1980

Surface Treatment of Metals

Dorothy Dunkirk-Bennett
Eastern Illinois University

THESIS REPRODUCTION CERTIFICATE

TO: Graduate Degree Candidates who have written formal theses.

SUBJECT: Permission to reproduce theses.

The University Library is receiving a number of requests from other institutions asking permission to reproduce dissertations for inclusion in their library holdings. Although no copyright laws are involved, we feel that professional courtesy demands that permission be obtained from the author before we allow theses to be copied.

Please sign one of the following statements:

Booth Library of Eastern Illinois University has my permission to lend my thesis to a reputable college or university for the purpose of copying it for inclusion in that institution's library or research holdings.

Dec 8 1980

Date Author

I respectfully request Booth Library of Eastern Illinois University not allow my thesis be reproduced because _____

_____

_____

_____ _____

Date Author

m

SURFACE TREATMENT OF METALS

(TITLE)

BY

Dorothy Dunkirk-Bennett

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

Master of Arts

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
CHARLESTON, ILLINOIS

1980
YEAR

I HEREBY RECOMMEND THIS THESIS BE ACCEPTED AS FULFILLING
THIS PART OF THE GRADUATE DEGREE CITED ABOVE

12/1/80
DATE

ADVISER

12/3/80
DATE

DEPARTMENT HEAD

SURFACE TREATMENT OF METALS

BY

DOROTHY DUNKIRK*BENNETT

ABSTRACT OF A THESIS

Submitted in partial fulfillment of the requirements

for the degree of Master of Art at the Graduate School of

Eastern Illinois University

CHARLESTON, ILLINOIS

1980

The purpose of this thesis is to relate to others my experimentation of various types of metals, and the methods employed to decorate the surfaces of these particular metals. The differences, and similarities in means of working with and decorating each type of metal used is also discussed.

The first part of the paper is devoted to a brief history of metal techniques. This gives a better understanding as to when the particular techniques were first employed and how many of them were almost lost with the arrival of nineteeth century industralization.

Techniques which I used, and the various means of achieving them is discussed next. This brings an understanding to the reader when the series of works are explained in the final section of the tesis.

The final portion of the paper gives detailed explainations of each of the pieces done while experimenting with the various techniques. Particular Problems which arose with the incorporation of techniques are discussed, along with the sucess of others.

I conclude the paper by noting that the major problem in my working with surface treatments was, that more forethought about accual construction was necessary. New techniques needed to be explored to avoid the quailities of dullness and staliness.

TABLE OF CONTENTS

LIST OF COLOR PLATES

INTRODUCTION

While still an undergraduate student, the interest in metals and the various methods used to decorate the surface of them increased. Work began with silver, copper and gold in jewelry classes and later steel and copper were experimented with in the field of sculpture. The techniques that were used were not new to the field of metalwork, but they were new and challenging to me.

Working with metal was a tedious and precise art, with little room for error. Each seam in the metal had to be perfect because repairing such imperfections made room for greater error.

It was surprising to find that all the different metals used were so much the same as far as assembling and decorating them. They varied in the degree of heat needed to fuse them together, as well as the amount of heat used to make the metals pliable.

Steel was the hardest metal to form of those used. A forge was needed if there was to be much shaping of the metal, unless it was an extremely thin gauge, in which case an acetylene torch could be used. Steel welding rod and an oxygen-acetylene gas torch was used to connect two pieces of steel into a long joint called a seam.

The other three metals worked with were all very similar in malleability. Silver, gold, and copper could all be shaped very easily after being annealed. Annealing was heating the metal to render it soft for further cold working. All three of these metals were seamed by soldering, using flux, gold or silver solder and a torch. Copper could also be seamed together using a brazing rod. This was similar to welding, the difference being that a brass rod was used to bond the two pieces of copper together rather than fusing the metal together, as in welding.

The basic techniques needed to work in the field of metals were learned as an undergraduate. This gave me the basis upon which I could experiment with surface treatments.

HISTORY

Metalwork dates back to prehistoric, primitive man and his copper ax. Since that time there have been a great number of improvements in metalwork itself and its techniques.

Actually, metalwork per se originated in the Eastern Mediterranean about 2500 B.C. with the formulation of a new material, bronze, which was harder than the metal already known to man, copper.[1] It was this time period which gave rise to some of the first decorative metal techniques we know of today: casting, embossing, forging, engraving, and repousse.

