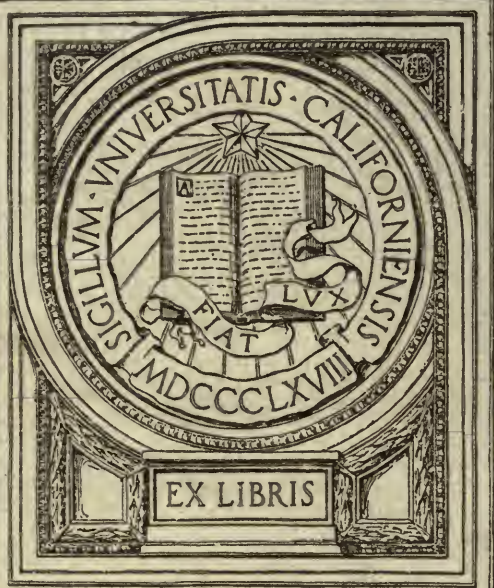

A NEW CHAPTER IN AN OLD STORY

To Dr. Benjamin Lee Wheeler
with the compliments
of the author
Fanny Bloch Price

THE FIRST MISSILE

The Cave Man of Prehistoric Times who Unconsciously Invented Arms and Ammunition

A NEW CHAPTER IN AN OLD STORY

BEING AN INTERESTING ACCOUNT
OF THE STRANGE STEPS

BY WHICH

A Great Modern Business

HAS GROWN
OUT OF ANCIENT CONDITIONS

TOGETHER WITH

A LOOK INTO THE FUTURE

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A NEW CHAPTER IN AN OLD STORY

FOREWORD

This book has been written to tell of an important event—important to us who write and to you who read. Like most important events its preparation commenced years ago.

Perhaps it would be as well to start at the very beginning, for it is an interesting story.

History — and Before

How it Began

A NAKED savage found himself in the greatest danger. A wild beast, hungry and fierce was about to attack him. Escape was impossible. Retreat was cut off. He must fight for his life—but how?

Should he bite, scratch or kick? Should he strike with his fist? These were the natural defences of his body, but what were they against the teeth, the claws and the tremendous muscles of his enemy? Should he wrench a dead branch from a tree and use it for a club? That would bring him within striking distance to be torn to pieces before he could deal a second blow.

There was but a moment in which to act. Swiftly he seized a jagged fragment of rock from the ground and hurled it with all his force at the blazing eyes before him; then another, and another, until the beast, dazed and bleeding from the unexpected blows, fell back and gave him a chance to escape. He knew that he had saved his life, but there was something else which his dull brain failed to realize.

He had invented arms and ammunition!

In other words, he had needed to strike a harder blow than the blow of his fist, at a greater distance than the length of his arm, and his brain showed him how to do it. After all, what is a modern rifle but a device which man has made with his brain permitting him to strike an enormously hard blow at a wonderful distance? Firearms are really but a more perfect form of stone-throwing, and this early Cave Man took the first step that has led down the ages to the Remington Arms and U M C ammunition.

This strange story of a development that has been taking place slowly through thousands and thousands of years, so that to-day you are able to take a swift shot at distant game instead of merely throwing stones,—this

EGYPTIAN SLING MAN FROM MAST TOP

is the story which we shall briefly tell.

The Earliest Hunters

The Cave Man and his descendants learned the valuable lesson of stone-throwing, and it made hunters of them, not big-game hunters—that was far too risky; but once in a while a lucky throw might bring down a bird or a rabbit for food. And so it went on for centuries, perhaps. Early mankind was rather slow of thought.

At last, however there appeared a great inventor—the Edison of his day.

He took the second step.

A Nameless Edison

We do not know his name. Possibly he did not even have a name, but in some way he hit upon a scheme for throwing stones farther, harder, and straighter than any of his ancestors.

The men and women in the Cave Colony suddenly found that one bright-eyed young fellow, with a little straighter forehead than the others, was beating them all at hunting. During weeks he had been going away mysteriously, for hours each day. Now, whenever he left the camp he was sure to bring home game, while the other men would straggle back for the most part empty-handed.

Was it witchcraft? They decided to investigate.

What They Saw

Accordingly, one morning several of them followed at a careful distance as he sought the shore of a stream where water-fowl might be found. Parting the leaves, they saw him pick up a pebble from the bank and then to their surprise, take off his girdle of skin and place the stone in its center, holding both ends with his right hand.

Stranger still, he whirled the girdle twice around his head, then released one end so that the leather strip flew out and the stone shot straight at a bird in the water.

The mystery was solved. They had seen the first slingman in action.

EGYPTIAN SLING SOLDIER

The Use of Slings

The new plan worked with great success, and a little practice made expert marksmen. We know that most of the early races used it for hunting and in war. We find it shown in pictures made many thousands of years ago in ancient Egypt and Assyria. We find it in the Roman Army where the slingman was called a "funditor."

We find it in the Bible where it is written of the tribe of Benjamin: "among all these people there were seven hundred chosen men left handed; every one could sling a stone at an hair breadth and not miss." Surely, too, you remember the story of David and Goliath when the young shepherd "prevailed over the Philistine with a sling and with a stone."

Today shepherds tending their flocks upon these same hills of Syria may be seen practising with slings like those of David. Yes, and slings were used in European Armies until nearly a hundred years after America was discovered.

MAKING FIRE WITH SPINDLE

THE USE OF THE BOW DRILL

FEATHERING THE ARROW

Something Better

Yet they had their draw-backs. A stone slung might kill a bird or even a man, but it was not very effective against big game.

What was wanted was a missile to pierce a thick hide.

Man had begun to make spears for use in a pinch, but would you like to tackle a husky bear or a well-horned stag with only a spear for a weapon?

No more did our undressed ancestors. The invention of the greatly desired arm probably came about in a most curious way.

Long ages ago man had learned to make fire by patiently rubbing two sticks together, or by twirling a round one between his hands with its point resting upon a flat piece of wood.

In this way it could be made to smoke, and finally set fire to a tuft of dried moss, from which he might get a flame for cooking. This was such hard work that he bethought him to twist a string of sinew about the upright spindle and cause it to twirl by pulling alternately at the two string ends, as some savage races still do. From this it was a simple step to fasten the ends of the two strings to a bent piece of wood, another great advantage since now but one hand was needed to twirl the spindle, and the other could hold it in place. This was the "bow-drill" which also is used to this day.

WINDING THE SHAFT

A Fortunate Accident

But bent wood is apt to be springy. Suppose that while one were bearing on pretty hard with a well-tightened string, in order to bring fire quickly, the point of the spindle should slip from its block. Naturally, it would fly away with some force if the position were just right.

This must have happened many times, and each time but once, the fire-maker may have muttered something under his breath, gone after his spindle, and then settled down stupidly to his work. He had had a golden chance to make a great discovery, but didn't realize it.

But, so it has been suggested, there was one man who stopped short when he lost his spindle, for a red-hot idea shot suddenly through his brain.

He forgot all about his fire-blocks while he sat stock still and thought.

Once or twice he chuckled to himself softly. Thereupon he arose and began to experiment. He chose a longer, springier piece of wood, bent

it into a bow, and strung it with a longer thong. He placed the end of a straight stick against the thong, drew it strongly back, and released it.

The shaft whizzed away with force enough to delight him, and lo, there was the first Bow-and-Arrow!

What Came of It

After that it was merely a matter of improvement. The arrow-end was apt to slip from the string until some one thought to notch it. Its head struck with such force that the early hunter decided to give it a sharp point, shaped from a flake of flint, in order that it might drive deep into the body of a deer or bear.

But most of all it must fly true and straight to its mark. Who of all these simple people first learned to feather its shaft? Was it some one who had watched the swift, sure-footed spring of a bushy-tailed squirrel from branch to branch? Possibly, for the principle is the same. At all events with its feathers and its piercing point the arrow became the most deadly of all missiles, and continued to be until long after the invention of fire-arms.

Ruler of the Earth

Armed with his bow-and-arrow, man now was lord of creation. No longer was it necessary for him to huddle with his fellows in some cave to avoid being eaten by prowling beasts. Instead he went where he would and boldly hunted the fiercest of them. In other words, his brain was beginning to tell, for though his body was still no match for the lion and the bear, he had thought out a way to conquer them.

Also he was better fed with a greater variety of game. And now, free to come and go wherever he might find it, he was able to spread into various lands and so to organize the tribes and nations which at last gave us civilization and history.

Unfortunately his weapons were not always used for hunting. Wars came, and arrows were seen to be as deadly against mankind as against the animals.

Thus, from the earliest days down through the Middle Ages and into modern times, we find archers in practically every army.

INDIAN WITH BOW

A Great Variety

It is interesting to see how many different forms of bow were used. The English had a six-foot "long bow" made of yew or ash, in a single straight piece, that shot arrows the length of a man's arm. The Indians had bows only forty inches on the average, since a short bow was easier to handle

in thick forests. They used various kinds of wood, horn, or even bone, such as the ribs of large animals. These they generally backed with sinew.

Sometimes they cut spiral strips from the curving horns of a mountain-sheep, and steamed them straight. Then they glued these strips together into a wonderfully tough and springy bow. Once in a while they even took the whole horns of some young sheep, that had not curved too much, and used the pair just as they grew. In this case each horn made one-half of the bow, and the piece of skull between was shaped down into a handle. This gave the shape of a "Cupid's Bow," but it could shoot to kill.

Other Types

Many of the ancient pictures that have come down to us from Egypt and Assyria are filled with archers doing various kinds of feats with odd angular bows. The Greeks used curved ends and a straight central handle. But perhaps the most scientifically constructed, were the built-up bows of the Japanese.

These clever little fellows chose well-seasoned mulberry, and encased each piece with two fire-toughened strips of bamboo. These they wound tightly together with rattan fiber. Where the strings were attached at the ends was placed a cover of sharkskin, and the whole was then given coat after coat of their famous lacquer, a varnish which never cracked, wore like iron, and resisted all kinds of weather. The result was a bow of the most wonderful lightness, strength, spring, and durability.

An Unusual Shape

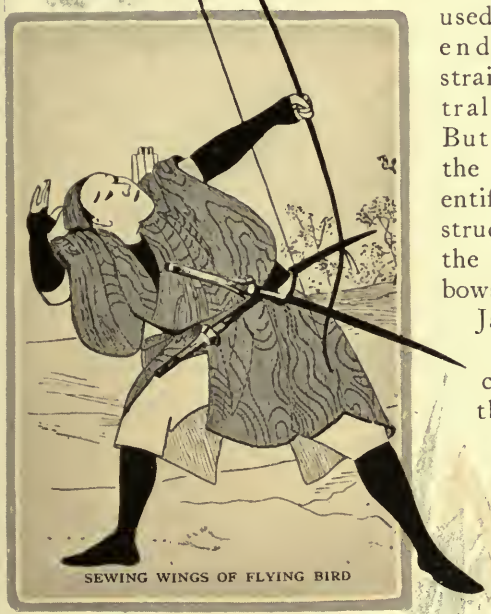
Its shape was quite as scientific. The bigger the bow, the stronger the shot, and of course they wished for large bows. The Japanese archers were much too short to handle large bows of ordinary shape, but this is where brains told again, and every one knows that the little brown men have brains.

So they shaped their bows, seven feet high in some cases, with the central part straight, the top curve long, and the bottom curve short. This gave a powerful drive from the lower part of the string, and made it possible to fit the arrow a foot below the center. The result was archery like that of the English long bow.

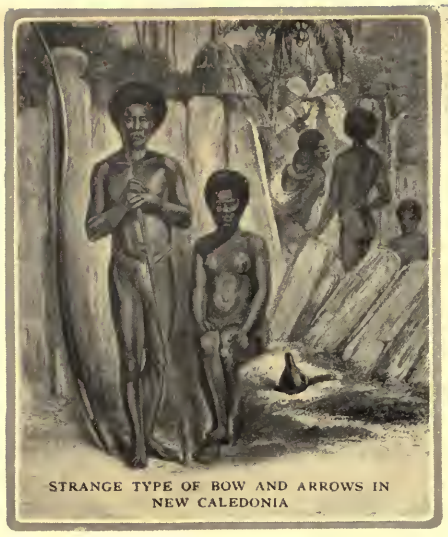
As to Arrows

The arrows were quite as important, and their making became a great industry with every race. This was because so many must be carried for each hunt or battle.

Who is not familiar with the chipped flint arrowheads that the farmer so often turns up with



SEWING WINGS OF FLYING BIRD



STRANGE TYPE OF BOW AND ARROWS IN NEW CALEDONIA

his plow as a relic of the period when Americans were red-skinned instead of white? These arrowheads have generally a shoulder where the arrow was set into the shaft, there to be bound tightly with sinew or fiber. Many of them are also barbed to hold the flesh.

A Workshop Near the Capitol

Strangely enough, one of the largest workshops ever found was in the District of Columbia within sight of our Capitol building. In some parts of the country may be found obsidian, or volcanic glass, and keen-edged splinters of this were even better than flint.

Later when the Indians had learned from the White Man the use of iron, they began to send iron-headed arrows between his ribs in return for the loss of their country.

Can you see the Indian arrow-maker at his task in the days when the "cost of living problem" consisted merely in the chance of losing an occasional arrow? He did not need to invest many millions in an ammunition factory like the vast Union Metallic Cartridge plant at Bridgeport. Instead he, himself, was both plant and working force, as he squatted under a forest tree and skilfully chipped a pile of flint-flakes into proper shape.

Or perhaps he would be working on shafts. In this case he would take a stick from a bundle of service-berry shoots, or some other chosen wood, and patiently straighten it by bending it back and forth through a piece of pierced horn. Occasionally he would squint along its length until his practiced eye was satisfied.

Then he would round it, smooth it, and gauge it with other simple tools. Every arrow in a quiver must be exactly alike and as straight as a sunbeam. The slightest error would spoil the aim of the marksman, and this too frequently might be a matter of life and death.

"Blood-Getters"

Cut off at the proper length, headed, notched, feathered,

PRIMITIVE ARROW-MAKER

HUNTERS WITH CROSS-BOWS IN THE FIFTEENTH CENTURY
Courtesy of Longmans Green Co.

perhaps painted as well, the arrow was finally complete, and yet not before the arrow-maker ofttimes did a curious thing. Taking up a blunt pointed stone he dug zig-zag grooves along its length, as may be seen in museums. What was the meaning of this?

Opinions differ. Some believe that they were to let air into the wound and cause a flow of blood. Hence their name "blood-getters." Others think they helped the arrow cling to the flesh, and still others claim they are merely a primitive symbol of lightning, because they were supposed to give extraordinary swiftness and accuracy through a sort of magic.

