

Before sizing a fired case, that you have "miked," remove the expanded plug, lubricate and full length size the case. You can now check the "mike" readings on the entire case. How much was that neck brought down? .295-.300? If your case now "mikes" less than .300 you should definitely polish out the inside of the die at the neck area. I have had many long-experienced handloaders tell me of their problems with loading and sizing operations and it has actually been surprising the number of these experienced men who did not know what excessive sizing and a loose chamber in the neck area would do to their accuracy and case life. In fact, it may be surprising to you as an experienced handloader to have me ask "do you know the inside dimensions of your sizing die?" Your lack of actual knowledge of the inside dimensions of your sizing die should not dishearten you too much, as it seems to be a standard procedure to accept a new sizing die without question as a perfect piece of precision equipment. I, for one, am very "tolerance" conscious on these sizing operations and do not lightly cast off as "close enough" someone else's imperfections in manufacturing. After all, the art of handloading hinges around consistency and uniformity, as well as the seeking of perfection, so why limit this strictly to the pouring of powder and seating of bullets?

For the handloader who unhesitatingly accepts as perfect his new sizing die I would like to quote a few of my experiences along this line. A few years ago I bought a set of dies and also a file type case trimming die from a manufacturer in Utah. The full length sizing die moved the shoulder back to create .020 head space when the die was set to lock down against the case holder. The file type trimming die was so tight, even on the full length resized cases, that well lubricated cases stuck and had to be punched out of this case trimming die. As you all know, a case trimming die such as this is supposed to be made to merely hold the case so the protruding neck areas can be filed to uniform length. A minimum of sizing at the neck area of a fired case would naturally be acceptable, but this case trimming die would bring the *outside diameter* of the case neck down to less than bullet diameter. This was nearly .030 more than was needed or could be used in a case trimming die. I sent that die back to them by my friend Hollingshead, a fine gunsmith from Humboldt County, California. He left it with them for a day and dropped it back by to me with the erroneous assumption that it had been corrected. I tested this file type trimming die but it still required a lot of extra work on my part to grind out this neck area to proper dimensions. It is hard to understand how any die maker could make such gross errors, when they have fired case samples to go by and then on top of this to not have the ability or desire to correct these errors.

Another sizing die of beautiful shiny outside appearances made by one of our more recent manufacturers supplied a friend of mine, who is in the Sporting Goods business, with a set of 7 MM Imp. dies that checked out fine with one exception. The sizing die would not bring the case neck down enough to hold the bullets. I returned the sizing die with a note and fired case samples thoroughly explaining the trouble. They exchanged the sizing die right away.

The replacement sizing die was tighter at the neck; in fact, it would actually shave off about .010 of that neck brass in a sizing operation. I don't know who was making their dies at the time but for the man who accepts dies as perfect I hope they have improved.

On another occasion I bought a set of 270 dies from one of our oldest and most respected die manufacturers, whose name is synonymous with loading equipment. This particular sizing die would not size down to .469 as my cases "miked" at the base, so naturally I could not use 270 brass that had been fired in a rifle with a larger chamber at this base area. I took this sizing die back to the San Francisco distributor who handled these products and the store manager worked with me in testing the remainder of his dies of this make. We found that all of his remaining dies had the same fault. A defect such as this in a sizing die is easy to detect. Some of the other defects, which you can never find, unless you know how to check inside dimensions are of even more importance.

After having tried most of the die manufacturer's products I have found that R.C.B.S. of Oroville, California invariably gives you closest of tolerances on the standard as well as custom built dies. I have tried his loading tool, which is outstanding and his bullet making equipment that does such a uniform job.

How would you check a sizing die to be sure it is not causing head space when you full length size your cases? Will the die correctly size brass that has been fired in a rifle with more head space than yours? We will take one of your fired cases, lubricate it but this time smear a little powdered graphite on the case shoulder. Now back off one eighth turn on your die and with a standard 14 N.F. thread, as most dies have, this will raise the die .009 of an inch. You can now size the case in this position. Remembering that you have powdered graphite on your fired case shoulder, remove the case after it has been sized with the die set in this position. Now carefully examine the case at the shoulder through a magnifying glass, if possible, and if you find this powdered graphite was firmly and definitely smeared by pressure from the die you can readily see that any cases that you may have sized in the past with the die screwed all the way down to lock against the shell holder would have given head space conditions in the case itself.