In the time span between ancient and medieval periods, there were not many advances made in the area of decorative metalwork. But the arrival of the Middle Ages did bring some advances: enamels, filigree work, mounting of cabochon stones, and seal and stamp cutting. The latter technique gave rise to the first minting processes.

By the time the Renaissance had arrived and gone, most of the decorative techniques we know of today were in existence. Most of these techniques have remained relatively unchanged technically for hundreds of years, though, of course, stylistic changes have occured.[2]

The arrival of the nineteenth century brought a major setback. The century of industrialization not only destroyed the organization of the metalcraft occupations, it also deprived

most of them of the very reason for their existence.[3] New machines made mass production of metal products cheaper for the consumer, thus making the crafts business financially non-competitive. In many instances, the new machines almost eliminated all the decorative techniques and years of metal-work by craftsmen.

Metalwork has recently returned to the old concept of an art form. This has put an emphasis on the aspects of skill and craftsmanship. While progress has been slow, much re-educating has been accomplished.

The following pages will go into more detail explaining the basic techniques used in this form of art and discuss personal attempts, both successful and unsuccessful, in jewelry and sculpture.

TECHNIQUES

PIERCING

Piercing is the technique of making holes and/or lines in the metal using drills and a jeweler's saw to achieve functional and decorative effects. This type of work requires careful planning of lines and accurate cutting with the saw.[4]

The first stage of this, or any technique, is the careful planning of the design. This is especially important in working with metals because mistakes are almost impossible to hide.

The design then has to be somehow transferred to the metal for reference. Two simple methods are:

1. Place a sheet of carbon paper between the design and the metal and trace it onto the metal itself.
2. Cover the metal with masking tape or some other adhesive material and draw the design on it. The masking tape can be removed once the entire process has been completed.

In order to place the saw blade in the metal to cut an interior design, a hole must be drilled. Using a drill bit about the same size as the saw blade, a hole has to be drilled at some point in each individual area that is to be pierced. Additional holes can be included for the sole purpose of design.

The saw blade is then inserted into the drilled holes with the teeth pointing downward. The blade is used in a vertical position and moved up and down with a very slight forward pressure to saw the design in the metal. The jeweler's saws are very fine and will break easily if very much pressure is used or if the blade is twisted.

The final step is to smooth the edges where the piercing has been done. For larger areas, needle files are used. In the smaller areas, such as pierced lines, a small piece of emery cloth can be used. This technique was used in Figure 5, page 20, and Figure 8, page 27.

REPOUSSÉ

Repoussé is the decorative process of beating out the shape of metal, usually from the back, utilizing punches and hammers. The process is usually followed by chasing with small chisel-like tools from the front of the metal which gives the design definition and development.[5]

The initial step in starting to repoussé a piece of metal is to anneal the metal and place it in a bowl of pitch. Annealing is the process of heating the metal with a large, soft reducing flame, until the metal attains a low-red color. The metal is then dropped into a pickle solution of dilute sulphuric acid to clean off any oxides. Annealing is done to avoid any cracking of the metal during the repoussé process.

The bowl of pitch is used as a supportive, yet resilient, backdrop, so that it will conform to the new shape you are giving to the metal and still be rigid enough to hold the metal in place.

The tools used to do the actual repoussé work are blunt, polished steel punches made of rectangular hardened steel stock and are about five inches long. A chasing hammer has a flat smooth face on one side and a balled end on the other side. The handle is tapered and has an oval, or pistol end, designed to give the hammer some spring which is necessary during both repoussé and chasing. The flat face of the hammer is used to strike the punches.

The next step is the actual act of doing the repoussé technique. Because this technique is usually used on the back side of the metal, it is important to remember that the work is in reverse of what the final results will be. The punch is then moved across the metal by the hammer blows to achieve the desired effects.

After the design has been completed, the pitch must be heated to remove the metal from it. Additional heating of the metal is needed to burn off any pitch which remains once the entire process has been completed.

This technique is seen in Figures 2 and 3, page 16, Figure 7, page 24, Figure 8, page 27, Figures 9 and 10, page 31, and Figure 11, page 32.