Deer's Ribs and Man's Ribs

Even the matter of notching was not as simple as it might seem to be. Arrows were aimed at the heart, but the heart is partly protected by ribs which the arrows must slip between. In hunting four-footed animals like the deer and buffalo with up-and-down ribs, the arrow must drive forward with the head standing nearly upright. On the other hand, man's ribs run crosswise, and the arrow must enter in a flat-headed position.

Since the notch gives the arrow its position in leaving the bow, hunting-arrows must therefore be straight-notched with reference to the head, and the best war-arrows cross-notched,—a truly ingenious idea.

"Frog Crotch" and "Bowel Raker"

Most nations, of course, had metal arrow-heads, and in Japan these had strangely named forms for special purposes. The "Frog Crotch" and "Knife Prong," for example, were made to cut the helmet strings and armor-lacing of the foe. One was called the "Armor Piercer," and was provided with a hardened steel head shaped like a mechanic's center-punch.

The "Bowel Raker" was a murderous affair which tore the abdomen of its victim. Still others were called from their shapes "Willow Leaf," "Turnip Top," etc. To use arrows for special purposes like these indicates that the Japanese were clever archers. We are told that some of them could even "sew the wings" of a flying bird, that is, drive a single

SHOOTING WILD BOAR WITH CROSS-BOWS
Courtesy of Longmans Green Co.

SIXTEENTH-CENTURY HUNTING CROSS-BOW

arrow through both wings without touching the bird's body.

Barbs and Poisons

It would take volumes to tell the story of archery in peace and war through all its thousands of years. We must hasten, and can not examine the barbed arrows of some races that were made to pull loose from their shafts and remain in the wound, or the cruel, poisoned points of others. We can not stop to consider the wonderful marksmanship which could split a slender hazel rod at 400 yards, nearly a quarter of a mile, or the power which could pierce a stout oak plank or drive an arrow completely through the body of a buffalo. Cases have been known where two buffaloes, running side by side, have been killed with a single arrow.

All these and many other points prove to us that the bow and arrow have played a very important part in the history of the world. Their use was undoubtedly one of the principal steps in the development of modern arms.

A Shooting Machine

But the age of machinery was coming on. Once in a while there were glimpses of more powerful and complicated devices to be seen among these simple arms.

A new weapon now came about through warfare. Man has been a savage fighting animal through pretty much all his history, but while he tried to kill the other fellow, he objected to being killed himself.

Therefore he took to wearing armor. During the Middle Ages he piled on more and more, until at last one of the knights could hardly walk, and it took a strong horse to carry him. When such a one fell, he went over with a crash like a tin-peddler's wagon, and had to be picked up again by some of his men. Such armor would turn most of the arrows. Hence invention got at work again and produced the Cross-bow and its bolt. We have already learned how the tough skin of animals brought about the bow; now we see that man's artificial iron skin caused the invention of the cross-bow.

What It Was

What was the Cross-bow? It was the first real hand-shooting machine. It was another big step toward the day of the rifle. The idea was simple enough. Wooden bows had already been made as strong as the strongest man could pull, and they wished for still stronger ones—steel ones. How could they pull them? At first they mounted them upon a wooden frame and rested one end on the shoulder for a brace. Then they took to pressing the other end against the ground, and using both hands. Next, it was a bright idea to put a stirrup on this end, in order to hold it with the foot.

Still they were not satisfied. "Stronger, stronger!" they clamored;

"give us bows which will kill the enemy farther away than he can shoot at us! If we cannot set such bows with both arms let us try our backs!" So they fastened "belt-claws" to their stout girdles and tugged the bow strings into place with their back and leg muscles.

"Stronger, stronger again, for now the enemy has learned to use belt-claws and he can shoot as far as we. Let us try mechanics!"

So they attached levers, pulleys, ratchets, and windlasses, until at last they reached the size of the great siege cross-bows, weighing eighteen pounds. These sometimes needed a force of twelve hundred pounds to draw back the string to its catch, but how they could shoot! Notice the pictures of the cross-bows and you will see that now the weapons began to look a little like guns as we know them. They had shoulder pieces.

In the Chino-Japanese War

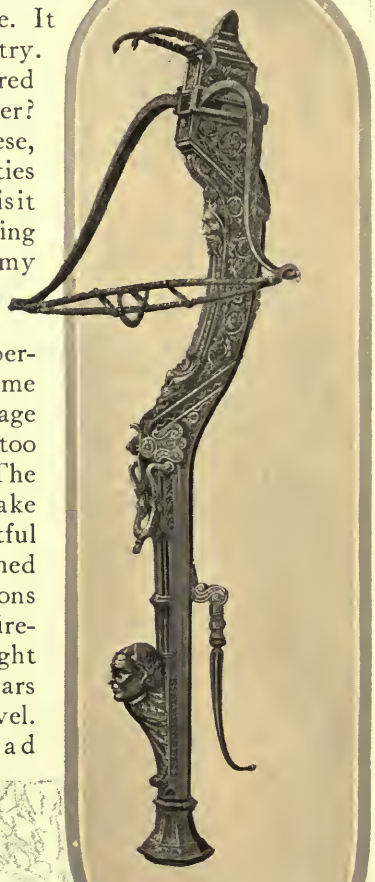
Everything is good until something better comes. Cross-bows were very good indeed in their day, and the smaller sizes became popular for hunting in many countries. Some forms also were made to throw stones and bullets instead of arrows. It will surprise most people to learn that cross-bows are still carried by Chinese soldiers in some of the interior provinces.

Don't smile, the Chinese repeating cross-bow is really a very clever arm, and none of us would like to get in its way. It has a box above the frame, and in this box are ten arrows. As fast as one is fired another drops into place, and the whole ten can be sent at their mark in fifteen seconds. Would you like to charge that kind of a proposition? Some of them were used in the war between China and Japan, and it appeared that a man killed with a cross-bow bolt was about as dead as one shot with the latest thing in modern ammunition.

And Now for Chemistry

Human muscle seemed to have reached its limit, mechanics seemed to have reached its limit, but still the world clamored, "Stronger, stronger! How shall we kill our enemy farther away than he can kill us?" For answer, man unlocked one of the secrets of Nature and took out a terrible force. It was a force of chemistry.

Who first discovered the power of gunpowder? Probably the Chinese, although all authorities do not agree. Strange, is it not, that a race still using cross-bows in its army should have known of explosives long before the Christian Era, and perhaps as far back as the time of Moses? Here is a passage from their ancient Gentoo Code of Laws: "The magistrate shall not make war with any deceitful machine, or with poisoned weapons, or with cannons or guns, or any kind of fire-arms." But China might as well have been Mars before the age of travel. Our civilization had



CROSS-BOW OF A WEALTHY SPORTSMAN

to work out the problem for itself.

Playing with Fire

It all began through playing with fire. It was desired to throw fire on an enemy's buildings, or his ships, and so destroy them. Burning torches were thrown by machines, made of cords and springs, over a city wall, and it became a great study to find the best burning compound with which to cover these torches. One was needed which would blaze with a great flame and was hard to put out.

Hence the early chemists made all possible mixtures of pitch, resin, naphtha, sulphur, saltpeter, etc.; "Greek fire" was one of the most famous.

What Two Monks Discovered

Many of these were made in the monasteries. The monks were pretty much the only people in those days with time for study, and two of these shaven-headed scientists now had a chance to enter history. Roger Bacon was the first. One night he was working his diabolical mixture in the stone-walled laboratory, and watched, by the flickering lights, the progress of a certain interesting combination for which he had used pure instead of impure saltpeter.

Suddenly there was an explosion, shattering the chemical apparatus and probably alarming the whole building. "Good gracious!" we can imagine some of the startled brothers saying, "whatever is he up to now! Does he want to kill us all?" That explosion proved the new combination was not fitted for use as a thrown fire; it also showed the existence of terrible forces far beyond the power of all bow-springs, even those made of steel.

Roger Bacon thus discovered what was practically gunpowder, as far back as the thirteenth century, and left writings in which he recorded mixing 11.2 parts of the saltpeter, 29.4 of charcoal, and 29 of sulphur. This was the formula developed as the result of his investigations.

Berthold Schwartz, a monk of Freiburg, studied Bacon's works and carried on dangerous experiments of his own, so that he is ranked with Bacon for the honor. He was also the first one to rouse the interest of Europe in the great discovery.

And then began the first crude, clumsy efforts at gunmaking. Firearms were born.

Shooting Tubes

Do you realize the privilege of living to-day instead of five hundred years ago? Suppose that you had to lay aside your handsome, accurately balanced

THE SLING MAN IN ACTION

Practice Developed some Wonderful Marksmen
Among the Users of this Primitive Weapon

EARLY HAND GUNS

Remington rifle with its dependable UMC ammunition, and then to stick a lighted match into the vent hole of a clumsy iron tube on a wooden handle. Suppose that you could not be sure whether the unscientific mixture would burst the barrel, fire out the projectile, or merely refuse to go off. Would you be the enthusiastic sportsman you are to-day?

That was what your ancestors were "up against," only they probably thought the weapon wonderful, and felt they were very much up-to-date. We will not go into details. It took centuries for guns to become perfect enough to take the place of bows and cross-bows, and we shall only glance at a few of the principal changes.

The Coming of the Matchlock

Hand bombards and culverins were among the early types. Some of these were so heavy that a forked support had to be driven into the ground, and two men were needed, one to hold and aim, the other to prime and fire. How does that strike you for a duck-shooting proposition? Of course such a clumsy arrangement could only be used in war.

Improvements kept coming, however. Guns were lightened and bettered in shape. Somebody thought of putting a flash pan for the powder, by the side of the touch-hole, and now it was decided to fasten the slow-match, in a movable cock, upon the barrel and ignite it with a trigger. These matches were fuses of some slow-burning fiber, like tow, which would keep a spark for a considerable time. Formerly they had to be carried separately, but the new arrangement was a great convenience and made the matchlock. The cock, being curved like a snake, was called the "serpentine."

Winding Up a Gun

About the time sportsmen were through wondering at the convenience of the matchlock, they began to realize its inconvenience. Thus do ideas change; you simply cannot keep humanity contented. But then the "kicker" is a valuable member of society. He brings us progress. The "kicker" said that matchlocks burned up a great deal of fuse, and were hard to keep lighted. Both statements were true, so inventors racked their brains again for something better. They all knew you could bring sparks with flint and steel, and that seemed an idea worth working on. A Nuremberg inventor, in 1515, hit on the wheel-lock. In this a notched steel wheel was wound up with a key like a clock. Flint

MUSKETEERS WITH MATCHLOCK, BANDOLEERS, AND REST

or pyrite, was held against the jagged edge of the wheel by the pressure of the serpentine. You pulled the trigger, then "whirr," the wheel revolved, a stream of sparks flew off into the flash-pan, and the gun was discharged.

The Invention of the Chicken Thieves

This gun worked beautifully, but it was expensive. Wealthy sportsmen could afford them, and so for the first time firearms began to be used for hunting. Some of these sixteenth and seventeenth century nabobs had such guns of beautiful workmanship, so wrought and carved and inlaid, that they must have cost a small fortune. You will find them in many large museums to this day.

"POWDER PLAY" IN THE DESERT

But now the robbers had their turn. There are two stories of the invention of the flint-lock. Both deal with robbers, both have good authority, and both may be true, for inventions sometimes are made independently in different places.

One story runs that the flint-lock which was often styled "Lock á là Miquelet," from the Spanish word, "Miquelitos"—marauders,—told its origin in its name. The other is, that the flint-lock was invented in Holland by gangs of thieves, whose principal business was to steal poultry. The Dutch expression for chicken thieves is "snaap-hans"—we might say "snap hens"—and the flint-lock was therefore called "snaphance" in Holland.

In either case the explanation is easy. The matchlock showed its fire at night and wouldn't do for thieves, the wheel-lock was too expensive, so again necessity became the mother of a far-reaching invention.

The Gun of Our Ancestors

Everybody knows what the flint-lock was like. You simply fastened a flake of flint in the cock and snapped it against a steel plate. This struck off sparks which fell into the flash-pan and fired the charge.

It was so practical that it became the form of gun for all uses; thus gun-making began to be a big industry. Invented early in the seventeenth century, it was used by the hunters and soldiers of the next

EARLY PERSIAN GUN

two hundred years. Old people remember when flint-locks were plentiful everywhere. In fact they are still being manufactured and are sold in some parts of Africa and the Orient. One factory in Birmingham, England, is said to produce about twelve hundred weekly, and Belgium shares in their manufacture. Some of the Arabs use them to this day in the form of strange-looking guns with long, slender muzzles and very light, curved stocks.

Freak Guns

There were freak inventors in the flint-lock period just as there are to-day. Some of them wrestled with the problem of repeating guns, and put together a number of barrels, even seven in the case of one carbine. Others tried revolving chambers, like our revolvers, and still others, magazine stocks. Pistols came into use in many interesting shapes, but these were too practical to be considered freaks.

Pistols, by the way, are named from the town of Pistoia, Italy, where they are said to have been invented and first used.

However, there was one odd idea which seems to have been very popular for a time. That was the combination of guns with other weapons, and their concealment in various peaceful looking objects.

Guns were made which were battle axes at one end and muzzles at the other; muskets were combined with pikes. Pistols were made a part of daggers and at times the muzzle was plugged with a dagger point that had to be removed for firing. In some cases even the frame of a cross-bow was made into a gun-barrel. It was also a favorite trick, especially with robbers, to conceal a pistol in an innocent looking whip-stock, or other unlikely place.

The Scotch Clergymen

We must not forget that rifling was invented about the time that the wheel-lock appeared, and had a great deal to do with the improvement of shooting. Austrians claim its invention for Caspar Zollner of Vienna who cut straight grooves in the barrel's bore. His gun is said to have been used for the first time in 1498, but the Italians seem to have still better warrant as these significant words appear in old Latin Italian, under date of July 28th, 1476, in the inventory of the fortress of Guastalla: "Also one iron gun made with a twist like a snail shell." The rifling made

SCOTCH WHEEL-LOCK

the bullet spin like a top as it flew through the air, thus greatly improving its precision. If this were a complete history, instead of a brief story, we should stop and tell about the different kinds of grooving.

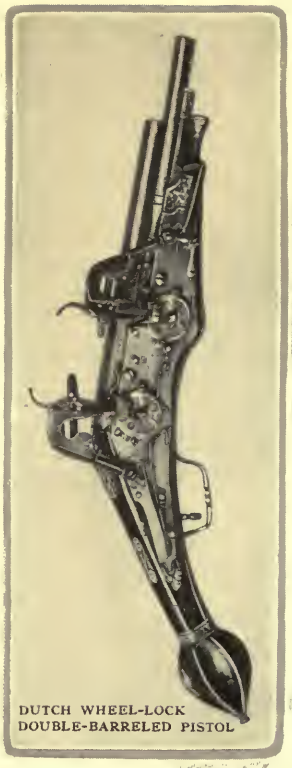
As it is we shall jump over to the year 1807, when the Rev. Alexander John Forsythe, LL.D., got his patent papers for something far better than even the steady old flint. He had invented the percussion system. In some form this has been used ever since. Which is to say that when the hammer of your gun falls, it doesn't explode the powder, although it seems to. Instead it sets off a tiny portion of a very sensitive chemical compound called the "primer," and the explosion of this "primer" makes the powder go off. Of course the two explosions come so swiftly that your ear hears only a single bang.