Using powdered graphite in this way you can positively set your dies for proper head space setting. Sometimes it may be necessary to polish off part of the die base to give enough sizing for brass that has been fired in a rifle with greater head space than yours.

If the sized cases will not chamber easily and *are crushing* the graphite on the shoulder, do not hesitate -- lay a fine piece of emery paper on a flat glass surface and polish off a little at a time until the sized cases will chamber easily and STILL CRUSH the powdered graphite on the case shoulder. By this method you can actually see where you stand on head space.

A simple process for marking the top flat surface of your loading tool in .001's is as follows: Dies have 14 threads to the inch. One complete turn is 1/14 of an inch or approximately .072 while 1/2 turn would be .036 -- 1/4 turn .018. These divisions are easy to mark. (See illustration) Now we will take that first quarter turn, coming up, and evenly space two more marks, each of these marks would each represent .006 of an inch. Now with a little care let's place five small marks between each of these. They will be .001 markers. Now with the die screwed down tight to where the locking ring shoulders, center punch a small mark on the top surface of the locking ring even with the starting point, or beginning mark on the tool head itself. Remove the die, file off the knurling from the locking ring in the area that is even with the index mark on the ring. Now you can make a good straight vertical mark here on this now smooth surface of the ring and will have a permanent means of measuring just how many thousandths of an inch you are going when you change the die setting.

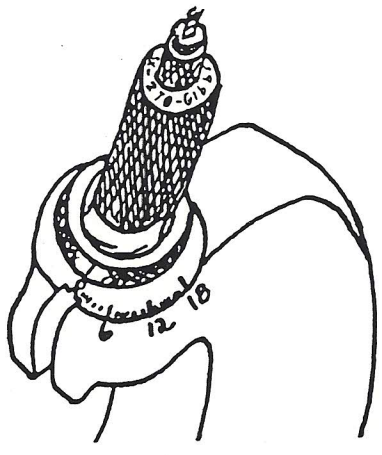
Removing stuck cases from a sizing die is really a problem if you don't know how. You can't drive them out with the expander plug assembly without ruining it, so don't try it! When a case sticks and the case holder pulls off part of the case rim, remove the die from the tool, unscrew the expander rod as far as you can, then drill a hole down through the case primer pocket for a 1/4 USS standard tap and then tap this hole for the coarse 1/4 threads. Select a piece of pipe or any other metal object that has a hole in it just large enough to slip over the case head. A large nut is good. Run a 1/4" nut on the 1/4" bolt far enough to let the bolt reach through the metal sleeve, place a thick heavy washer over the sleeve. Now run the bolt down through the washer and sleeve. Start the 1/4" bolt and run the threads down through the tapped case head. Hold the bolt head with one wrench, tighten the nut against the washer with the other, while holding the die in a vise, continue tightening that 1/4" nut and your homemade "wheel puller" very easily gets you out of a serious predicament.

Fireforming of those wildcat cases has always been the main drawback to having a rifle chambered to a case other than factory. Not even considering the time involved, the cost of bullets, powder and primers is usually just as much as the cost for a regular load. Another bad feature on fireforming is the extra wear on that fine barrel. I have spent many hours loading good bullets, powder and primers to fire in a larger capacity chamber just to get the finished brass product. A few years of this was enough, quite a lot of thought and experimenting along the lines of eliminating this fireforming process resulted in the Wildcat case former that I now market. This tool is very easy to operate and it takes practically no time to form fifty or a hundred cases for any wildcat.