CHASING

Chasing is the decorative metal process involving surface modeling of metal from the front with the aid of various-shaped punches and a hammer.[6]

This process is similar to that of repoussé, except that the front of the metal is being struck instead of the

back. The punches used in repoussé yield a rounded surface, while the ones used in chasing are able to produce sharper, more defined lines and shapes.

Chasing can be used on a piece that has had repoussé work done on it to greatly refine and define the forms in the design that have already been produced. It can also be a totally independent form of decoration used completely alone.

Figure 5, page 20, Figure 4, page 18, Figure 6, page 22, Figure 7, page 24, Figures 2 and 3, page 16, and Figure 15, page 40, show examples of this technique.

ETCHING

Etching is a simple process of removing unwanted metal by the use of an acid solution. After executing a design, cover the entire piece of metal with a very thin coat of wax. The areas that are to be etched are carefully scratched through the wax resist with a thin, sharp instrument. The areas that have been scratched are the areas that will be etched.

The metal is now ready to be placed in the acid solution, which for silver is one part nitric acid and three parts water.[7] Never allow the solution to come into contact with your skin; very severe burns will result.

The acid should be used in a pyrex or stoneware container and when preparing the acid always add the acid to the water. If the water is poured into the acid, there will

be fuming and spattering which could prove to be dangerous to the person mixing the two.

The amount of time that the metal is left in the acid solution will depend on how deep you want the etched impression. Observe the metal and remove from the acid with a pair of wax-coated tweezers when the impression is satisfactory.

After removing the metal, wash it with water before handling the surface. Then burn the wax off the metal with a soft flame. The surface may then be finished as desired.

Figure 1, page 13, is an example of this particular technique.

PATINA

Patina is the process of achieving a color coating on the metal by the use of chemicals, or as a result of natural atmosphere over a period of time.

The following patinas were employed on the pieces described later in the paper.

Figure 13, page 36, was coated with the following chemical process to turn the piece a blue-green color. The piece was immersed in a boiling solution of:

1 ounce Sodium Thiosulphate
8 ounces Iron Nitrate

After immersing the piece, the following solution was painted on:

8 ounces Copper Nitrate
4 ounces Ammonium Chloride
4 fluid ounces Acetic Acid (6%)
1 fluid ounce Chromic Acid
1 gallon water

Then the entire process was repeated after the piece was dry.

The patina used on Figure 16, page 42, was:

15 parts Nitric Acid
8 parts Copper Sulphate
20 parts Alcohol
125 parts water

The patina was painted on the piece to render a blue-black coloration.

BRAZING

Brazing is a technique using a brass rod to fuse metal together or to decorate the surface of metal. Copper and steel were covered with the brazing rod to add color and interest to the following pieces: Figure 13, page 36, Figure 14, page 38, and Figure 15, page 40.

SERIES OF WORK

ETCHED PLATE (Figure 1)

The first attempt at surface treatment was a silver plate which lent itself readily to the etching process. The sunken area of the plate appeared to be surrounded by the rim in much the same manner as a print is framed by the mat. This allowed the unique opportunity to use etching as the final decorative process as opposed to the intermediate stage as in printmaking.

The plate was formed in a specially constructed die. Several sheets of plywood were taken and holes the size of the center of the plate were cut in the center of them.

The plywood was then glued together and mounted on a solid sheet of plywood. There was one other piece of plywood used. It had a slightly larger hole in it and could be screwed on to the form to hold the silver sheet over the depression created in the constructed form.

The next process was to sink the center of the disk. After annealing, the silver was placed in the form and very carefully struck with a ball-peen hammer until the desired depth was achieved.

The plate was then removed from the form and completely coated with a thin layer of wax to prepare it for etching. A dissecting probe was used to draw the desired design through the wax. The plate could then be immersed in the acid.

After about twenty minutes, the plate was taken out of the acid and the wax removed. While etching was successful, there were a few areas where the acid had undercut the wax, and fairly large areas of silver were unintentionally cut away. With that exception, the outcome of the project was pleasing.

The etched pattern of the design fit well within the confines of the shape, and offered a pleasing textural contrast to the polished surface of the remainder of the plate.