SWISS PISTOL OF THE EARLY SEVENTEENTH CENTURY

Caps and Breech-Loaders

Primers were tried in different forms called "detonators," but the familiar little copper cap was the most popular. No need to describe them. Millions are still made to be used on old-fashioned nipple guns, even in this day of fixed ammunition.

But now we come to another great development, the Breech-Loader.



DUTCH WHEEL-LOCK DOUBLE-BARRELED PISTOL

Perhaps you have had to handle an old muzzle-loader. It was all right so long as you knew of nothing better, but think of it now that you have your beautiful Remington and your UMC ammunition! Do you remember how sometimes you overloaded, and the kick made your shoulder lame for a week? Or how, when you were excited you shot away your ramrod? The gun fouled too, and was hard to clean, the nipples broke off, the caps split, and the breeches rusted so that you had to take them to a gunsmith. Yes, in spite of the game it got, it was a lot of trouble, now you come to think of it. How different it all is now!

From Henry VIII to Cartridges

Breech-loaders were hardly new. King Henry VIII of England, he of the many wives, had a match-lock arquebus of this type dated 1537. Henry IV of France even invented one for his army, and others worked a little on the idea from time to time. But it wasn't until fixed ammunition came into use that the breech-loader really came to stay,—and that was only the other day. You remember that the Civil War began with muzzle-loaders and ended with breech-loaders.

WHEEL-LOCK RIFLE

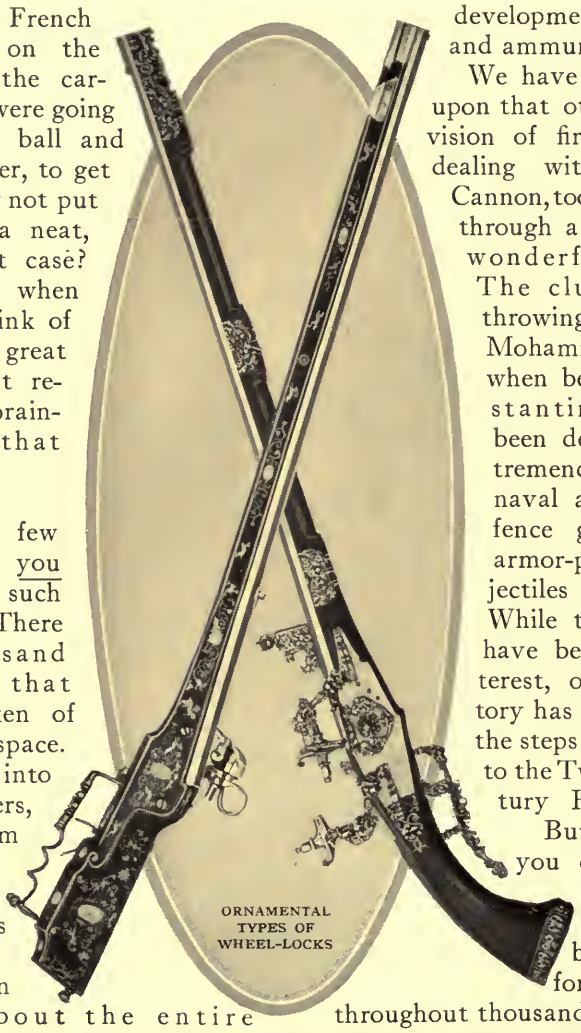
Houiller, the French gunsmith, hit on the great idea of the cartridge. If you were going to use powder, ball and percussion primer, to get your game, why not put them all into a neat, handy, gas-tight case? Simple enough, when you come to think of it, like most great ideas. But it required good brain-stuff to do that thinking.

. . .

These are a few reasons why you can hunt with such convenience. There are a thousand other things that might be spoken of had we the space. Some will come into the other chapters, but most of them will have to be taken for granted, unless you wish to get books and begin studying about the entire development of arms and ammunition.

We have not touched upon that other great division of firearm history dealing with ordnance. Cannon, too, have passed through a succession of wonderful changes. The clumsy stone-throwing guns, used by Mohammed II in 1453 when besieging Constantinople, have been developed into tremendous modern naval and coast-defence guns hurling armor-piercing projectiles many miles. While these changes have been full of interest, our brief history has kept in mind the steps that have led to the Twentieth Century Hunting-Arm.

But one thing, you can see that many forgotten men have been working for your benefit throughout thousands of years.



ORNAMENTAL TYPES OF WHEEL-LOCKS

GERMAN HARQUEBUS PISTOL

The Romance of Remington Arms

A Refusal and What Came of It

Two men, a smith and his son, both named Eliphalet Remington, in 1816, were working busily one day at their forge in beautiful Ilion Gorge, when, so tradition says, the son asked his father for money to buy a rifle, and met with a refusal. The request was natural for the surrounding hills were full of game. The father must have had his own reasons for refusing, but—it made Remington Arms!

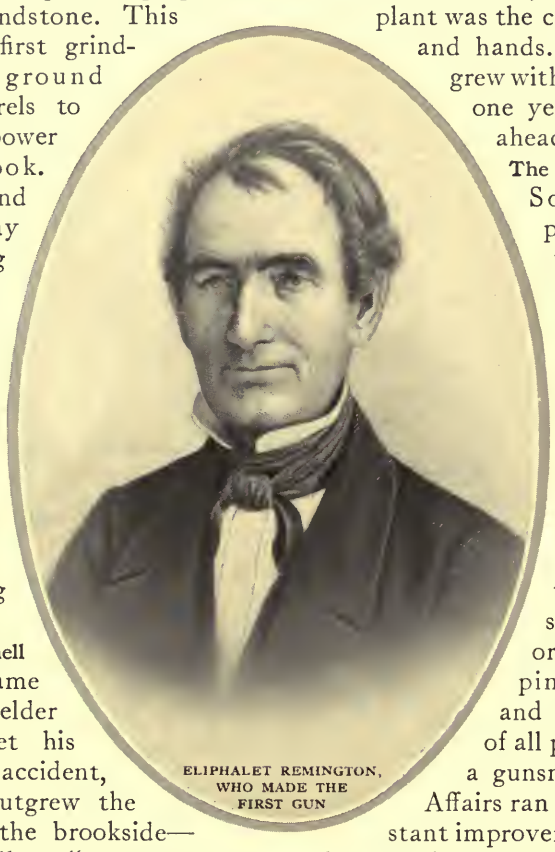
Eliphalet Jr. closed his firm jaws tightly, and began collecting scrap iron on his own account. This he welded skilfully into a gun-barrel, walked fifteen miles to Utica to have it rifled, and finally had a weapon of which he might well be proud.

In reality, it was such a very good gun that soon the neighbors ordered others like it, and before long the Remington forge found itself hard at work to meet the increasing demand. Several times each week the stalwart young manufacturer packed a load of gun-barrels upon his back, and tramped all the way to Utica where a gunsmith rifled and finished them. At this time there were no real gun-factories in America, although gunsmiths were located in most of the larger towns. All gun-barrels were imported from England or Europe.

A Machine to Save His Shoulders

The broad shoulders of Eliphalet Jr. must have ached under his load, for his busy brain soon devised machinery with which he could do the

rifling for himself. Thus the forge became a complete gun-factory, receiving material as scrap iron, and turning out finished rifles. Shotguns also were made. Up in the gorge was a ledge of red sandstone. This furnished the first grindstones which ground down the barrels to proper form by power from the brook. Thus father and son worked away briskly creating a brand-new American industry. They put brains as well as metal into their guns, and soon Remington Arms began to be famous in all the surrounding counties.



ELIPHALET REMINGTON, WHO MADE THE FIRST GUN

Bursting the Shell

In 1828, the same year that the elder Remington met his death through accident, the business outgrew the little shop by the brookside—burst its shell like a "seventeen-year locust"—and bought a large farm near the Erie canal. There to-day the great plant stands.

No town was there at that time, merely a country "corners," and Mr. Remington, after his father's death, built a house to live in, and put up a wooden shop for his machinery. Here he brought water for several wheels from Steele's Creek, and set up his big tilt-hammer, trip-hammers, bellows, grind-stones, and boring- and rifling-machines; the racket they made was music to his ears, for the busy little plant was the child of his brain and hands. The business grew with a jump; within one year demand ran ahead of supply.

The "Stone Forge"

So Remington put up an additional building, since known as the "Stone Forge." Into this he put more trip-hammers specially for welding and forging barrels. By this time the demand was so great that he organized a shipping department and carried a stock of all parts needed by a gunsmith.

Affairs ran along with constant improvements for a decade, and the energetic young smith developed into a famous and prosperous manufacturer. Finally, in 1839, he founded a partnership with Benjamin Harrington for the purpose of making, as a separate industry, farm utensils and other iron articles, although this is not a part of our story.

Gathering Scrap

You can't make iron goods without

iron, and supply was not well organized then. So you must imagine Mr. Remington sending men with teams throughout the surrounding country to stop at all farmhouses, bargain for broken plows, hatchets, kettles, odds and ends of all kinds, to feed the busy forges. Thus the country was drained of its scrap iron, fresh metal was drawn from the Clinton ore beds of Oneida County, while timber, cut from the surrounding hills, was burned into charcoal for fuel.

THE "OLD FORGE"

In the meantime Mr. Remington had sons of his own growing into maturity, and Philo his eldest, prepared to enter the industry.

The Mexican War

In 1845 a war-cloud grew suddenly out of the southwest. At the distant mutterings of the coming conflict with Mexico, the Government looked about hastily for firearms.

William Jencks, having invented a carbine, the War Department gave Ames & Co. of Springfield, Mass., a contract to manufacture several thousand under the Jencks patent. For some reason this firm wished to be relieved of this order, and Mr. Remington perceived that this was the great chance for which he had been waiting. He purchased the contract and their special machinery, and became a Government contractor.

Of course the carbines were well made. Carried by the American forces, they helped to win the Mexican War. Eliphalet Remington was therefore not without his share in the extension of the Union. Another building was added, and another water-race constructed in order to take care of the carbine contract; thus the plant grew. This building, the "Old Armory," still stands.

THE FIRST FACTORY BUILDING

Bigger Contracts

A few more years passed and far-sighted statesmen saw with alarm that another and vastly greater war-cloud was gathering. Signs increased that both North and South were slowly moving toward civil war.

Arms were the all-important thing. Mr. Remington, having shown his ability in the carbine contract, re-

"HARPER'S FERRY MODEL" MUSKET

ceived an order for five thousand rifles of the "Harper's Ferry" model; and later additional orders for seventy-five hundred. In 1857 and 1858, the Government called on him for five thousand Maynard self-priming musket locks. Remington revolvers under the Beal patent were also made in quantities.

Meanwhile, in 1856, the firm of E. Remington & Sons was formed with the three sons, Philo, Samuel, and Eliphalet, as partners of their father, and a thriving village took the place of the country "corners."

The Storm

1861 came, the storm-cloud burst in all its fury, and Government orders began to pile in upon the factory. Five thousand "Harper's Ferry" muskets came in to be changed so that either sabers or bayonets could be attached. The work had to be completed within two weeks, for the emergency was tremendous. Every man and boy in Ilion was engaged and the gigantic task finished on time.

Additional buildings were put up. Steam was added to water-power, expensive machinery was installed. Work, day and night, went on to the limit of human endurance. Besides the rifles, there were such urgent calls for Remington pistols that an additional building was rented in Utica, the daily output being three hundred pistols.

A Hero's Death

The terrific strain was more than Eliphalet Remington could stand. It was a matter of patriotism as pure as any that had called others to the firing line. Many men could handle a musket but he, "The Father of American Gun-Making," as he has been called, must bring his tremendous energy and mechanical genius to the task of producing muskets for the rush of volunteers. At no point had he spared himself, and when on August 12, 1861, he passed away, his great organization was a vital link in the chain of national defense. He truly gave his life for his country. Thus did the youth of twenty-three, who forty-five years before had forged the first gun-barrel,

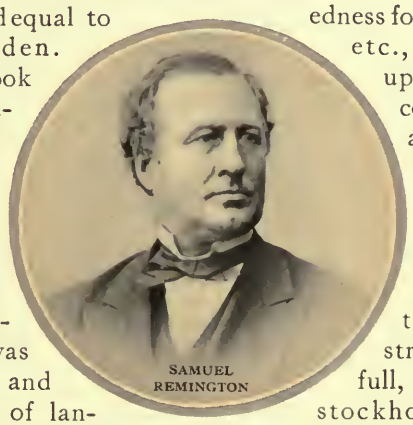
REMINGTON HAMMERLESS SHOTGUN

PHILO REMINGTON

live to see his name the greatest in the annals of American gun-making, his arms relied upon in the country's direst need, and thus met his death in the service of the Union.

The Sons

The three sons proved equal to the burden. Philo, the eldest, took charge of the manufacturing. Samuel, the next in age, became the general agent, negotiating contracts and purchasing machinery and materials. Eliphalet, the youngest was a beautiful penman and had great command of language. Therefore he took up the correspondence. This was before the days of typewriters—another industry in which, by the way, the Remingtons were destined to play an important part.



SAMUEL REMINGTON

In 1865 the partnership of E. Remington and Sons was succeeded by a corporation of the same name, having a nominal capital of one million dollars, and a plant valued at one and one-half million dollars.

Peace and Disaster

Meanwhile, in Virginia, Gen. Grant steadily, surely drew his lines more tightly about the brave but exhausted Southerners. The great Northern forces, many of them armed with rifles of Remington make, at last proved irresistible, and upon the 12th day of April, Gen. Lee surrendered.

Mingled with the great rejoicing, there came a touch of severe misfortune to Ilion, for the Government cancelled all unfilled orders, and the complicated organization, built up with so much trouble and expense, to meet the strain of production, stopped short with a jar. Large indebtedness for machinery, material, etc., had been incurred upon the Government contract. Cutting off all resources meant disaster, and the local bank, a large creditor, was forced into failure. Later, when prosperity returned, the Remingtons in strictest honor paid in full, with interest, all the stockholders and creditors of the unfortunate bank.

The Breech-Loader

This crisis was a kind of "acid test." First it tested credits. Theirs were so high that notes were extended and new credits granted. Next it tested character. Some one has said that when trouble comes "weak men take to the woods but strong men

ELIPHALET REMINGTON, JR.

take to work." The Remingtons were strong men; and they worked.

