Dept 94

19

James Alday
J.W. Brooks
L.P. Gogol
R. Lemon
M.H. Walker

N G Leonard
T Nelson
R J Sanzo

(Dept 93)

L M Alexander
L Bojdak
J A Dodson
D L Haponski
L Haponski
L W Hughes
L L Johnson
W Kencharek
G D Starks
T Sullivan
J Wood

Dept 95

7

S M Alvis
J F Finnegan
P G Hart
J A Roberts

E M Beach
T Ireland
G Polley

Dept 96

L W Baum, Jr
P G Johnson

F Greyback

T Cook

Dept 07

30

R H Brown
R A Engle
D L Garlock
J W Miller
R A Morris
K C O'Connell
F G Du Pont (Bpt)

M J Bridger
J Pugliese

L J Bruso
S Cancelino
C Crist
R T Egland
C L Fagle
W J Hazlett
S P Lahey
W Palmatier
W J Rathbun
G Reinhardt
J J Sanzo
G A Siver
R C Strait
Travis, R C
J Young
NSR R J Horton
NSR K Mumford

Dept 97

W L Dahl
P H Eccleston
R P Kelly
W E Leek
J S Martin
C H Morse
P Nasypany
N M Reed
R J Service
C W Stephan
H J Waterman
N E Williams

J J Bechard
D E Bullis
G. Cristman
R C Ecker
C L Ennis
L Goodstal
L J Hagen
J P Linde
R L Sassone
F A Southworth

R G Butler
A R Eddy
H Peters
J Prywinski
W Rankins
B L Rivers
A Slabec
W A Sohns
C G Williams
A J Long
R G Prosser
NSR D Leek
NSR F Turner

Dept 98

W R Googin
A Hugick
R J Nezezon
C B Workman

R E McCloskey
R E Nightingale
G H Zoller

W Curry
J H Hennings
T J Plunkett
D Urts

Wilm

D J Sankey

Dept 998

P A Hugick

R Deller
J K Fitzer
C Theriault

Dept 08

J D Campbell, III
J O Pickens
J H Sweeney

R A Bracken

fmb 7/5/66

DRAFT

WELeek:T
7-20-66

CENTER FIRE, RIM FIRE & SHOTGUN

During the next 10 years there will be some gradual but fairly drastic changes in the development of our products here at Ilion. First of all I would like to talk about changes which may be expected in autoloading, pump and bolt action center fire rifles, and break the program into two phases.

Phase 1, we believe would include development of these items which will take in all of the three models. Detachable rotary box magazines will be added and there will still be some of the standard calibers such as 30-06 and 308, 270 which have always been very popular. Guns will be much lighter, with recoil reduction added, but to maintain accuracy and stiffness of the barrels we think that they will become fluted; that is, grooves to be placed on the outside of the barrel in a lengthwise direction.

Front-lock-up system will be standard in the bolt action rifles as well as the autoloaders and pumps. In the bolt action conventional two lug system will probably prevail. Conventional cartridge case will still be used, but will await development of something in the nature of a new propellant, but to obtain a high degree of accuracy and velocity the ideas developed by the Germans and others during WW-2, such as the Gerlich bullet, into a tapered bore can and should be introduced into a commercial gun. The Gerlich type bullet is a dimensional size with enlarged fins which are exposed to the gas pressures when the cartridge is ignited. As the large size fin bullet progresses down the tapered bore the fins fold in to recesses provided and the bullet takes the new shape of smaller diameter and in doing so attains a high velocity. This principle was used in German 88s

during the war to devestating effect on our tanks and other military equipment.

Phase 2 - see back of page 1

In the rim fire rifle line we believe that the new bolt action line of guns that will be introduced in 1967 will suffice for quite a period of time because we feel that no other company can afford to design simultaneously 15 items such as we did and tying them in with a center fire line of rifles, and also being able to afford the expenditure of some two and a half million dollars plus whatever the added amount will be by the time they would be involved in the design and production.

It does leave us with the need for a new autoloader and pump action rifle to replace the M7552-572 system. Both of these new rifles should accommodate the new 5mm Remington Magnum caliber and therein lies the basic problem. This system must be locked up securely as the cartridge develops fairly high pressure. A new method of unlocking has been developed which is a takeoff from the center fire primer type set-back developed and experimented with during WW-2. Herein we allow the center section of the head of the cartridge to move rearward a few thousands of an inch which impartwise inflates an unlock system and when pressure is at a minimum and safe level the gun will unlock. This has been developed and tested to a certain extent and found to be satisfactory so far. However, we have had difficulties with the cartridge in accommodating it with the standard extractor system. As yet we have not developed a new system which will adequately support the cartridge itself. This problem also prevails in the rim fire bolt action line.