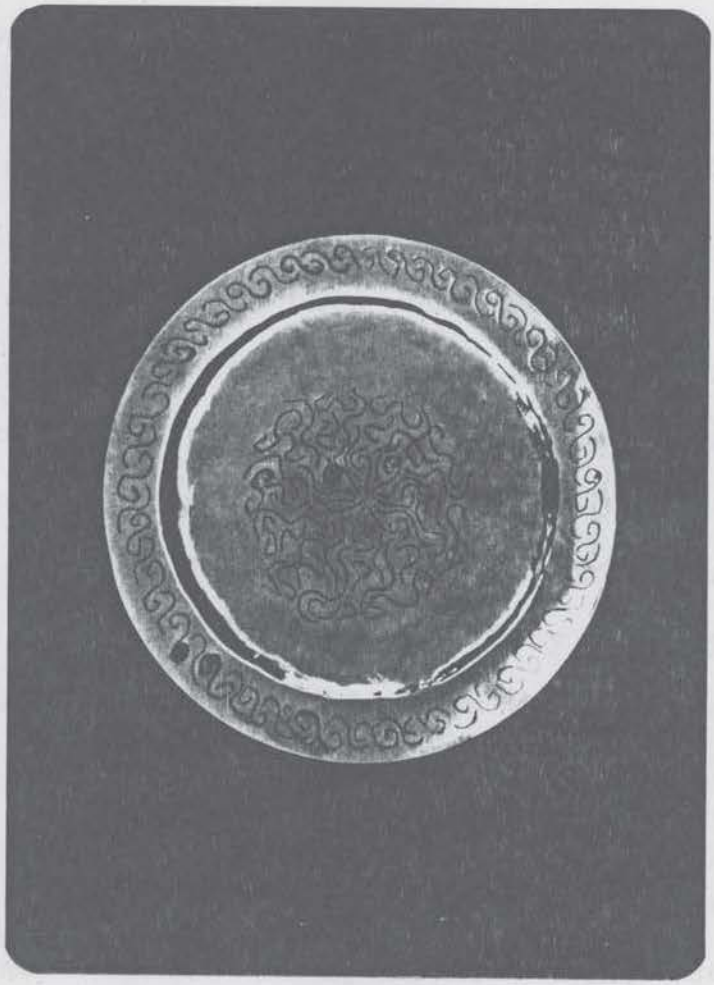

Figure 1: ETCHED PLATE

BELT BUCKLES--FACES (Figures 2 and 3)

The repousse process was used in the construction of the belt buckles because the repousse readily offered a means of achieving the three-dimensional qualities of the facial structure.

Both buckles started out in a rectangular shape so that it would be easier to work on while shaping the faces. The first step was to sink the entire facial area. The nose of the first piece was sunk after the depth of the face had been created. This was a rather unwise decision because the metal was stretched too thin and resulted in the metal splitting at this point. This had to be repaired with solder.

On the second piece, the entire area of silver was sunk as deep as it needed to be for the nose. The cheeks, eyes, and other facial features were worked back from the nose, thus eliminating the possibility of over-stretching and damaging the metal. This work was achieved by working from the front of the piece.

Both faces were continued by working the repousse on both sides of the metal. The final forming step was the adding of smaller details by the chasing process. Then a solid piece of silver was soldered to the back, leaving the piece hollow.

While the two buckles were pleasing, it was observed that a much greater degree of desired detail could be achieved with additional practice.

The repousse and chasing combined gave the belt buckles an intricate and pleasing quality. The ability to humanize

an otherwise cold, lifeless piece of metal into a finished product was a rewarding experience.