The war had shown that the arm of the future must be a breech-loader. Very well, the Remingtons would lead the procession, as always before, by producing the world's best breech-loader. An inventive genius named John Rider was engaged to develop the new arm, surrounded by the best skilled mechanics securable. These soon presented the famous system of a dropping breech-block backed up by the hammer. The world took notice. The new plan was so simple, so practicable, so serviceable, that Denmark placed an immediate order for forty-two thousand rifles. Prosperity returned, and again the windows of the big plant glowed all night as work was pressed upon this contract. In 1867 the United States Navy Department adopted the Remington breech-loader and ordered twelve thousand. During the same year Spain ordered eighty-five thousand. Next year came a demand for thirty thousand for Sweden; Egypt took fifty thousand; in 1870 France called for the extreme capacity of the factory.

Samuel and Philo

These orders proved the Remington the best rifle in the world. Other factories were now making breech-loaders, but governments clamored for the output of one company. Samuel Remington spent his entire time abroad, as sales-agent; his brother, Philo, was presiding genius of the factory at Ilion.

Large additions were made to every department. At times 1,850 hands were employed, and the plant run for twenty-four hours a day, the daily output reaching a total of thirteen hundred rifles and two hundred revolvers.

A Bad Cartridge

Some interesting incidents occurred in connection with these foreign contracts. Samuel Remington had practically closed with Prussia for an order of two hundred thousand rifles. The Army Board, after the severest tests, was enthusiastic in favor of this arm, when the King came to the place of demonstration and asked to see it. Samuel Remington handed him a loaded rifle and stood back confidently. The monarch raised it to his shoulder, sighted along the barrel, pulled the trigger, and—the hammer merely snapped! A bad cartridge at this of all moments! Impatiently Wilhelm threw down the rifle and strode away. The deal was off, a matter of several million dollars.

Once an order was pending for equipping the whole Turkish Army with four hundred thousand rifles, when a certain individual demanded a royalty so exorbitant that Samuel Remington refused. "Royalty" is a polite word for "graft."

THE "LONG BOW" IN SHERWOOD FOREST

One of Robin Hood's Famous Band Encounters a Savage Tusker at Close Range

The Egyptian Palace

In spite of such incidents the business was enormous. France took a total of one hundred and forty-five thousand arms; New York State bought twenty-one thousand for her militia; Porto Rico took ten thousand; Cuba eighty-nine thousand; Spain one hundred and thirty thousand more; and Egypt fifty-five thousand.

The Egyptian Khedive was so impressed with the filling of his contract that he presented Samuel Remington with a marble palace near Cairo. From Mexico came orders for fifty thousand arms; from Chile for twelve thousand. The great New York sporting goods house of Hartley and Graham, who further along will come into our story, disposed of one hundred and forty-four thousand.

REMINGTON SALESMAN IN CHINA

One of the agents of this latter concern put on Chinese clothes, made his way to Pekin, and gained the ear of Li Hung Chang, who ordered Remington rifles for the Chinese Army. All these brought the total sales up to the million mark.

The Great Ball

It was while the Spanish officers were in Ilion, that the town gave its ever-memorable Spanish Ball. Patrick Gilmore and his famous band were imported for the occasion and everything else was in proportion. Well might Ilion celebrate, for Spain and her colonies had taken more than three hundred thousand rifles, which meant millions in wages to the town.

This was the high-water mark of that period. Conditions changed again and the day of huge foreign orders began to pass. One cause was graft. The Remingtons, being unwilling to take business through bribery, lost possible orders. Furthermore, many countries now established factories.

Retire or Serve

Thus another time came when a critical decision must be made. Philo Remington and his brother, being wealthy and full of honors, thought seriously of retiring from business.

But success brings duties as well as rewards. The town depended on the factory, and the brothers felt that the hands must be kept from want. It meant to go backward, or to go forward upon new lines and again they decided to go forward. It was at this time that they brought out the famous Remington Typewriter, which now occupies a large building

near the parent plant. Sewing machines and farm implements also were made for a while.

The Day of the Repeater

But a new day had dawned in the history of arms. Just as bows had replaced slings, and the percussion system had taken the place of flint and steel, so now repeaters began to show their advantage over single fire.

The Remingtons employed inventors to develop the world's best repeater, just as they had done with breech-loaders. The first model, developed at large expense proved unsatisfactory, and rather than have the Remington name associated with anything inferior, the heavy investment was charged to profit and loss.

James P. Lee's bolt mechanism was a different proposition. Mr. Lee, after experimenting for several years at the Remington factory, perfected the parent of modern military rifles.

Why the Chinese Defeated the French

These new rifles were first used in action by the Chinese. At the battle of Lang Son in the '80's, the French with their Kropatcheck guns were three times repulsed by the Chinese armed with Remington-Lees. The American-made guns could be recharged in a few seconds, while those of the French took much longer. The latter were at the mercy of the foe when their magazines were empty.

Still difficulties followed. It was expensive to build necessary machinery; there had been heavy losses in other enterprises; three hundred and fifty thousand dollars went in the Agricultural Works; the Scattergood Cotton Gin was a financial failure; the Sewing-machine lost about one million dollars; an enterprise for making electric-lighting plants was unsuccessful; large gifts to charity and education had lowered their resources; and finally they were led to disaster by helping a false friend.

A Glimmer of Hope

Just at this time Turkey appeared again in the market, and for a while hope ran high that her order for six hundred thousand rifles would be placed in Ilion. This would have saved the day. The Turkish experts reported favorably upon the Remington-Lee, but the German Government was able finally to secure the order for a German manufacturer.

Creditors now began to press. Some cash was raised by the brothers through selling their interest in the Remington Typewriter to its present manufacturers, but not sufficient to save them, and in 1886 the business, that had begun seventy years before with the making of the amateur gun-

PAGES FROM THE CATALOG IN CHINESE

barrel, passed into a receiver's hands.

Two years were taken in winding up its affairs, and in March, 1888, Hartley and Graham of New York, bought a large interest. Philo Remington survived but one year longer. Like his father's, his death was also chargeable to service; he had continued his business in order that his dependents might not come to want, and the struggle broke him down.

The Entry of Marcellus Hartley

Philo Remington died, but the business survived. To-day, as formerly, the great factory at Ilion is pulsing with life and teeming with prosperity. To-day, as for nearly a century, the name Remington stands at the very head of the arm-making industry; the hunters and marksmen of the world look to it for the newest ideas, and the most perfect mechanism.

This is largely due to another remarkable personality whose life and career will be touched on more fully in the following pages. At this point it is enough to say that a strong, far-sighted man of ample resources and great constructive ability now took control.

That is why the highest grade of invention and mechanical skill have continued to be employed, and the American marksman, the best shot in the world, has been given the best arms to shoot with. Shotguns have been made selling as high as $750.

Solid breech hammerless guns have carried the name Remington to a higher point in recent years than in any of its former days, and the marvellous auto-loading action seems to be practically the last word in firearms.

To-day

Upon the death of Mr. Hartley in 1902, his grandson, Marcellus Hartley Dodge became President of the Company, and his associates are unanimous in believing that in the future lie the greatest days of the venerable business.

FIRST REMINGTON ARMORY

The Tale of U M C Ammunition

The Young Merchant

IT TAKES more than a perfect gun to make good shooting, the ammunition also must be right. That is why you always specify "U M C," and the story of that famous red and white trademark is worth telling. At the start, the story is so much that of the remarkable man who founded the business that we shall gain a better understanding by glancing at the early life of Mr. Hartley.

Thirty-one years after the younger Eliphalet Remington made his famous gun-barrel, Marcellus Hartley, at the age of twenty, became entry clerk and assistant book-keeper with Francis Tomes and Sons, dealers in hardware and sporting goods. Soon he found himself in the gun department, which meant more to him than he then realized. He advanced rapidly, and the firm sent him on Western and Southern trips to solicit trade. Traveling in those days had many hardships, and at one time he was shipwrecked in a hurricane on Lake Erie with the thermometer at 15 degrees below zero. However, he gained much knowledge and experience, made many friends, and at twenty-seven decided to go into business for himself.

One day three young men, J. Rutsen Schuyler, Marcellus Hartley, and Malcolm Graham, met in a Maiden Lane restaurant for a serious talk. Before they left, the firm of Schuyler, Hartley and Graham had been decided on, and soon after, March 1, 1854, the new name appeared at 13 Maiden Lane.

Weathering a Panic

The young men had to borrow most of their capital, but had brains, energy, and experience of their own. Mr. Hartley's part consisted in trips to Europe to buy stock, principally sporting guns, and in acting as his own drummer in the West. They

made money from the start, and by 1860 had become the largest American dealers in firearms.

Then came the war; America's young industry could supply only a part of the needed arms. While the factories at Ilion and elsewhere were pushed to their limit, it also became necessary to buy large quantities abroad. Mr. Hartley was the most competent buyer of foreign guns to be found, and Secretary-of-War Stanton surprised him with an appointment. With a rank equivalent to that of brigadier general, and a large credit upon Baring Brothers of London, this young man of thirty-five sailed abroad in July, 1862. It meant a great business sacrifice but he was too patriotic to hesitate at his country's need.

EARLIER TYPES OF

THE GREAT BRIDGEPORT PLANT OF THE

A Difficult Mission

The mission was very difficult. England was full of hostile spirit. The cotton supply for her great mills came from the Southern States, and the war hurt business, consequently there was wide-spread sympathy for the South that hindered Mr. Hartley at every turn. Confederate agents were abroad endeavoring to buy up all possible supplies; and a third difficulty appeared in the combinations of manufacturers to corner the gun market.

His task, therefore, was to create sympathy for the North, to out-general the Confederate agents, and to break the corners in arms. In all these he succeeded wonderfully. He printed and distributed

LATER TYPES OF


CARTRIDGES

fifteen thousand copies of John Bright's great anti-slavery speech at Birmingham. First and last he secured about two hundred thousand rifles in the months he spent abroad.

A Strange Encounter

Many years later he attended a dinner where a Mr. Trenholm was one of the speakers. In the course of his remarks this gentleman referred to war times, when he had to purchase arms as European agent for the Confederacy. Often when upon the point of securing greatly-needed guns he had found that some secret influence was defeating him. In one case a Belgian manufacturer had slipped away when he had thought he was certain of his rifles, and he had wondered at the mysterious skill of his unknown opponent. This dinner meeting was a surprise to both, for it came out that the unknown was Mr. Hartley.


METALLIC CARTRIDGE COMPANY

Returning from Europe he resumed the work of his firm, which had prospered greatly, and then his career broadened into four main lines of development.

Four Enterprises

One of these undertakings brought close relations with the Remingtons, and led later to the acquisition of that famous business. Another was the formation of the Bridgeport Gun Implement Co. to make rods, cleaners, extractors, powder measures, etc., for the old-style arms; and later, other sporting articles when breech-loaders


RTRIDGES

changed the situation. A third was the engagement, to experiment with dynamos and lamps, of Mr. Hiram Maxim, since famous as the inventor of the Maxim gun, then best known in electricity. This laid the foundation of what is now the great Westinghouse Electric Company, later sold to Mr. Westinghouse. The fourth was the subject of this chapter, The Union Metallic Cartridge Co.

MARCELLUS HARTLEY

From a Souvenir to a Great Industry

Years before, while traveling in the West as salesman for Tomes and Company, Mr. Hartley was shown a roughly-made metallic shell for the charge of a gun. He begged the shell as a souvenir, and from this acorn a big oak finally grew.

After the war, ten years later, he took action. By this time he fully realized the great importance of metallic cartridges for the new breech-loading arms. Several factories after trying to make them without much success had given up. These plants and patents were for sale.

Mr. Hartley's firm bought the Crittenden and Tibbals Manufacturing Company of South Coventry, and the business of C. D. Lett of Springfield. These they moved to Bridgeport, Connecticut, and on August 9, 1867, The Union Metallic Cartridge Co. was incorporated. It consisted of Mr. Hartley, Mr. Schuyler, Mr. Graham, Mr. Charles H. Pond, and Mr. Robert J. White. The oak had taken root.

Then began the first successful manufacture of metallic cartridges in the United States. Back in the '50's percussion caps, skin cartridges for revolvers, linen cartridges for Sharp's breech-loaders, and a few poor rim-fire copper cartridges had been made, but now came this new industry more important than all the rest combined. At first they made rim-fire cartridges, for the center-fire had not been invented, percussion caps and shotguns, but soon dropped the guns to concentrate on ammunition.

A Versatile Genius

Mr. Hartley and his associates by their business sagacity had created an opportunity, and were on the lookout for a mechanical genius. He came; his name was Alfred C. Hobbs.

Hanging on the wall of the present New York City office is a former lock of the Bank of England. The English Government had offered a prize of one thousand dollars to any one who could pick it. Mr. Hobbs, jack-of-all-trades, finally did it in fifty-one hours. He had been

superintendent of the Howe Sewing Machine Company, and, after five years brought his great ingenuity to the problems of cartridge-making.

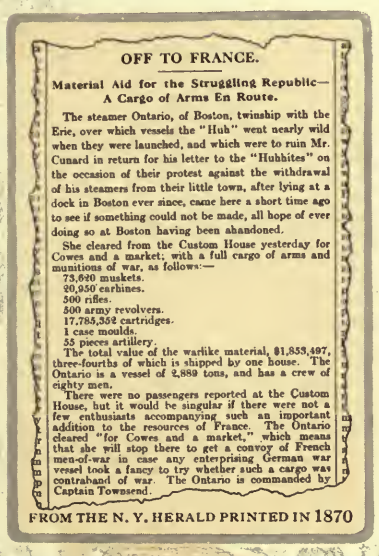
For twenty years he remained in charge, inventing nearly all the special machinery that made the business so successful. It is difficult to get a permit to visit the Bridgeport factory. The mechanical secrets are too valuable.

THE U M C FACTORY IN 1873

Col. Berdan's Center-Fire Idea

The first cartridges consisted in packing powder, ball, and wads into a single case so that the powder was ignited by a very small quantity of high explosive called "priming mixture." For a while this priming mixture was concealed in a hollow rim and exploded by the pressure of the falling hammer. But Col. Berdan revolutionized cartridge-making. He manufactured a form of our present primer; placed the priming mixture in a little cup, then secured, just below but in contact with this mixture, a piece of metal called the "anvil." This cup, now called the "primer," was seated in the center of the base of the cartridge. When the hammer fell and struck the firing-pin that ignited this little cap, the priming mixture was driven against the anvil and exploded. This explosion was transmitted to and ignited the powder through a small opening in the base of the shell. Owing to the position of the primer, these cartridges were called "central-fire cartridges" and are well known today.

These cartridges were first made at the U M C factory.