These rifles we think should also contain detachable rotary box ~~detachable type~~ magazines instead of the tubular system, and we would expect to make them very high quality in both expensive and standard grades, and of course to stock them with

genuine American walnut.

As far as autoloading and pump shotguns are concerned, a drastic change we think must take place in shape and function of these mechanisms. We have had since WW-2 four autoloading shotguns, all of the same shape, balance and feel. It is believed by many that the superior balance and handling qualities of an over and under would be most desirable in an autoloading and pump shotgun, but because of the need for reciprocating mechanism to accommodate function of loading and unloading the shell in these guns, a long receiver has been necessary. With a new approach to an over and under look it is believed that a mechanism can be feeding devel oped which will, after moving the shell out of the magazine tube, will move it in an upward position, chambering it without a longitudinal movement, and locking and firing, extracting and ejecting the shell back down through the bottom of the receiver. This would allow for a stronger action, shorter length ~~way to~~ better balance. Therefore we would obtain a new look, lighter weight, better balance and hopefully someone will come up with a shorter length 12 Ga. shell, perhaps electric ignition, and of course continued improvement in recoil reduction would be in order.

Process Improvements

No design is complete without a process in mind, and after a concept has been made, ~~the process of how we are going to make it must immediately be in the minds of the designers~~. Certain process improvements are necessary to complement the models that we have been discussing. One item that is very important, I think, for future development is metal coloring, whereby we should and must provide rustproof metal parts. This would be a great boon to the gun industry. We have been rather faulty and negligent in this area. At one time cyanide black was developed which was a superior rustproof process, but here again error was made as has been made many times in industry, where a process has been developed without keeping design in mind, and when the new process was incorporated in the existing designs, failures did take place in the gun itself. This coloring process was abandoned.

In the plastic area we have been proficient in injection molding, and according to the Du Pont Company are the finest custom molders in the world with molding of nylon. We have enlarged our program into the use of compression molding where we accommodate small parts such as butt plates, grip caps, etc. and we are becoming very proficient in that area. We are also getting involved with the processes of the manufacture or use of fiberglass into component parts. We see a great need for the use of fiberglass, for example, in hulls for the cabs, etc. for the ORV. Also, all of these items can be utilized in providing us with stocks and forearms for future guns with the thought in mind of laminating the outside surfaces with walnut. There is also another approach which we plan

to use in the improvement of stocks and fore ends, and that is to compress laminated wood into a very strong and almost indestructible fore end and stock. This has been accomplished up to a point where we can manufacture two halves such as in the N-66, only these in wood, but we have had some difficulty in matching the two so that the matching surfaces are acceptable appearance-wise. We have been experimenting with vacuum impregnating where we impregnate the wood to a depth with resins and color dyes. At the present time this has not been too successful but the new equipment will, I'm sure, help us in this area.

We have mentioned the walnut covered molded shapes or formed shapes. This can be accomplished in metal as well as in plastics.

On formed receivers we have had some success. The M/6600 you will remember used a formed receiver which was similar to the 66 but of heavier gage material. We have the vendor produce parts now to a shape which can be altered to suit practically any size receiver that we need. In these formed shapes which are approximately .080 to .090 thick we intend to braze inserts front and rear to support the stock and fore end, and then internally support the reciprocating movement of the parts with the trigger guard.

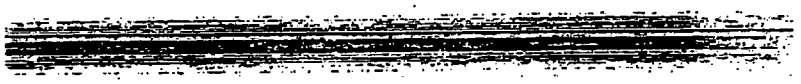
We have found as far as costs are concerned they would be quite comparable to our machining costs at the present time. However, a reduction in machines would be in order; therefore, indeterminate savings would ~~be the~~ result.