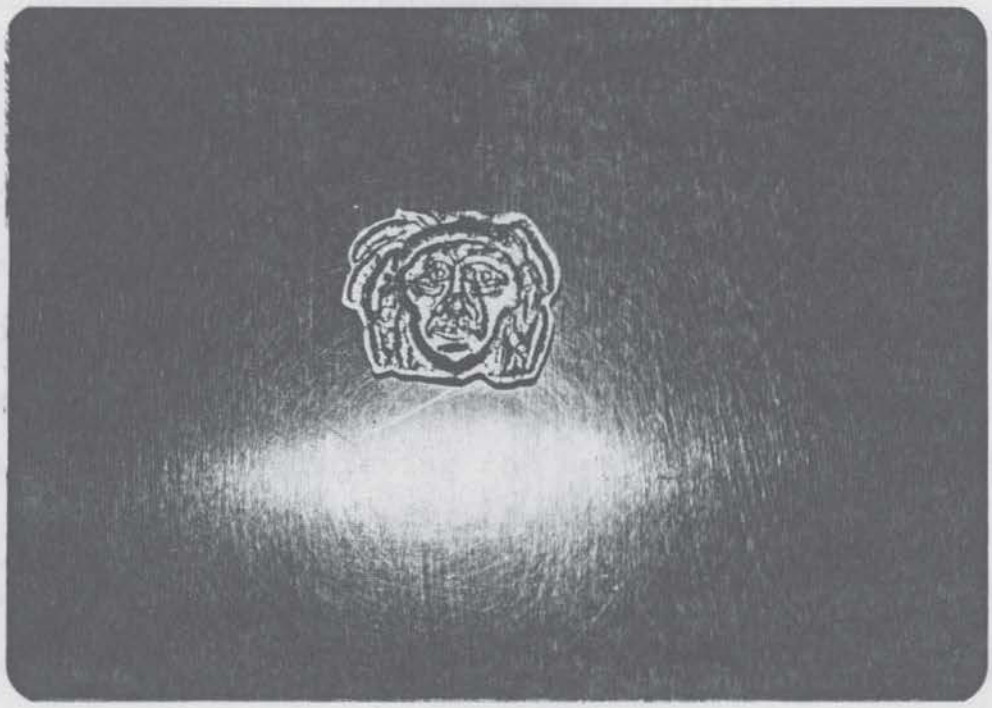

Figure 2: BELT BUCKLE - FACE

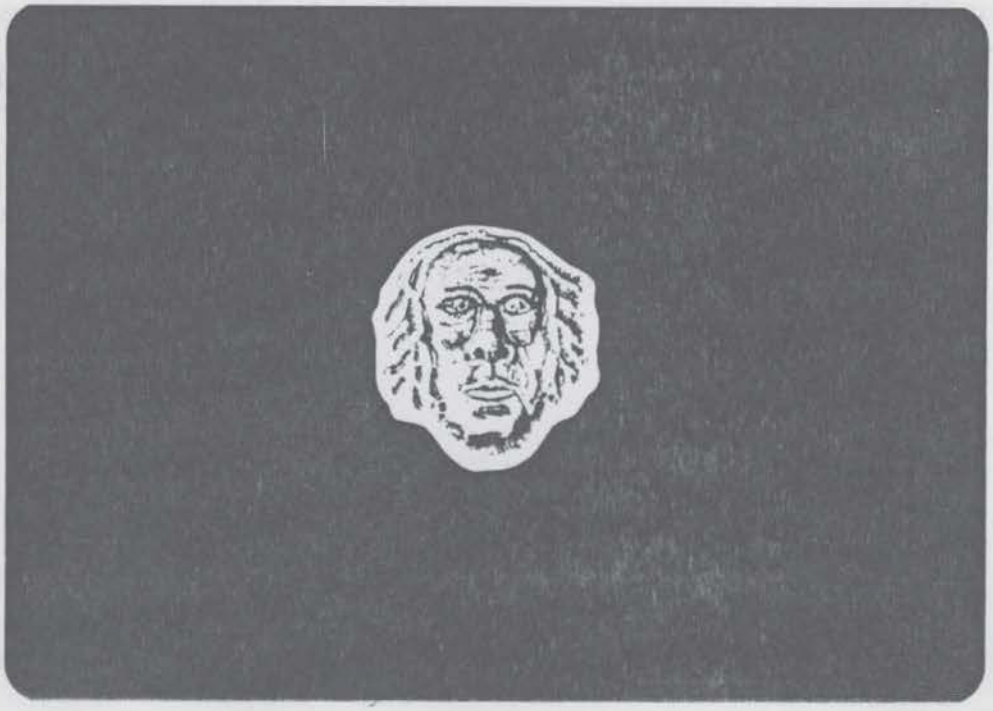

Figure 3: BELT BUCKLE - FACE

BRACELET--SILVER AND SPANISH LACE (Figure 4)

On any piece of jewelry, a stone may be dominant or subordinate within the overall design. Because of the complexity of this particular stone, it was felt that the bracelet should be made to be the subordinate factor. The simplicity of wire combined with small textured areas allowed the setting to appear as an outgrowth of the bracelet itself and was useful in achieving the desired design philosophy.