OFF TO FRANCE.

Material Aid for the Struggling Republic—A Cargo of Arms En Route.

The steamer Ontario, of Boston, twinship with the Erie, over which vessels the "Hub" went nearly wild when they were launched, and which were to ruin Mr. Cunard in return for his letter to the "Hubbites" on the occasion of their protest against the withdrawal of his steamers from their little town, after lying at a dock in Boston ever since, came here a short time ago to see if something could not be made, all hope of ever doing so at Boston having been abandoned.

She cleared from the Custom House yesterday for Cowes and a market; with a full cargo of arms and munitions of war, as follows:—

73,640 muskets.
20,950 carbines.
500 rifles.
500 army revolvers.
17,785,332 cartridges.
1 case moulds.
55 pieces artillery.

The total value of the warlike material, $1,833,497, three-fourths of which is shipped by one house. The Ontario is a vessel of 2,889 tons, and has a crew of eighty men.

There were no passengers reported at the Custom House, but it would be singular if there were not a few enthusiasts accompanying such an important addition to the resources of France. The Ontario cleared "for Cowes and a market," which means that she will stop there to get a convoy of French men-of-war in case any enterprising German war vessel took a fancy to try whether such a cargo was contraband of war. The Ontario is commanded by Captain Townsend.

FROM THE N. Y. HERALD PRINTED IN 1870

Surrounded by the Enemy

In 1870 occurred an incident unequaled in the history of salesmanship. France, in a desperate struggle with the invading Prussian armies, needed American arms and ammunition, and in August the firm's special representative, Mr. W. W. Reynolds, secured in Paris an order of considerable size, and also a large payment for preceding shipments. Paris being besieged, how was he to get them to America with every foot of the surrounding country guarded by watchful Germans?

The Pinch of the Siege

After a few days food

DISCUSSING TERMS AT END OF FRANCO-PRUSSIAN WAR

began to grow scarce, but ever as he strolled about he thought of escape. He must get his order and his payment past the Prussian lines. The only pathway lay through the air. Armed with a permit from Peard, the Finance Minister, he sought out an old theater which had been converted into a balloon factory; to complete one balloon took ten days, and cost $1,250 in gold.

At this point word was received from the Government that M. Gambetta, the great War Minister, must leave Paris for reasons of state, and the use of the American's balloon was requested. A period of bad weather followed; from day to day Gambetta was forced to delay his start, so that the second balloon was finished before the first left. Friday, the morning of departure, came. An immense crowd of people drew together; the members of the Government were present, and both balloons bore the French tricolor. Gambetta and his companions climbed into the wicker basket attached to one. In the other were seated Mr. Reynolds, his friend Mr. C. W. Way of New York, a French officer M. Cuzon, and the aeronaut Durevilio.

Danger in the Air

At eight minutes past eleven theropes were thrown off, and the balloons shot high into the clear sky. A breeze bore them toward the Prussian lines; soon there were puffs of smoke far beneath them. Bullets whistled through the air; cannon, musketry and rockets were turned upon the adventurers, and for a time they were in the greatest danger. Swiftly moving specks — mounted Uhlans — galloped along the thread-like roads below, expecting the voyagers would be forced to descend; but fortune favored, and the freshening breeze finally bore them out of range.

A Narrow Escape

Then there came a new peril. Gambetta's engineer lost control of his balloon which dropped close to the ground and then shot swiftly up again directly beneath Mr. Reynold's car; for a few minutes it looked as though a fatal collision could not be avoided. A sudden breath of wind changed its course, and once more the two swept onward together.

Gambetta attempted to land at Criel but discovered just in time that

it was a Prussian camp. He escaped by throwing his baggage overboard and was wounded in his hand by a shot. Later he came down into a tree top near Amiens. The Americans kept on for ninety-five miles and made a safe landing at Ville Roy whence they, too, went by rail to Amiens.

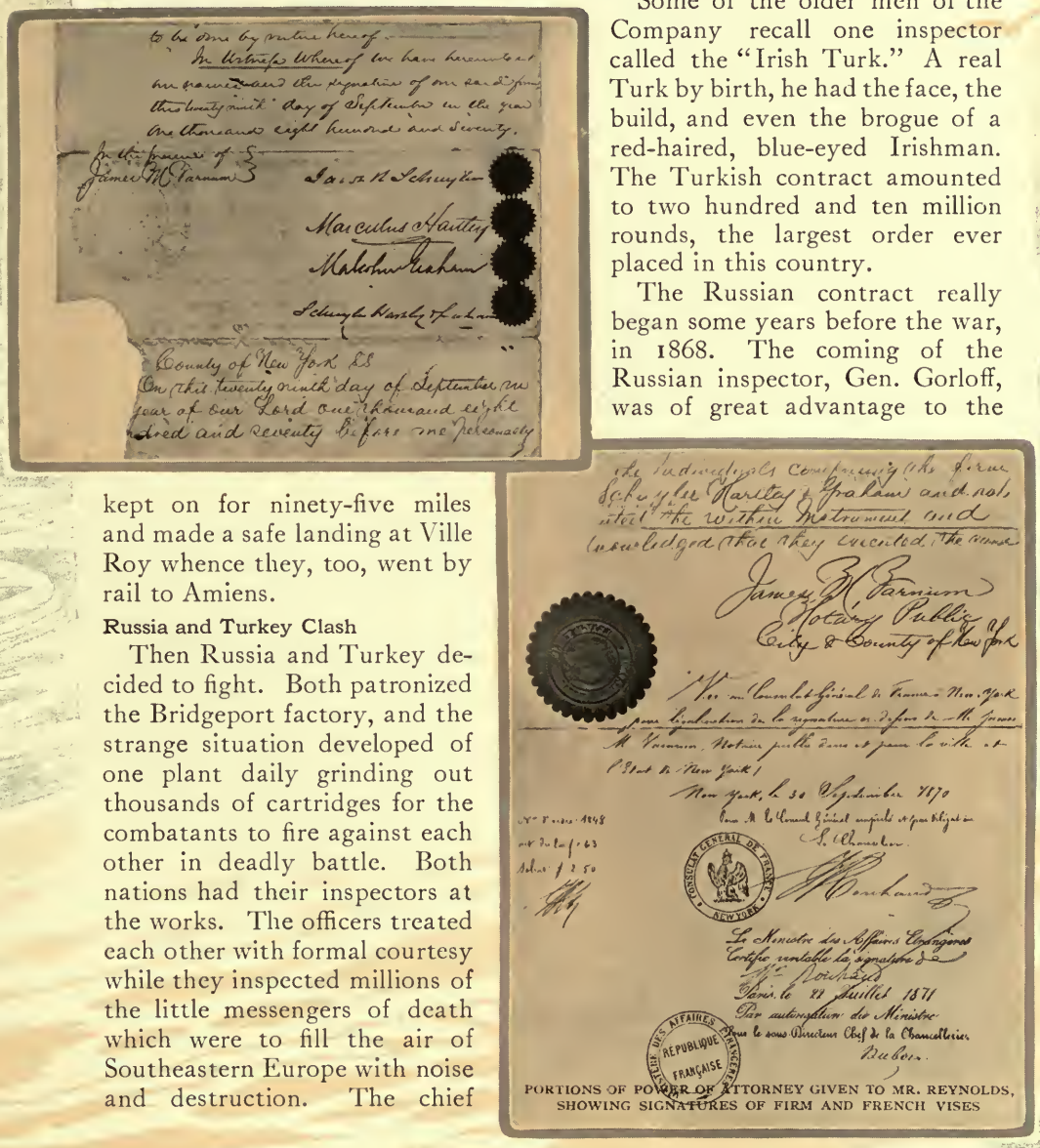
Russia and Turkey Clash

Then Russia and Turkey decided to fight. Both patronized the Bridgeport factory, and the strange situation developed of one plant daily grinding out thousands of cartridges for the combatants to fire against each other in deadly battle. Both nations had their inspectors at the works. The officers treated each other with formal courtesy while they inspected millions of the little messengers of death which were to fill the air of Southeastern Europe with noise and destruction. The chief Turkish inspector was the famous Tewfik Pasha, later Minister of Finance, and at one time minister to this country.

The "Irish Turk"

Some of the older men of the Company recall one inspector called the "Irish Turk." A real Turk by birth, he had the face, the build, and even the brogue of a red-haired, blue-eyed Irishman. The Turkish contract amounted to two hundred and ten million rounds, the largest order ever placed in this country.

The Russian contract really began some years before the war, in 1868. The coming of the Russian inspector, Gen. Gorloff, was of great advantage to the



PORTIONS OF POWER OF ATTORNEY GIVEN TO MR. REYNOLDS, SHOWING SIGNATURES OF FIRM AND FRENCH VISES

business. This competent officer was a very severe inspector, and thus helped establish the highest standard of product. After two years of strict application to business Mr. White, secretary of the Company, took him out for a social evening; Gen. Gorloff then remarked that it was his first outing in America, and added that if the contract were a failure he might as well blow his brains out.

Was it a failure? Gen. Gorloff reported: "There have been fired in our regular work twenty thousand, seven hundred and twenty cartridges without one missfire, and two hundred reloaded ten times, making twenty-two thousand, seven hundred and twenty total, without a missfire, in the inspection of two million."

Recovered from a Wreck

Robert J. White reported in 1871: "The bark Forya from New York to Cronstadt with three million, six hundred and forty-five thousand, one hundred and twenty U M C cartridges for the Russian Government was dismasted in a gale, had the deck stove in, and was abandoned at sea. The steamer Iowa from Liverpool found her partly filled with water, pumped her out, and towed her to New York, arriving April, 1871. Much of this ammunition had been under water five weeks. The whole was taken out and returned to the factory, the wet paper boxes removed, and ten thousand, four hundred and fifty of the cartridges fired, proving them uninjured." Twenty years later more of this lot were tested without a missfire. U M C cartridges from the wrecked "Maine," found in good condition after thirteen years' submergence, furnish another striking example. Could there be better proof of the quality of the primer, its water-tight fit in the primer pocket, or the excellence of the lubricator and the crimp?

In 1871, the Russian Grand Duke Alexis came to this country and visited Bridgeport, where he made a speech. The U M C plant was in gala attire, one long line of "grasshopper machines" being decorated with bouquets that rose and fell with the motion of the mechanism. So many factory girls appeared in silk dresses that the Duke was much amazed at the condition of operatives in America.

The Russian Tramp

A poorly clothed man, apparently a vagrant, one day approached Gen. Gorloff with a request for work. He said he was a Russian who had been told by the Consulate in New York that he might find a job at Bridgeport. The General directed him to the U M C Company who set him to work cleaning the office,

CHARGE OF THE TURKS AT KARAHASSANKOI

TEWFIK PASHA

looking after guns, etc. Though his clothes were shabby, he had small hands and feet, and kept himself remarkably clean. One day, two months later, he failed to appear as usual, but about ten o'clock arrived faultlessly attired from silk hat to polished shoes, and said with a courtly bow: "Good morning, General, I leave you today. Good-by."

He was a nobleman's son who had been detailed to serve as a spy upon the General.

An International Secret

At one time Gen. Gorloff rejected a large quantity of cartridges to the great surprise of the Company who had believed them perfect. Spain, engaged with a Cuban rebellion, promptly bid for the rejected lot; there had been a secret understanding that these should be refused by Russia to aid Spain.

It was well that Spain secured this shipment since the Insurrectionists had not neglected to provide themselves with Remington rifles and U M C ammuntion. In the later Cuban rebellion, that just preceded the Spanish-American War, all the forces fighting under Gomez, Maceo, Garcia, and the others, were so equipped although it had been a difficult matter for the "Junta" to forward their munitions to the scene of war. More than one such filibustering expedition was overtaken and captured within the three-mile limit by United States authorities.

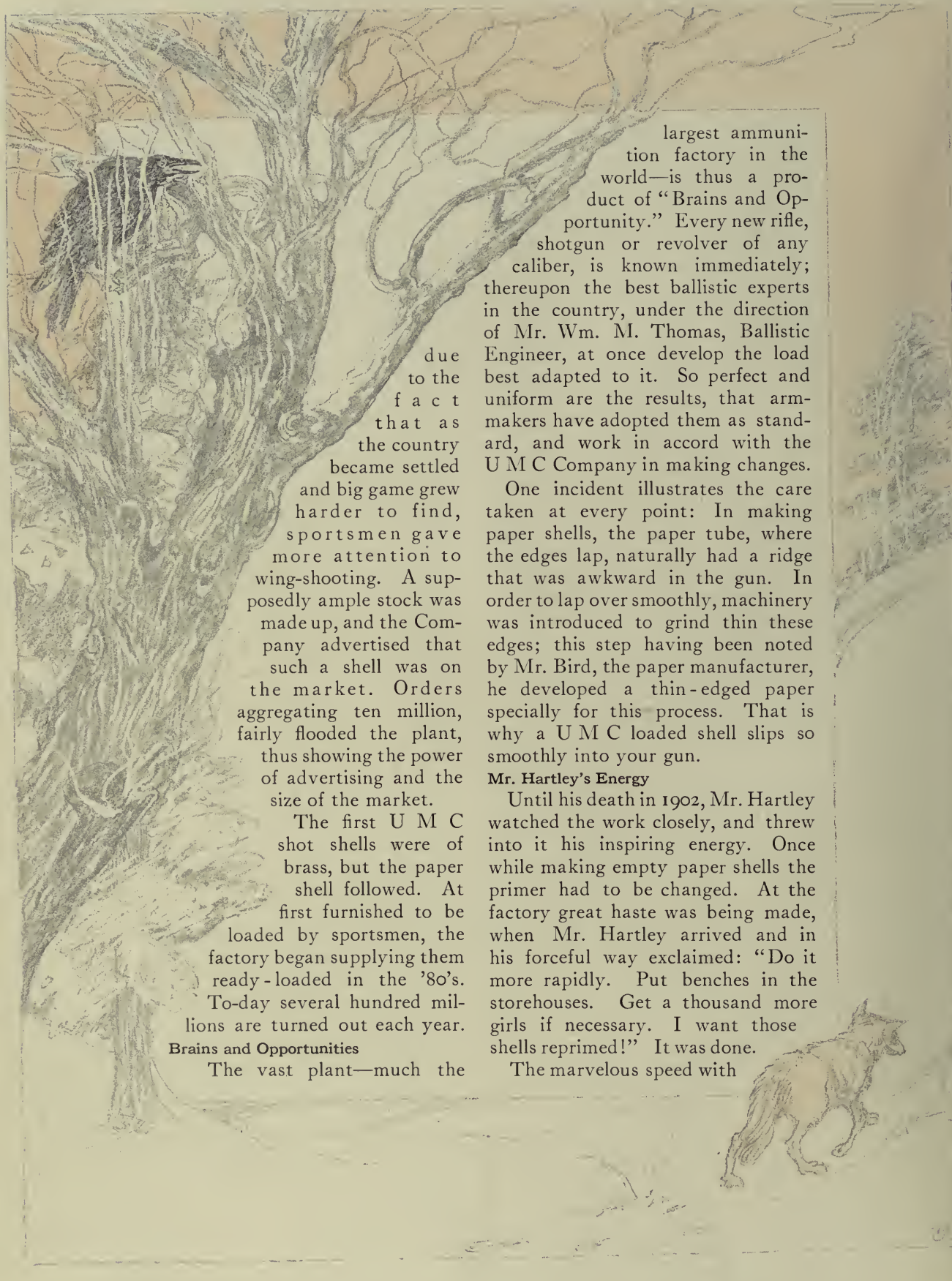
Very much the same experience marked many of the other Central and South American wars and uprisings. However much these factions might differ among themselves, they all agreed as to what were the best rifles and cartridges. In one case there was the curious situation of two nations —Colombia and Venezuela—at war with each other, while a separate insurrection was proceeding in each country; all four of the warring bodies fired U M C bullets from Remington rifles.