Here we will quote as an example -- you can insert a G.I. 06 brass that has the crimped primer in it and remove a completely formed and de-capped 25-06 -- *in one operation.*

Another case, as an example -- insert a 300 H&H and in one operation remove a 300 Weatherby, or insert a standard 270 brass and remove the 270 Ackley or 270 Gibbs. In fact any case that needs firing to form is just the ticket for this tool. Any of the Gibbs cases can be formed, either by firing or by using this Wildcat caseforming tool. This tool was tested by the technical experts of the *American Rifleman.* M.D. Waite contacted me with his favorable comment on the operation of this tool. The speed and ease of operation in forming and de-capping is amazing. Even those stubborn G.I. primers give no difficulty at all. Each of these tools is custom made and assembled to your fired cases and sizing die specifications. In fact, you must send in three fired, unsized cases, and your sizing die for me to assemble your individual case forming tool. The cost of this tool is $12.50 complete with full instructions on its use.

Chambering to any of the Gibbs cases is $17.50. With your rifle chambered you can either fireform your cases or get the Gibbs case forming tool to eliminate fireforming. Loading data is furnished with each chambering job and I also personally test fire each rifle with maximum loads for accuracy and pressure indications. ●



Chapter Nine

POWDER COMPARISON

BEFORE WE get into front ignition loading and especially the duplex loading where we will be using two different powders, let's see what some of their burning characteristics are. With front ignition loading you should always load to 100% density. (Right up to where the bullet will seat down on the powder.) There are two reasons for loading a full case. First, there is the factor of even and uniform burning of the powder. When a load is to 100% density the powder is forced to burn the same each time. Secondly, with front ignition duplex, this 100% loading prevents the fast burning powder, in the bottom of the case, from mixing up into the slower burning powder that is your primary propellant.

For a good illustration of the powder's burning qualities I will quote these maximum safe loads in the 30 Gibbs using DEN-43 brass and different powders. These loads are all with standard loading.

First, a quick reference to the Gibbs cases -- the case capacity of my cases are greater than a standard 06 or the Ackley Improveds. So don't try these loads in anything but my larger capacity 06 case -- the 30 Gibbs.

These loads for the 30 Gibbs are all with DEN-43 brass and Western 8-1/2 primers and were all fired in a Model 70 Winchester 30-06 chambered to the 30 Gibbs. Case capacity with Super X brass and loaded to 100% density is 67 grs. 4350. For fellows who would like more velocities and flatter shooting from their old reliable 30-06, chambering to the 30 Gibbs is the easiest and most practical way to utilize their present rifle and cases to get these Magnum velocities without the extra expense of Mag. brass and rifles. These velocities can be attained with safe maximum pressure and at no expense to case life.

From this loading chart on the 30 Gibbs we can readily see that 57 grs. 3031 -- 61 grs. 4064 -- 62 grs. of 4320 are all giving the same "mike" readings on the DEN-43 brass. All of these cases were of uniform base size before these tests were made. The 4350 load, with 150 gr. Hornady, even though it was 100% density in this brass, still did not show as much pressure or velocity as the other loads with faster burning powder. The 150 gr. Hornady load with 60 grs. of 4064, in the 30 Gibbs, was chronographed against the Factory 150 Silvertip in a 30-06 and gave a velocity reading of 485 ft. per sec. more velocity than the 150 gr. in the 30-06.

In front ignition duplex loading we will call the slow burning powder that gets the bullet started, the *primary* powder. The fast burning powder that will always lay in the bottom of the case will be the *base* load.

One thing to remember with front ignition about the powder density is the fact that different powders will take up more or maybe less space than the other powders. 4320, for instance, is very dense and you will find it takes up less space or requires more of it to fill a case. 4759, on the other hand, is very fast burning but the ratio of displacement as compared to 4350 is about 7 grains to 10 grains of the 4350. 4227, another very fast burning powder is closer to 3031 on displacement and performs better with lighter bullets.

The flash tube will naturally displace some of the powder. As a result you will find that a 100% density load with a 38 MM flash tube, in a standard 270, will be about 54 grs. of 4350. Once while running drop and accuracy tests at 400 yds. I was comparing drop and accuracy between the 130 gr. Silvertip factory load in a Standard Model 70, and a front ignition load using the 150 gr. Sierra Boattail in the same rifle. Both loads were zeroed at 100 yds. and both fired at 400 yds. (6 power scope and bench rest position). The front ignition load with the 150 gr. bullets shot flatter than the factory 130 gr. bullets and also formed a 6" group against the 130 gr. -- 10-1/2" group. This front ignition load with 38 MM flash tubes was 54 grs. 4350.