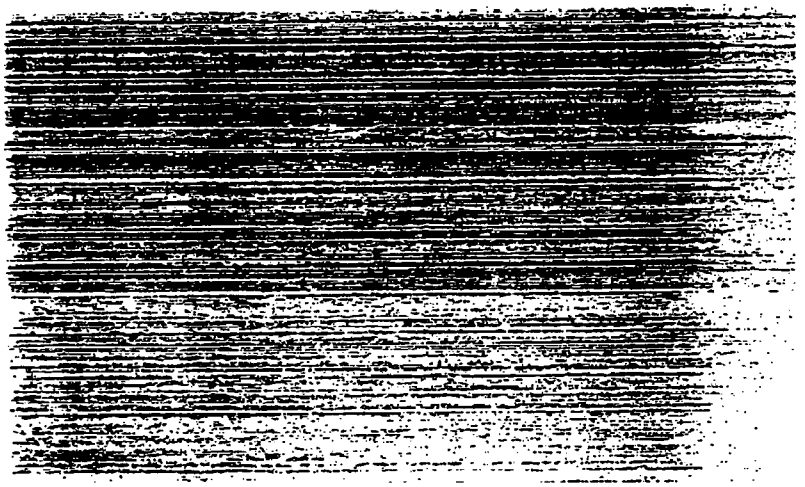
~~PROCESS IMPROVEMENTS~~

Several years ago we were in search of a new material for a recoil reducing butt plate that would be superior to rubber. Contacting our friends in Wilmington we found that at that time there was a material called Adiprene which was still in the test tube stage. However, the chemists felt that they could produce a material from formulation of Adiprene that would satisfy our needs. We explained to them the function of a butt plate, shoulder force effects on the human shoulder, the rate at which it was applied, etc.. In our experiments with this formation we found the results as shown on the chart, where the shoulder force is somewhere in the neighborhood of 180 to 200 lbs. force with the Adiprene pad, with the Remington rubber recoil pad around 320 lbs., and of course with regular stock from mill pad it was around 350 lbs..

If you notice, the delay in milliseconds takes place as the pad absorbs the shoulder force and spreads it out over a longer period of time. We ran into difficulties in the processing of this material. At that time adequate equipment was not on hand to meter the proper amount of mixture of the Adiprene. Also when we did get a pad molded and onto stock the bonding of the two parts (Adiprene and walnut) were not compatible. We also had indications of hardening through aging of the material and molding was very difficult. Since that time process techniques have improved along with the equipment to be used. Also, improved formulations of the Adiprene have been made. We think that combination of an Adiprene in the inside section of a rubber shell would make an ideal recoil pad which would give us the same characteristics as indicated on this chart, and by having the rubber sheath on the outside we could accommodate of the stock and pad in simultaneous manner.

We have been assured by the chemists that they can adjust the structure of the Adiprene to fit the shoulder force and the rate at which it is applied so that we can chemically tailor a pad to fit the recoil of a shotgun or a high power rifle, using this as a sales feature.





N/C

During the past 20 years there have been indicators telling us that eventually we would not be able to make a new product, new machinery at a profit satisfactory to Remington Management. As the years progressed this became more apparent. I might cite a few examples.

During the development of the M/11-48 shotgun there were some 9 different models made, the last and final of which was the only one tested to the 12,000 round endurance test. We based results of the test then on one gun to put the whole line in production, and during that following year made 5,000 design changes. This was proof indeed that statistically one gun certainly is not adequate for testing purposes.

We were lucky in that after development of the M/870 we produced three autoloading shotguns using the basic elements of the 870 for approximately 80% of the mechanism. [redacted] approximately 50 to 100 models for test purposes. I think there were 40 models made for the Spts.-58 and I don't recall the number for the M/878 and something like 70 or 80 models made for the M/1100. These tests proved very satisfactory, results of which indicated that we had a satisfactory product.

You may know that a model costs between $10,000-20,000 to manufacture, and if we had started with a new gun, such as in the M/1100, with all new machinery and no parts available in production, it would have cost us roughly about $20,000 per model to test. This would have been out of the question. The Nylon 66 was another example. Prior to that the development of a rifle similar to the M/550

proved to be too costly. The Nylon 66 would also have fallen into the same category with exception that after developing the stocks dies we were able to make the major portion of the gun by molding, ~~the stocks, fore ends and receivers all in one piece.~~ The only cost, then, for the new item, was the development of ~~the~~ small and sometimes minor parts that go into the gun. Therefore a statistical sample was justified and proved to be satisfactory.

What have we done in the bolt action line? After the development of the M/721 we progressed into the M/725, changed the styling somewhat, changed a little bit more drastically in the M/[illegible] we have added the M/600 and XP-100, all on the same receiver, utilizing the same machinery, with some adjustments, ~~to that machinery~~. None of these items could be produced, ~~brand new, and from scratch~~, at the present time, with new machinery ~~and~~ at a profit.

The latest design ~~was the~~ effort ~~that~~ was ~~made~~ to produce a line of rim fire rifles. [illegible] finally we had to go in a line of rim fire rifles, and even effort was made in the line of a bolt action shotgun ~~that we could get enough parts spread out~~ over enough machinery in enough combinations to make it pay, and we just ~~achieved through~~ design ~~& guts~~ simultaneously is practically unheard of in the gun industry and I don't think has ever been accomplished before.