GRAND DUKE ALEXIS AND GENERAL CUSTER

Perhaps no one is more deeply versed in the inside stories of international conflicts during the past thirty years than is Mr. W. J. Bruff, the Company's general manager. Did not the seal of business confidence fasten his lips, there is much of recent history that he might illumine.

Making Paper Shells

In the panic of 1873, the steady wages of the U M C plant relieved Bridgeport. This same year the Company bought from C. D. Wells of Springfield his equipment for making paper shells which were practically all hand-made. Soon machines were invented for this work,—an important development, because shotguns were rapidly increasing in use. This was



due to the fact that as the country became settled and big game grew harder to find, sportsmen gave more attention to wing-shooting. A supposedly ample stock was made up, and the Company advertised that such a shell was on the market. Orders aggregating ten million, fairly flooded the plant, thus showing the power of advertising and the size of the market.

The first U M C shot shells were of brass, but the paper shell followed. At first furnished to be loaded by sportsmen, the factory began supplying them ready-loaded in the '80's. To-day several hundred millions are turned out each year.

Brains and Opportunities

The vast plant—much the largest ammunition factory in the world—is thus a product of "Brains and Opportunity." Every new rifle, shotgun or revolver of any caliber, is known immediately; thereupon the best ballistic experts in the country, under the direction of Mr. Wm. M. Thomas, Ballistic Engineer, at once develop the load best adapted to it. So perfect and uniform are the results, that arm-makers have adopted them as standard, and work in accord with the U M C Company in making changes.

One incident illustrates the care taken at every point: In making paper shells, the paper tube, where the edges lap, naturally had a ridge that was awkward in the gun. In order to lap over smoothly, machinery was introduced to grind thin these edges; this step having been noted by Mr. Bird, the paper manufacturer, he developed a thin-edged paper specially for this process. That is why a U M C loaded shell slips so smoothly into your gun.

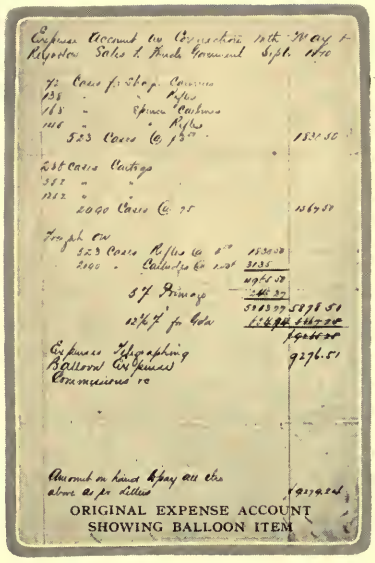
Mr. Hartley's Energy

Until his death in 1902, Mr. Hartley watched the work closely, and threw into it his inspiring energy. Once while making empty paper shells the primer had to be changed. At the factory great haste was being made, when Mr. Hartley arrived and in his forceful way exclaimed: "Do it more rapidly. Put benches in the storehouses. Get a thousand more girls if necessary. I want those shells reprimed!" It was done.

The marvelous speed with

DEER-STALKING WITH THE CROSS-BOW

This Compact Arm with its Small Bolt and Great Power was Popular with Many Sportsmen



ORIGINAL EXPENSE ACCOUNT
SHOWING BALLOON ITEM

which the great ten-story shot-tower was rushed to completion several years ago, shows that the energetic spirit of Mr. Hartley survives in the present management. The ground was broken in July, and perfect shot produced in the following February.

Smokeless powder came into use; the U M C Company led in applying it to fixed ammunition. It needed new primers for perfect ignition, after careful experiments, these were perfected, resulting in the "Nitro Club" and "Arrow" brands of shot shells.

Foreign orders, an increasing demand for sporting ammunition, both at home and abroad, the needs of the growing army of operatives, the addition of much new machinery, the necessary equipment for so great a business—all of these have compelled from time to time repeated enlargements of the factory.

And so the big plant's history has run on in ever-increasing scale. Ideas born within its walls have developed until they required more buildings. The growth has been continuously from within outward. Men once factory hands have risen by their own abilities to important places, as Jerome Orcutt has done—forty-six years ago a tool-maker, now the second vice-president.

This great Company has played its part in the wars of the earth but the principal role today is that of peace in serving hunters and marksmen. For these it produces loads to fit every known make of modern hand firearm, and carries in stock the enormous total of fifteen thousand different kinds of loads.

The subject is growing more complicated as new inventions are being developed; in the future, as in the past, the Union Metallic Cartridge Company will be found foremost in the manufacture of ammunition.

A Visit to the Bridgeport Plant

Getting Impressions

IT IS no easy matter to secure a pass to the Bridgeport plant. Its great advantage over other concerns lies, to a large degree, in the exclusive machinery, that has been developed at so much pains and expense, and the secrets of which are so carefully guarded. In our case, however, there will be nothing to hinder us from getting a few general impressions, provided we do not go into mechanical details too closely.

The very size of the great manufactory is impressive — sixteen acres of floor space, crowded with machinery, and resounding with activity. In building after building, floor above floor, the sight is similar: the long rows of busy machines, the whirling network of shafts and belts above, the intent operatives, and the steady clicking of innumerable parts blended into a softened wide-spread sound. It seems absolutely endless; it is a matter of hours to go through the plant. Stop at one of the machines, and see the speed and accuracy with which it turns out its product; then calculate the entire number of machines and

MR. THOMAS AND MR. ORCUTT EXAMINING AXE-HEAD PIERCED BY BULLET


EXAMINING PAPER SHELLS

you will begin to gain a little idea as to what the total output of this vast institution must be.

More than once you will find yourself wondering whether there can be guns enough in the world, or fingers enough to press their triggers, to use such a tremendous production of ammunition. But there are, and the demand is steadily increasing. This old world is a pretty big place after all.

No Labor Troubles

One of the earliest impressions you are sure to get is of the superior grade of employes. These are not the ordinary factory hands, but men and women of a very intelligent type—Americans mainly. They are working under such comfortable conditions of light, heat and ventilation, and the machines are equipped with such devices for safety and convenience, that you are not surprised at this general air of content, so different from that found in many plants.

It is an interesting fact that, among the 2,500 hands, labor troubles have been practically unknown throughout the Company's entire history. This truly speaks volumes, both for the reasonableness of the hands, and the consideration of the management. High wages, steady employment, considerate treatment and opportunities for advancement, these have been the policy from the first, and the men at the top are in many cases those who have grown old in the service.


WEIGHING BULLETS


INSPECTING METALLIC SHELLS

Handling Deadly Explosives

Another thing to strike you is the matter-of-fact way in which these operatives, girls in many cases, handle the most terrible compounds. We stop, for example, where they are making primers to go in the head of your loaded shell, in order that it may not miss fire when the bunch of quail whirrs suddenly into the air from the sheltering grasses. That grayish, pasty mass is wet fulminate of mercury. Suppose it should dry a trifle

too rapidly. It would be the last thing you ever did suppose, for there is force enough in that double handful to blow its surroundings into fragments. You edge away a little, and no wonder, but the girl who handles it shows no fear as she deftly but carefully presses it into

SOME OF THE SHOOTING TESTS

SHOOTING ROOM OF BALLISTIC DEPARTMENT*

moulds which separate it into the proper sizes for primers. She knows that in its present moist condition it cannot explode.

Extreme Precautions

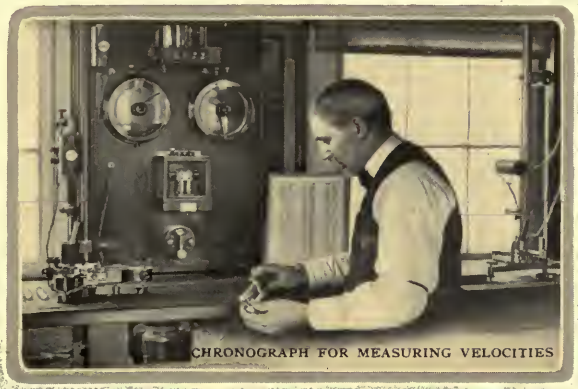
Or, perhaps, we may be watching one of the many loading machines. There is a certain suggestiveness in the way the machines are separated by partitions. The man in charge takes a small carrier of powder from a case in the outside wall and shuts the door, then carefully empties it into the reservoir of his machine, and watches alertly while it packs the proper portions into the waiting shells. He looks like a careful man, and needs to be. You do not stand too close.

*The bullet breaks a metal tape at the moment of leaving the muzzle. This time and the time of striking target are electrically recorded on the Chronograph.

The empty carrier then passes through a little door at the side of the building, and drops into the yawning mouth of an automatic tube. In the twinkling of an eye, it appears in front of the operator in one of the distributing stations where it is refilled, and returned to its proper loading machine, in order to keep the machine going at a perfectly uniform rate; while at the same time it allows but a minimum amount of powder to remain in the building at any moment. Each machine has but just sufficient powder in its hopper to run until a new supply can reach it. Greater precaution than this cannot be imagined, illustrating as it does, that no effort has been spared to protect the lives of the operators.

Learning a Secret

Did you ever find an imperfect



CHRONOGRAPH FOR MEASURING VELOCITIES

PUTTING METAL HEADS ON PAPER SHOT SHELLS

cartridge or shot shell in a UMC box? It is hardly possible. Doesn't it strike you as remarkable that, in an output of something like four million per day, every cartridge should be perfect?

Such things are not accidental. The secret is U M C inspection. Let us see what that means. It means laboratory tests to start with. Here are brought many samples of the body paper, wad paper, metals, water-proofing mixture, fulminate of mercury, sulphur, chlorate of potash, antimony sulphide, powder, wax, and other ingredients, and even the operating materials such as coal, grease, oil, and soaps. In this room we see expert chemists and metallurgists with their test-tubes, scales, Bunsen burners, retorts, tensile machines, microscopes, and other scientific-looking apparatus, busily hunting for defects.

ROW OF PRESSES*

For example, one marker is examining a supply of cupro-nickel, such as is used in jacketing certain bullets. A corner of each strip is first bent over at right angles, then back in the other direction until it is doubled, then straightened. It does not show the slightest sign of breaking or cracking in spite of the severe treatment, therefore it is perfect. Let but the least flaw appear, and the shipment is rejected.

Photographing the Invisible

Another man is engaged in taking photographs of the invisible—invisible, that is, to the naked eye. By means of a powerful microscope attachment he first enlarges tiny metal crystals until it can be seen whether the structure shows the chance of fracture. This is most important. It indicates why U M C shells do not burst in use. Even the severe govern-

*Such is the speed of these presses, that the brief interruption necessary for taking this photograph, caused the loss of nearly 40,000 cartridge shells, although the presses were stopped for less than five minutes.

ment test, requiring that the same shell be fired and reloaded twenty times does not worry this plant, for it has the record of some of its shells, that have been fired and reloaded eighty times, finishing in good condition.

Then come the various branches of the inspection work. These are too many and long to examine in detail. Our guide explains that the Inspection Department is a unit by itself, distinct from the rest of the shop. Its head reports directly to the Manager of Works and is not connected with the manufacturing departments. His word is law. No matter whether a carload shipment is being held up for a handful of one particular kind of cartridge, the car cannot go until this man is satisfied that all are right.

Expensive Care

It is expensive to take such pains. We are told that it costs more to inspect shot shells than it does to load them, and that some of the high-power rifle cartridges are inspected so many times that, were it not for the use of automatic machinery, they could not be sold at a reasonable price. Here and there, as we go, we get glimpses of this process which takes the entire time of several hundred employes. At one point large inspection belts covered with the product, move slowly between rows of bright-eyed girls who occasionally make little darting grabs at something that has seemed defective to their practiced glance. In other rooms, long rows of operatives are holding hands full of shells up to the light, or rolling them over their hands in the same keen search.

The Inspection of Empty Shells

Perhaps it may be interesting to quote from a summary prepared by Mr. Thomas, showing but one stage of the process:

"Shot shells are received by inspection department after the heads, tubes, bodies, primers, and battery cups have been carefully examined, gauged, sized and tested; they are then:

"(1) Gauged for body diameter in chamber gauges.

"(2) Gauged for head thickness and head diameter, and if any quantity of these defects be found, all shells in inspection department of that particular brand are returned to manufacturing department to be either corrected or scrapped.

"(3) Primers carefully examined.

"(4) Entire shell examined for

SHOT TOWER—TALLEST BUILDING IN CONNECTICUT

EMPLOYES OF BRIDGEPORT PLANT GOING HOME FROM WORK

any blemish which might mar the general appearance. Slight scratches on head, or spots on bodies are sufficient causes for their rejection. The average consumer would be unable to determine in many cases, if shown our scrap pile, why the shells in question had been rejected."

Similarly, metallic cartridges must have shells gauged for size of pocket; heads gauged for diameter; shells carefully inspected inside and out for flaws, dents and buckled necks; primer pockets examined for shape and condition; shells gauged for length; shells gauged in chamber gauge for body diameter; necked shells gauged for profile and distance from head; shells examined for depth of primer seating, condition of anvil, and exploded primer; and shells finally gone over for general defects that may have escaped other inspections.

Weighing Bullets

In the same spirit, girls with delicate scales, like those you see in a druggist's prescription department, are weighing the bullets carefully, one by one, hour after hour, day after day, giving all their thought and attention to this one thing; while other employes explode about two million primers a year in testing their sensitiveness.

The loaded shells and cartridges go through a series of gauges and tests seemingly unnecessary after all that have preceded the loading. For example, it does look a little wasteful to see men take shells at random from the various loading machines and packing tables, in order to cut them up and examine the contents. When we learn that a half-million perfectly good shells are thus destroyed each year, it impresses us as painstaking run mad, but it helps to explain why there are no misfires in your U M C box.