This same rifle set a new record for accuracy and flat shooting with the same flash tubes and a load of 15 grs. 3031 base powder and 39 grs. of 4831 (Data) as the primary charge. This new record was all six shots in a 4-1/8" group at 400 yds., again shooting flatter than the 130 gr. factory load.

Another front ignition load of 20 grs. of 4064 as base powder and 34-1/2 grs. 4831 (Data) did almost as well on accuracy with a 4-1/4" group at 400 yds. and 6" flatter than

the 130 S.T. This 150 gr. Sierra load may be too warm for your 270 so approach it cautiously as I consider it maximum in my Model 70 with Super X brass and Western 8-1/2 primers.

Another load for a 270 that I have used a lot with 38 MM flash tubes is 10 grs. of 3031 (Base powder) and 44 grs. of 4350 (Primary) with the 150 gr. Sierra bullets.

The faster burning powders, such as 4759 and 4227 will show better results when using the 130 gr. bullets. Your primary powder should be 4350 as 4831 is a little too slow for the light bullets. A combination of duplex that has too wide an extreme of burning qualities between the two powders will usually cause poor accuracy and also collapse your flash tubes out near the end. With a very fast burning base powder such as 4227 you must be sure and start with only a couple of grains and slowly work up, keeping the same density, to your safe maximum loads. Watch your case heads for ejector marks and check each progressive load for loose flash tubes after firing. Excessive loosening of the tubes indicates PRESSURE. I would not advise any faster burning powder than 4759 or 4227. More care must be used with 4227 as its density is much greater than 4759. As an example, when you add an extra grain of 4227 you use one less grain of 4350 but when you add .7 of a grain of 4759 you remove 1 grain of 4350 to maintain same density. 4759 burns almost twice as fast as 4350 but it displaces almost twice as much space in your case. 100% density of loading is, as I said, essential with duplex loading, but you will find that crushing the bullet down too far on the powder column is not advisable. Always tap your cases as you pour each powder to insure even density of loading then fill the case to just where the bullet will definitely hold the powder firmly.

Never use the same load for different makes of cases. UMC and G.I. brass are thicker and will not hold as much powder as Super X and Super speed cases. Good front ignition, as regular loading, must be uniform so be sure and keep it that way.

In this loading chart I will give some of the loads that have proven to be O.K. in my rifles. You with a tighter chamber or tighter bore should first load under these and learn what to watch for as you approach maximum loads. You may not be able to go as high and you may be able to go higher but start low and take it easy.

In regards to using any type of separator, paper or otherwise, between the fast and slow burning powders, I have loaded many loads with different types and thickness of separators and they were all unsatisfactory on performance. If each powder is poured slowly and the case is tapped while pouring, I am sure that with 100% density of loading you will get much better results without any type of powder separator in the case.

If you like to experiment with different combinations of powders, flash tube lengths and bullets the number of combinations in front ignition duplex loading are endless. My efforts in preparing this record of my findings is not to give you an exact detailed load for your rifle, but to help you learn how to work out these individual loads for yourself.

Take now as an example, the larger cases such as the 300 Mag. and all the different versions of wildcats. Front ignition loading for them is just as easy as it would be for a 257 Roberts, after you learn how to approach the loading process.

The longer a flash tube is the greater the length of time it will take your powder charge to burn and the longer your pressure curve is. On any full length Mag. brass it would be a good idea to start with a flash tube of 50 MM. Load this case with Data powder for the medium weight bullet, or if you are dubious start with the 150 gr. bullet and check the case expansion against your normal safe maximum loads in regular loading. If the data powder proves too slow, start adding a little 3031 or 4064 in the bottom of the case. If, after you have learned that 20 grs. of 3031 in the base is not warm enough, then try 4350 (alone) in the case. I have found in front ignition duplex loading that a column of powder that is composed of 20% -- 3031 and 80% Data is equal in pressure to a straight column of 100% 4350. Although the pressures will be equal the velocities of the duplex load is greater. In other words 12 grs. of 3031 as base and 48 grs. of Data as primary will give approximately the same pressures as 60 grs. 4350.