BOL 006164

Now we have a new line of products which we think will ~~be necessary~~ to keep Remington on the march and ahead of its competitors for the next 10 years. All of these are brand new, from muzzle to butt. They will require brand new machinery.

I can tell you now that we cannot produce these items at a profit on conventional

Considered as a solution to our dwindling profit pos...

machinery and conventional methods. Therefore we are proposing a program here this morning which should be taken seriously as I'm sure it would allow us to proceed ahead into the new 10-year era in a profitable manner. That is the progression of automation into numerical-control machines.

Oftentimes people ask "What is N/C?" Numerical control regulates the action of one or more machines by automatic interpretation of instructions expressed as numerals. What this means is that with a punched tape the holes of which are oriented so that it controls and tells the machine what to do thru an electronic mechanism so that the interpretation of its instructions are directed to the machine to make angles, distances, holes, etc..

What are the advantages that Numerical Control would provide for Remington?

Direct and indirect labor costs will decline.
Lower risk factor in producing new items.
Decrease in cost.
Competitive advantage.
[redacted]
Smaller inventories.
Reduced paperwork.
Reintegration of manufacturing functions.
More economy in factory locations.
Improved cash position.
[redacted]
erical Control should not be expected to do:
[redacted]
There is no advantage if we have no need and cannot economically justify.
There is no advantage if we can justify but cannot adjust our thinking to fully exploit and utilize the potential.
Very disadvantageous to us if we have provable need and can justify, yet do not, but our competitor does.

What are some of the other implications? They would be impact on the organization, communication, personnel training, maintenance, computer science, and management time.

What are some of the manufacturing advantages in this extension of automation by N/C. We obtain more flexibility, accuracy, repeatibility, increased productivity, high machine tool utilization, tool saving, and reduced lead time.

Here is our proposal. We propose that a Numerical Control ~~Custom~~ Pilot Shop be initiated wherein we would manufacture the Model 870, and 1100, in 28 and 410 ~~Gauges and also a M/52 Over & Under and the Parker.~~ We have estimated to the best of our ability along with the ~~valued~~ plant assistance ~~of our plant friends as to~~ what the per cent return on investment might be for the 870 and 1100 in 28 and 410 only. We have made two estimates, one based on selling these guns at standard price, $99.95 and $154.95 respectively, and also on a $20 increase to $119.95 and $174.95 respectively. We think the increase is justified because Mr. [illegible] 28 & 410 gauges charges $100 for his conversions.

In these estimates several assumptions were made, that the purchase of the receiver would be a M/42 blank actually obtained from the plant after the roll marking operation. After the Numerical Control Custom Shop completed the manufacture of the receiver it would be returned to the plant for brazing, welding, finishing and coloring. We would also obtain M/Fl-48 - 28 & 410 Gauge barrels from the plant and ask them to also machine the gas cylinder on plant machines. Extra tooling, etc. was included in our estimate.

We would assume the plant would manufacture the fore end on plant machines for which tooling was included. All powder metal parts to be produced on present machine capacity time and tooling was considered. Finishing of parts; i.e. use of vibrator finishing, polishing, tumbling, etc. would be performed on plant equipment. Plant capacity to supply all add use parts such as pins, extractors, springs and followers would be included and they would perform all heat treat operations.

Other than that, the assembly, programming, maintenance, manufacture in general would be accomplished in the ~~Custom~~ Pistol Manufacturing Shop, with a ~~total~~ of 22 individuals.

This estimate also includes the building ~~of a factory of~~ one floor level with 7200 square feet of area, providing us with a 3,000 ft. machining area, 50 ton air conditioner, plumbing, unit heaters, wiring, and space allowed for normal facilities. ~~To be an insulated Butler type building.~~

Based on the rate of 20,000 total units

~~Results show a return on investment with the increased $20 charge in selling price, to be 9%, and with standard selling price, 12.3%. Project investment would be in the neighborhood of $2,250,000.~~

It's conceivable then that with the complications of adding numerical control to the Remington production facilities, that to ease the burden, teach the people the required knowledge necessary to function with Numerical Control, it would be ideal to start with a small ~~custom~~ shop with space available to allow growth.

With the new models which were discussed at the beginning ~~and~~ of our talk and designed for Numerical Control, and to be introduced into production facilities,

it would be expanded to the Numerical Control Custom Shop, and eventually a new factory, fully automated, with a nucleous of Numerical Control would be formed. This is our recommendation.