Testing for All the World

And then at last come the shooting tests. Five hundred thousand rimfire cartridges, two hundred and fifty

thousand center-fire cartridges, and five hundred thousand loaded shells must still be sacrificed on the various shooting ranges each year, in order to study Velocity, Intensity of Sound, Penetration, Pressure, and Shot Pattern, also the Mushrooming qualities of soft-point bullets, and the Rigidity of those with metal cases. Each of these points in what is known as the "Ballistic" work has special experts and apparatus. There is no guesswork anywhere.

Among other points we step into the gun-room. It looks like the arsenal of a fort. There are case after case of rifles, shotguns, revolvers, and pistols of practically every style, caliber, and make, ever put on the market, some of them classified as English, German, Turkish, Argentine, French, etc. These are all for test purposes, for it is the determination of the Company to produce the standard load for every known kind of firearms; and as soon as a new type appears anywhere, its counterpart finds its way into this room. In an adjoining room, filled with pungent fumes of powder, a rackful of these guns is being used with the appropriate loads.

Thus the process of destruction serves that of construction, and the apparent waste of a large sum of money each year in "burning powder," is really a wise economy. Maintaining the standard at whatever cost, is a business investment in the future.

Deer In the Powder Park

Two miles distant is the powder park, a really beautiful spot where curiously enough, a small herd of wild deer that broke into the park several years ago, have lived contentedly ever since. Many small buildings are scattered through the three hundred and sixty-one acres, and in these is stored the main supply of powder. By means of a pouring plant this powder is turned from the kegs into

NOON HOUR AT ONE OF THE ENTRANCES—THE INDUSTRIAL ARMY JUST BEGINNING TO LEAVE

LARGEST CARTRIDGE EQUALS MORE THAN 1,000,000 OF SMALLEST (HELD ON HAND)

small carriers, and every forty-five minutes one of the Company's little engines takes a single car of these sealed carriers over their private railway to the factory. Thus the powder is delivered only as fast as needed.

Various Departments

It is not our purpose to see things systematically, and we shall ramble at will from one department to another. At one place we find whole rows of machinery turning out old-fashioned percussion caps, and realize that there must be still many of the old muzzle-loading nipple guns in use in various out-of-the-way corners. Again, we find somewhat similar machines pressing the steel linings that have made the U M C steel-lined shot shells famous the world over.

In another room we sniff the fragrance of cooking flour, suggestive of a cracker bakery, but it is only paste for the paper tubes of the shot shells. Again, here is the heavy, steamy odor of wet felt where the wads are being made; and there on the other hand, are printing presses of unusual shape turning out a shower of printed "top-shot wads."

If you look at the end of your shotgun load you will find the shell closed with a disc of cardboard bearing the size and description of that particular load. If you were to dig out this disc you would find it printed on both sides. Why?

Economy of Handling

Formerly these were printed on one side only, but in handling millions of such small objects a large number were sure to be turned over, and then needed to be righted. This took time, and time is money. Finally it was decided to print on both sides, which was quite as easy, and then the discs would be always right side up.

Other presses are printing labels and box covers. At one point girls are fitting cardboard boxes together with a deft speed that is fascinating to watch. At other points packing is going on with many clever little mechanical aids to quick handling.

And then there are the great warerooms for raw materials, and the other rooms for crating, marking, and trundling into waiting box cars.

The Big Teapot

High above the huge plant stand two objects that may be seen for miles around. One of these is the new shot tower, and the other the water tank of one hundred thousand gallons,—the "big teapot" they call it familiarly—which is connected with the intricate system of sprinkler pipes

in every building. This means that every nine square feet of floor space has automatic fire protection.

Near this is the power plant with its lofty boilers, mighty engines, and marvelous dynamos sending life through wires to the army of machines.

The electrical equipment is of the finest, and the switchboards are everywhere enclosed in wall cases with glass doors and asbestos lining, to guard against chance of accident.

Built in Seven Months

All this time, however, we have had the shot tower in mind. Occasionally we have caught glimpses of it from various windows, and when we have stepped outdoors in passing from building to building, there it has stood, dominating the whole scene.

Our guide, with the satisfied air of having saved the best for the last, now says that we will go there, and tells us, as we cross the yard, how it was rushed to completion in seven months, and that it represents the last word in scientific shot production.

The great building is solid masonry, metal, and concrete. There does not seem to be a burnable square inch about it anywhere. Two large iron cylinders descend in the center, coming down through the ceiling from above; we are invited to look through an open port in one of these.

Raining Shot

We see nothing but the whitened opposite wall, against which a light burns.

It appears absolutely empty, though within it is raining such a swift shower of invisible metal that if we were to stretch our hands into the apparently vacant space they would be torn from our arms.

A large water tank below is churned into foam with the impact of the falling shot, and as we look downward we make out finally the haze of motion. It is so interesting that we take the elevator and rise ten stories to the source of the shower.

Here high in the air are the large caldrons where many pigs of lead, with the proper alloy, are melted into a sort of metallic soup. This is fed into small compartments containing sieves or screens, through the meshes of which the shining drops appear and then plunge swiftly downward.

Cascades of Shot

But this only begins the process. Taken from the water tanks and

POWDER CAR ON PRIVATE RAILWAY CONNECTING PLANT WITH POWDER FARM

hoisted up again, the shot pellets, in a second journey down, through complicated devices, are sorted, tumbled, polished, graded, coated with graphite, and finally stored.

The building is almost bare of workmen; everything is mechanical.

One pretty sight is that of cascades of shot pouring out of spouts, and rolling smoothly down glass inclines, tier above tier. Here perfect shot, moving more swiftly than the occasional imperfect ones, shoot over low partitions, which check the latter, and drop them into separate bins. Nothing imperfect enters any U M C load.

A Bunch of Statistics

Now we return to our starting point, but our guide feels that we should take with us figures of what we have seen, and runs over the following list:

"There are one hundred and one buildings with a total floor area of sixteen acres, in a twenty-five-acre tract. Including the powder park and other land, the Company owns four hundred and twenty-seven acres.

"There are fifty thousand dollars' worth of fire protection apparatus.

"The private railway system includes about a mile of track between the buildings, in addition to the track running out to the powder park.

"About four million loads are produced each working day. These require an average of thirty-five operations each, or one hundred and forty million operations in ten hours.

"One day's shipment will sometimes run to seven million loads.

"From four to five million paper wads are cut every day.

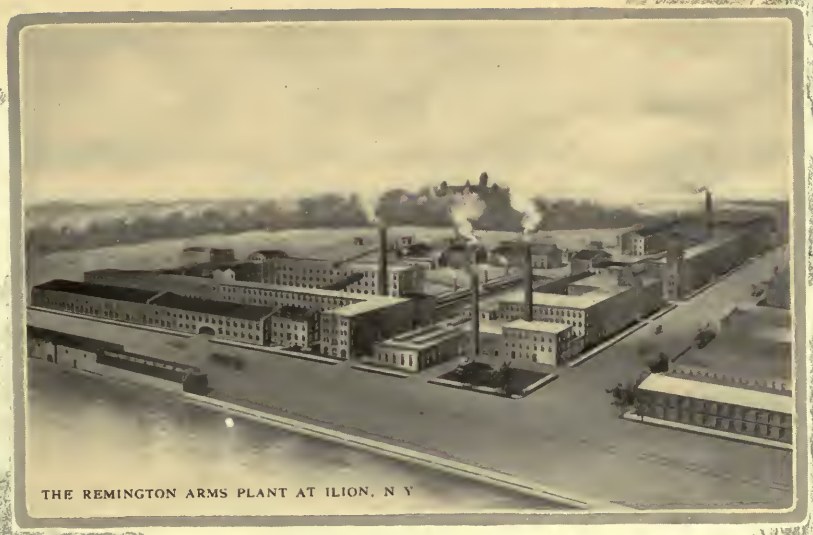
"In the shot tower one hundred and fifty tons of metal can be daily converted into the inconceivable total of twelve hundred million—one and one-fifth billions—of shot pellets. Laid out in a row touching each other, one day's production of shot would reach two thousand miles, or from New York to Salt Lake City.

"The ammunition produced ranges all the way from tiny 'B. B. cap' cartridges to five-inch shells. Something over one million of these smallest cartridges would be required to equal one of the largest."

MARCELLUS HARTLEY DODGE
PRESIDENT
AT THE BRIDGEPORT PLANT

The Office Building

Nothing has been said of the brain of the plant, its offices. These are to be found in every factory, but rarely so spacious as here, occupying as they do a whole building with many departments. Here we began, and here we end our journey, with bodies tired and minds weary but interested.



THE REMINGTON ARMS PLANT AT ILION, N Y

An Interesting Day at Ilion

The Growth of Eighty Years

Not far from the banks of the Erie Canal, where it runs through Ilion, stands a group of large brick buildings about whose early days we have already learned. Here, as described in an earlier chapter, came Eliphalet Remington more than eighty years ago; but how amazed he would have been could he have realized the greatness of its present growth, for, as we roam through the works, we come upon signs, "Building No. 53," "Building No. 69," etc. It is borne in upon us that a deal of space is required to produce all the Remington arms that the world demands.

Of course, as in the cartridge factory, we find here similar vistas of swiftly whirring shafts, belts and pulleys; long rows of resounding machinery, and armies of operators. There are, however, points in which the manufacture of guns differs from all other processes. These we will notice especially.

To Prevent Bursting

At the outset, we touch a point of interest. When you raise a gun to your shoulder you take a chance. It must be pressed close to your face, since that is the only way for you to sight it. It must contain a powerful charge, or it will not shoot to kill. Suppose that there be a flaw in the barrel near the base, the gun might explode with serious results.

This often happened with the clumsy arms of olden time. It is occasionally heard of today.

Therefore, if you are a sportsman, it is reassuring to step into the room where they test materials. Modern science has learned a thousand things. It takes no chances.

A new shipment of steel enters the works. It comes from a steel mill famous for its products, and is sup-

posed to be made upon a formula which must give perfect results, according to the laws of metallurgy, but even these passports are not sufficient. It must stand the test.

By Machine and Chemistry

Accordingly, numerous samples are taken from different parts of the lot and fashioned into "Test Plugs." Question number one is asked of the metal by the keen-eyed man in charge of the laboratory:

"Were you carefully made upon that formula? Do you contain the exact percentage of carbon which will give the best results?"

The answer involves weighing in the most delicate scales, and testing with chemical reactions until it is absolutely certain that the steel is according to formula, and is uniform throughout. But this does not pass it until question number two is asked:

"Are you as strong as you should be? Come, show your strength."

And now the test plugs go into a powerful contrivance that strains them in the most scientific way, and shows the answer upon an indicator. Since the giant force of 300,000 pounds pressure to the square inch can be brought to bear, the slender plug must break at some point, and this point is carefully recorded.

If it fall even a trifle short of the strength required, which is 5,000 pounds to the square inch, more than double the pressure of a service charge, the steel is rejected. That is one of the reasons why you can raise your Remington to your face with perfect safety.

Remington arms, by the way, are made of "acid open-hearth steel," which is stronger, weight for weight, than the Bessemer steel used by most manufacturers.

We "Pass the Test"

If visitors were tested as severely as the material, we should all be turned back at this point. Fortunately, we are favored and allowed to pass inside. Here we spend, most interestingly, several hours wandering from building to building, and admiring the ingenious skill with which the modern firearm is produced.

Some departments quiver with the shock of huge hammers which come crashing down upon the metal parts and give them, roughly, the shape that later will be finished and perfected by machine and tool.

At other times, we stand fascinated by the automatic machinery that hums busily along, almost unattended as some faithful, intelligent servant who can be trusted to work by himself.

In one place, a press is rapidly engaged in giving the correct bend to

AN UNEXPECTED MEETING

The "Kentucky Rifle" with its Flint-Lock was Accurate but must be Muzzle-Charged

REPEATING SHOTGUN
MACHINING DEPARTMENT

some small but important part. It stops its great pressure at exactly the right point with the most mathematical nicety, and a visitor remarks: "Such a delicate touch as that might almost play billiards!"

Making Barrels

One of the most important features is, of course, the making of barrels. The machines for drilling and boring are the best that money can buy, and the operatives the most skilful to be found anywhere. Care at this stage reduces the necessity for straightening later. Every point is given the minutest attention. In drilling 22 calibers, for example, the length of the hole must be from 100 to 125 times the diameter of the drill.

Improvements have made it possible to drill harder steel than formerly. This reduces the weight of the gun, and is important to the man who carries it.

Taking off 2-1000 of an Inch

The boring is an especially delicate task. In choke-boring your shotgun, for example, the final reamer took off only 2-1000 of an inch. Think of such a gossamer thread of metal! But it insures accuracy. No pains can be too great for that.

This exquisite painstaking will be seen still more in the barrel-inspection department, to which we will go now. In passing, we must not forget the grinding shop where is perhaps the finest battery of grinding machines in the United States; or the polishers running at the dizzy speed of 1,500 to 1,700 revolutions per minute, and making the inside of the barrel shine like glass. This high polish is important for it resists rust and prevents leading.

That is the atmosphere of the whole place. Every action has its reason. There is not an unnecessary motion made by any one, and there is not one necessary thing omitted, whatever the cost or trouble.

ASSEMBLING REPEA

Looking at Reflected Lines

But here is the Inspection Department. Hanging in the windows are translucent frames with a black line across the center of each. You will see one of the inspectors take a barrel from the waiting rack, hold one end toward the light, squint critically through the tube, and lay it aside approvingly.

You pick it up and follow his example. First, you point it straight at the black cross-line on the frame. Then you tip up the farther end ever so little, and see how two reflected shade lines form on

the shining inner surface and run down the barrel toward your eye. These lines are straight as a die, therefore, the barrel is perfect. Should either one waver the slightest fraction the inspector's quick eye at once detects it. Yours might not. Swiftly he picks up one after another and repeats the process. Ah! there is one that doesn't satisfy. This he places in a frame having a three-point bearing; taps it gently once or twice, looks through it again, repeats the process, and now finds it absolutely true.


GUNS AND RIFLES

Or perhaps he uses a slightly different device and does the straightening with a hook instead of a hammer. Either method accomplishes the purpose.

An Inspecting Machine

But the spirit of the factory never rests contented with past achievements. That is why there is now being introduced a new machine, of even greater delicacy, showing reflected circles in the barrel, and doing the straightening mechanically. No other manufacturer uses such a machine.

We must not forget the gauges. Have you any idea how many times your Remington rifle or shotgun has had to pass through the gauging process? Not a single part of the mechanism could go to the assembling room until it had been separately measured and proved perfect.

There are two hundred and forty-five inspection points, and five hundred and seventeen gauges must be used: forty-nine on the guard; forty-six on the receiver; thirty on the breech-block, and so on. On the receiver for the No. 10 repeating shotgun, however, seventy gauges are used, and thirty-one for the trigger alone.