Now we will suppose that a full case of 4350 with the 50 MM tube is still not giving you a maximum load. You can then start shortening the tubes a little at a time. On this full length mag. case 44 MM should prove to be about right. As a general rule, each 9 MM of tube will displace about 1 grain of powder.

Short tubes that come near the middle of the case greatly hasten the burning process and have proven unsuccessful for me. As a general rule the tube should extend a little over two-thirds of the way up the case body.

The life of flash tubes is very good if they are treated right. It takes very little force to check them each time or to tighten them the first time. I have also found that it is better to leave the fast burning base powder out of the flash tube. All you need do is insert a 3" piece of small welding rod or wire in the flash tube while you are pouring the fast base powder. You need not worry about the primary powder getting in the tube; it is O.K. Go ahead and pour all these base charges in your cases and then come back and weigh and pour the primary charges. The usual precautions are taken to prevent getting two base charges in one case, but don't worry, you will find it out when you can't pour all of your slow burning primary powder in the case. The case just won't hold that much.

We were field testing a new 300 Weatherby recently at our local range. One of the visitors asked me if I handloaded and as I answered him I noticed his face was scarred up in several spots. I was curious at his heavy emphasis as to being careful, so naturally I asked him what he had done. My belief has always been that accidents in handloading don't just happen. *They are caused.* It seems that careless use of his automatic primer feed had caused the whole shebang to blow up right in front of his face. Still he was lucky to only get a few scars.

The new 300 Weatherby, using Weatherby's 180 gr. ammo, with a 4X scope and in the hands of our rangemaster, Carl Ballard, proved to be the most accurate Weatherby product we have ever field tested with the regular heavy loads. Carl, from prone sandbag position fired five shots at 200 yds. in a 4-1/4" group. This is a new record for any of Weatherby's rifles on our range. Someday I really hope to encounter an accurate Weatherby rifle as I would like to do some front ignition duplex loading on these cases, especially in the larger calibers. Even with this large case capacity I am sure that a combination of proper length flash tube, proper bullets and the right combination of powders in a front ignition duplex loading will give very outstanding results. It is my contention that even with his long-throated free-bored section of the barrel, front ignition will give much greater barrel life, and I know, much less recoil. Velocity and accuracy should be comparable.

FRONT IGNITION LOADS

WESTERN—8½ PRIMERS

Rifle	*Bullet*	*Flash Tube*	*Base Powder*	*Primary Powder*	*Comment*
7×57 IMP.	160-Sierra	32 MM	16 Gr.-3031	33 Gr.-4350	Seems fine
7×57 IMP	160-Sierra	32 MM	21 Gr.-3031	29 Gr.-4350	E.J.F. No press. signs
7×57 IMP.	160-Sierra	STANDARD LOADING			53 Gr. 4350-Warm
270-WIN.	150-Sierra	38 MM	54 Gr.-4350		Acc. 1-10
270-WIN.	150-Sierra	38 MM	15 Gr.-3031	39 Gr.-DATA	Record 400 yd. group
270-WIN.	150-Sierra	38 MM	20 Gr.-4064	34½ DATA	Max.-Caution-Accurate
270-WIN.	150-Sierra	38 MM	10 Gr.-3031	44 Gr.-4350	Very Acc. 100 yds.
270-Ackley	130-Sierra	45 MM	25 Gr.-4064	30 Gr.-DATA	4¼" group at 400 (1-10)
270-Ackley	150-Sierra	45 MM	20 Gr.-3031	35 Gr.-DATA	4¾" group at 400 (1-10)
270-Ackley	150-Sierra	39 MM	7 Gr.-4759	49½-4350	Fast & Max. (1-12)
25-06 IMP.	ABC-100 Gr.	Std. Load		58 Gr.-4350	Max. (1-12)
25-06 IMP.	117 B.T.	Std. Load		54½ Gr.-4350	Keyhole & Wild (1-12)
25-06 IMP.	117 B.T.	38 MM	6 Gr.-4759	51 Gr.-4350	Very Acc. & Flat Shoot. (1-12)
25-06 IMP.	100 Gr. ABC	38 MM	6 Gr.-4227	53-4350	Max. & Acc. (1-12)
30-06	180-ABC	40 MM	26 Gr.-3031	28-4350	Acc. 1-10 Springfield
30-06	180-ABC	40 MM	30 Gr.-3031	24-4350	No Mild Load (1-10)

E.J.F.—Eject Fine T.P.—Tight Pockets P.O.K.—Pockets OK Acc.—Accurate

Be alert -- Publisher cannot accept responsibility for errors in published load data.

LOADS FOR THE 30 GIBBS

Bullet	*Powder*	*Charge*	*Mike Reading At Pressure Ring*	*Comments*
150-Hornady	3031	54 Gr.	.4694-95	E.J.F.&T.P.
150-Hornady	3031	55 Gr.	.4695-97	E.J.F.&T.P.
150-Hornady	3031	56 Gr.	.4698-470	E.J.F.&T.P.
150-Hornady	3031	57 Gr.	.470-.470	E.J.F.&T.P.*
150-Hornady	3031	58 Gr.	.4704-05	.Warm
150-Hornady	4350	66 Gr.	.4695-.470	E.J.F.&T.P.
150-Hornady	4064	57 Gr.	.4695-97	E.J.F.&T.P.
150-Hornady	4064	59 Gr.	.4695-97	E.J.F.&T.P.
150-Hornady	4064	60 Gr.	.4697-470	E.J.F.&T.P.
150-Hornady	4064	61 Gr.	.470-.470	E.J.F.&T.P.*
150-Hornady	4064	62 Gr.	.4703-05	E.J.V.G.-warm
150-Hornady	4320	58 Gr.	.4695-96	E.J.F.&T.P.
150-Hornady	4320	60 Gr.	.4695-97	E.J.F.&T.P.
150-Hornady	4320	61 Gr.	.4697-98	E.J.F.&T.P.
150-Hornady	4320	62 Gr.	.470-470	E.J.F.&T.P.*
150-Hornady	4320	63 Gr.	.470-4705	E.J.o.k.&T.P.
150-Hornady	4320	64 Gr.	.4705-471	Slight ejector mark-L.P.
180-Sierra	4350	64 Gr.	.470-.470	100% density* ACC.&flat shtng.
180-Barnes	4350	65 Gr.	.4698-.470	100% density*
220-S.P.	4350	59 Gr.	.4695-97	E.J.F.&T.P.
220-S.P.	4350	60 Gr.	.4697-.470	E.J.F.&T.P.*
220-S.P.	4350	62 Gr.	.4702-05	100% density E.J.F.&T.P.-warm

E.J.F.&T.P.—Eject fine and tight primer pockets.

L.P.—Loose pockets. E.J.V.G.—Eject very good.

All loads marked with * have proven to be safe maximum loads in my rifles.

In conclusion on loading and powders:

1. Keep the fast powders out of the flash tube. Let the slow burning primary powder fill it.

2. When in doubt, start with extra long flash tubes, slow burning powder and light bullets and if you prefer, load the first few cases to less than 100% density.

3. Find out the "mike" readings on your regular maximum loads you have used in the past. Use these readings for comparison.

4. If a "standard load" in your case gives you 100% density and is O.K. on pressure, a 100% density load with a proper length flash tube will be a *milder* load when using *same components*.

5. Always work up your loads progressively. "Mike" all the cases and record their readings. Watch for extraction trouble, ejector marks, flattened primers and excessive loosening of the flash tubes.

6. Don't use someone else's recommended loads, not even mine; work out your own.

You will probably work out some very satisfactory loads for your rifles. You will also probably learn things not mentioned in this text and I hope you do. Working out these best loads for your rifles will consume a lot of your time and will require a lot of skill on your part. Maybe I have given you the basic fundamentals, but the real work, care and process of elimination will all be yours. Never say, in regards to one of your loads, "I think" but be sure, as there are too many accidents caused by what someone thought. ●