Beyond the Power of Sight

Some of these gauges are marvels of delicacy, but there is one machine used which perhaps has never been equaled. Not only will it make measurements to one twenty-thousandth of an inch but it is actually sensitive to differences of a one hundred-thousandth of an inch. Such a minute dimension we can not even imagine; it is beyond the range of the most powerful microscope, and yet here is a piece of mechanism which can really detect it.

Compare this with the machine which can test material up to 300,000 pounds to the square inch, already spoken of. Do you wonder that an arm coming from a place


ASSEMBLING AUTO SHOTGUNS

PAST AND PRESENT MODELS

RIFLES

1. Harper's Ferry muzzle-loading musket.
2. Transformed Springfield breech-loader.
3. Geiger patent 50 caliber carbine.
4. Beales pat. 44 caliber sporting rifle.
5. Thomas pat. rifle cane, 22 and 32 cal.
6. Remington pat. military rifle.

7. Remington pat. military carbine.
8. Keene pat. sporting mod. repeater.
9. Knife bayonet for military rifle.
10. Remington pat. small-bore sporting.
11. Lee pat. military rifle, saber bayonet.
12. Remington pat. sporting, No. 2 model.
13. Hepburn pat. target, No. 3 model.

where they use such devices should be a "game-getter"?

From Past to Present

One room links us with the past, for in it are to be found a collection of the guns manufactured at Ilion during the past fifty years. We look in vain, unfortunately, for examples of the original rifles as made in the little forge by the brookside; even the Jencks carbine, which began the series of Government contracts, is not shown.

Here, however, is the "Harper's Ferry" model, —an antiquated muzzle-loading musket—while the next in order shows the great step to the breech-loader. In the third, the nipple-lock has been replaced by one of more modern make; a little farther beyond is seen the entry of the famous dropping breech-block backed up by the hammer. It was this improvement that started the flood of foreign orders narrated in "The Romance of Remington Arms."

PISTOLS AND REVOLVERS

1. Rider pat. 22 & 44 cl
2. Eliott pat. 41 cal. double derringer

3. Rider pat. 22 cal.
4. Rem. pat. 44 cal.
5. Smoot pat. 41 cal.
6. Eliott pat. 32 cal.
7. Beales pat. 32 cal.
8. Rider pat. 50 cal.

Passing over several types, the next to claim special attention shows the transition from single-fire to repeater. This is the Remington-Lee bolt-mechanism rifle, developed after years of experimenting in this factory. It constitutes the parent of modern military rifles, and is the arm that was first used in battle by the Chinese, as already described, proving so superior to the Kropatchek rifles of the French.

The series of rifles culminates, of course, in the familiar pump—or trombone — action, and the automatic repeater; in this latter the recoil is utilized to perform all the operations of setting, firing, ejecting empty shells, and replacing them with fresh loads.

9. Beales pat. 38 cal.
10. Rider pat. 32 cal. magazine repeater
11. Smoot pat. 32 cal.
12. Eliott pat. 41 cal. single derringer

13. Smoot pat. 38 cal.
14. Eliott pat. 22 cal.
15. Rider pat. 32 cal.
16. Rem. pat. 22 cal.
17. Beales pat. 44 cal.

Shotguns, Pistols, and Revolvers

Nor must we overlook the similar progress, as here set forth, in shotguns, from the dropping breech-block type to the trombone action and automatic repeaters. Shotguns form an increasingly large proportion of the total output, because of the greater number of sportsmen hunting birds and other small game. The requirements of these hunters are closely studied. The many styles of pistols and revolvers displayed are relics of the past. Their manufacture,

MODELS—Continued

14. Remington pat. juvenile, No. 4 model.
15. Remington pat. juvenile, No. 6 model.
16. Remington pat. target, No. 7 model.
17. Browning pat. sporting, auto-loader.
18. Pedersen pat. trombone repeater.

SHOTGUNS

19. Rider pat. 20 ga., single shot, No. 1 model.
20. Whitmore pat. 12 ga., 2-bar'l, lift lever.
21. Remington pat. 12 ga., 2-bar'l, mod. 1889.
22. Rem. pat. 12 ga., 1-bar'l, semi-hammerless.
23. Rem. pat. 12 ga., 2-bar'l, hammerless.
24. Browning pat. 12 ga. auto-loader.
25. Pedersen pat. 12 ga. trombone repeater.

with the exception of the double derringer, has now been discontinued by the Company in order to concentrate attention upon the production of rifles and shotguns.

Rifling and Other Matters

There is much more to notice as we go from building to building in the big enclosure. In some places we come out upon elevated passageways, running over the roofs of buildings; we examine with interest the rifling department, one of the most critical points in the shop where the shallow spiral grooves are cut into the barrel in order to give the bullet the rotation which will keep it true in flight. These grooves of course must be of exactly the right depth and spiral that the best results shall always follow.

We shall see, without stopping to describe, the big oil-pumping engines that supply oil for the lathes and drills; also the brazing furnaces, together with many other things; and we shall come at length to the gun-testing rooms.

"What!" you exclaim, "more tests? Is there to be no end to it?" Apparently not, for these are Remington guns with ninety-five years of reputation to sustain.

Testing with Loads

First, then, is the barrel as perfect as we believe it? We know that it is perfect in gauge and workmanship, but is there the slightest chance of an invisible flaw in material? The original tests of material made this very, very unlikely, but we will take no chances. If there be such a flaw, it must burst at more than double the service charge.

Accordingly the gun is laid in a rest with its muzzle pointed through an opening in the wall into a bank of sand. We get behind a steel plate for safety, and put cotton in our ears; the trigger is pulled by means of a string,—bang! the gun is uninjured; its strength has been assured.

Then follow tests for action and speed, and if the gun be an autoloader the swift rattle of its discharges is surprising. The well-gauged parts move as smoothly as the works of a watch. And finally there are the target tests.

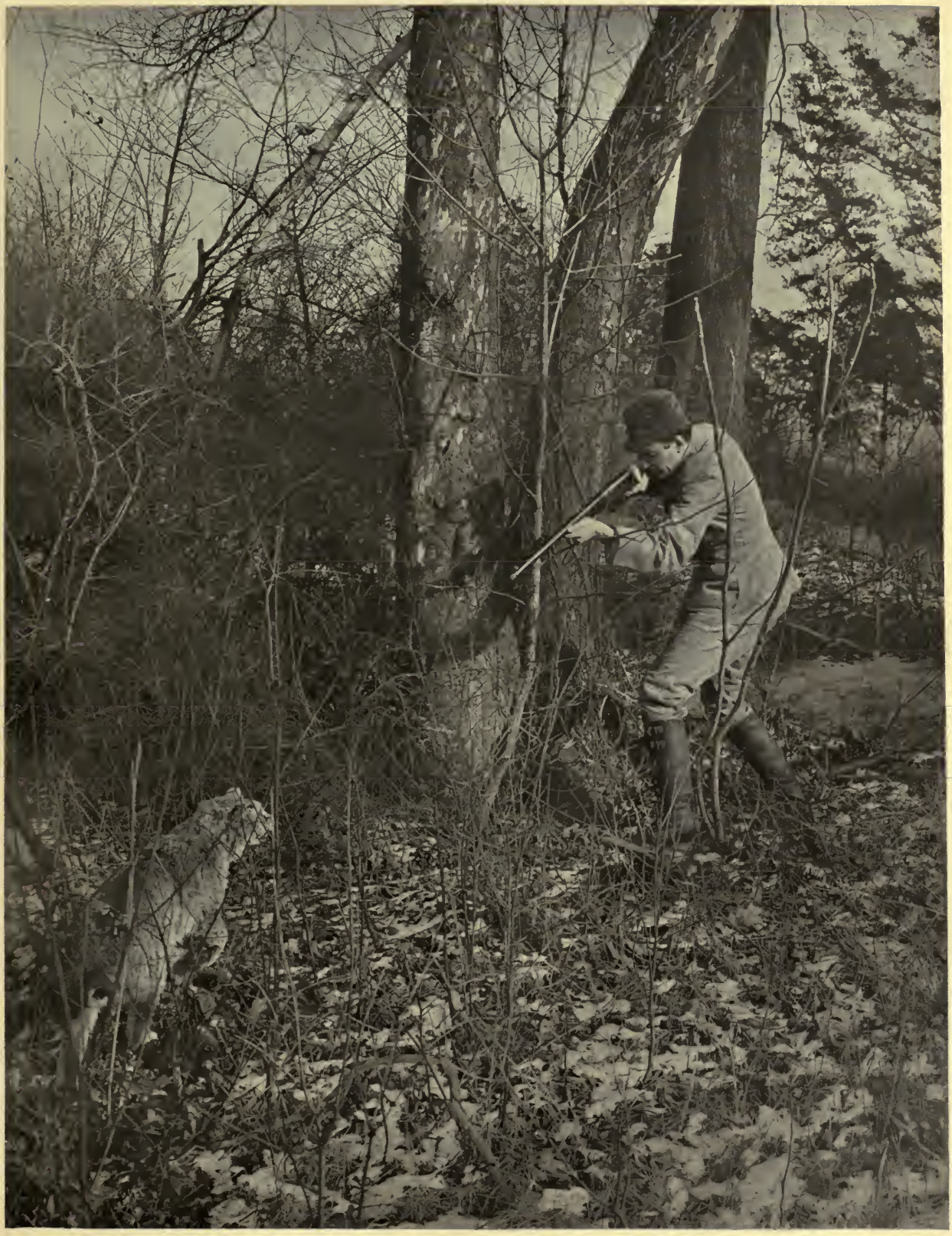
Firing at Targets

Rifle after rifle in succession is laid in a rest and fired at a mathematically divided target upon the hillside.

The results are noted through a telescope. Difficulty at this point invariably rejects the rifle.

Shotguns are discharged at paper targets in the shooting gallery. We walk through the hallway that runs outside to the point where a boy is handling the targets. We hear a distant bang. The boy pulls a handle in the side of the wall, and a frame emerges bearing a well-peppered sheet of paper. This he unfastens and hangs up for reference, pinning a fresh sheet in its place. These targets must all be examined and every shot-hole be counted. If in any case there be found less than 75% of the shot within a circle of thirty inches from the center, the gun is at once rejected.

Every Remington gun must pass triumphantly through each of its tests. You will find the inspector's mark at the base of your rifle or shotgun barrel; it is never placed there



MASTER OF THE SITUATION

The Modern Sportsman with his Remington-UMC Automatic Rifle is Prepared for all Emergencies

until the completion of this entire process.

Utilizing "Kicks"

The auto-loading gun, the especial pride of the Remington Works, with its solid breech, its side ejectment, its perfect balance, and its self-acting mechanism, makes use of the recoil,—"the Kick"—and turns it into service. Something very much like this, in another sense, takes place in the factory office, and perhaps it is after all the most interesting feature of the institution. All the rest deals with the present, but this has its bearing on the future.

Once a week, on Tuesday, the department heads gather for the purpose of discussing all letters, suggestions, or complaints. Complaints? Is it possible that such incredible pains as we have witnessed can ever fail to satisfy? Yes, occasionally, for the human being is a curious creature, and no one has ever satisfied him everywhere.

But the Company invites complaints, is grateful for them. Each point is weighed and discussed with as much care as the inspection of a barrel. Many minds have

UNUSUAL TYPES OF ARMS OVER BOARD ROOM MANTLE

many points of view. It is possible that some kick may contain a hint of great value, of which no one has yet thought. The kick must be made of service.

Your Letter

Therefore, if at any time you feel moved to write to the makers of your gun, you may do so with the certainty that the letter will be read and discussed around the table in the long room, that has the big bison-head at one end, surrounded by a collection of curious and historic guns. There men, who have made guns for more years, perhaps, than you have lived, will consider every point you raise, and if it should happen, as might chance, that the point you make be new, they will hold you in grateful remembrance.

WHERE THE CONFERENCES TAKE PLA

The New Chapter

The Greater Future

THIS is the Chapter of the years to come. Thousands of dealers, and millions of customers will help us write it in every land. You have already traced with us the biographies of two great institutions. Each started with small beginnings, and rose steadily to a stage many times greater than was dreamed in its early days. In so doing the Remington Arms Company acquired acknowledged leadership in the manufacture of rifles and shotguns, while the Union Metallic Cartridge Company became easily the world's foremost producer of ammunition. Then one day in the recent past two famous trade-marks slipped quietly into one, thus:

Remington + UMC = REMINGTON UMC

A new chapter—this Chapter—in the world's industrial history had begun.

A Symbol and What It Means

Trade-Marks and symbols may mean much or little. "Old Glory" beheld the first time is merely a pretty flag, but an American who sees it flying in some foreign land, bares his head,

and thinks with emotion of the great Republic it represents. "Remington" and "U M C" call to mind the years of time, the lives of men, and the millions of capital, that have been devoted to the upbuilding. Each has gained a meaning, full of interest to those who know, but taken together they represent a force, so much greater than the sum of both, that it may be years before the world realizes its full significance.

The new trade-mark, therefore, stands for the tremendous weight of past achievements, but its principal bearing is on the future.

It means that the greatest experts known to both industries have been brought into close co-operation under a single head. This is important in view of the fact that guns are made for ammunition, and ammunition for guns. Each is useless without the other. An improvement in either, that is not accompanied by a corresponding improvement in the other, loses much of its value.

Creative Brains

But two corps of experts working together from both sides of a single problem, are like the two blades of a pair of shears cutting swiftly and truly because of their union. There can be no uncertainty under such conditions. Every new theory in gun-making must be developed through the co-operation of those who will produce the ammunition for its use. Every idea, arising in the busy brains of the cartridge and shell makers, is instantly influenced by the keen practical judgment of the Ilion authorities. Thus it does not have to stand the test of outside use in order to prove success or failure. From the start it necessarily is right.

Matchless Facilities

Brains, however good, must be backed by resources. The Remington Arms-Union Metallic Cartridge Co. has the advantage of unequaled facilities. From laboratory apparatus to mechanical equipment, commercial organization, and financial capacity, its development is not hampered at a single point. Many of its devices are exclusive, and every new resource of value, that can contribute ever so slightly to the general welfare, is supplied as soon as it appears.

Impelling Spirit

But more important than either, is the spirit behind both men and means. This country stands upon the threshold of greater commercial development than the world has ever seen. No past leadership will suffice unless newly won with each new year. Manufacturing, no longer merely an industry, is coming to be thought of as a science and an art. The full, broad realization of these facts is the largest asset of this Institution; its dominating thought of the future, and its determination to keep a place in advance of even the general forward movement, constitute the strongest insurance that every development of value will make its first appearance bearing the symbol "Remington-U M C"