The stone was set in a bezel. Metal had been previously soldered on in such a manner that it could be bent down tight over the stone, thus completely hiding the bezel wire. This made the stone more a part of the piece rather than just being "stuck" on the bracelet. Eighteen-gauge metal was used. It could not be easily bent out of shape. Because of the thickness of this 18-gauge metal, it was difficult to burnish tightly.

In addition to the chased design around the stone, chased tubes were placed around the ends of the bracelet so that they would have a finished quality.

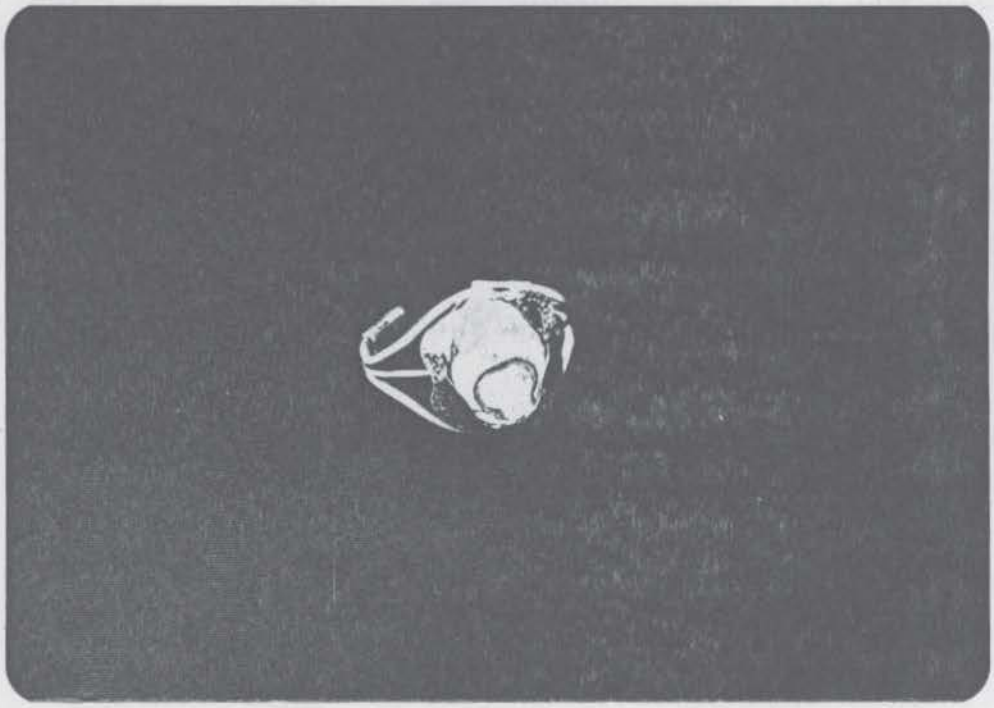

Figure 4: BRACELET--SILVER AND SPANISH LACE

PIN--SILVER AND SPANISH LACE (Figure 5)

The shape of the piece was left simple because of the chased and pierced details that would be applied to the silver.

After deciding on the design, drilled holes, and pierced lines were combined to be part of the piece. The drilled holes were much larger than the thin lines wanted, so those were used as a beginning and ending point for the piercing.

Two different punches were used for the chased design. The chasing ruined some of the pierced lines, closing them up, so a saw blade had to be used to reopen a few of those lines. The final outcome was pleasing because of the light, airy feeling in the contrast of the textures.

Figure 5: PIN--SILVER AND SPANISH LACE

THIMBLE--SILVER (Figure 6)

On this particular piece, an experiment was done with the combination of chasing and wire work for a more three-dimensional effect. A trapezoidal piece of silver was used assuming this would result in the thimble shape. The result was a slanting truncated cone. The top and bottom had to be sawed off to correct the lopsided characteristic. The top of the thimble was made from a slightly domed piece of silver and soldered to the cylinder.

The thimble was filled with wax to hold its shape while the exterior was chased. The edges were executed with a strict, controlled design, while the area above this had a more free-flowing effect.

The wire was then twisted together, using two strands, and pounded with a hammer to flatten it on two sides. It was then soldered on to the top and bottom edges of the thimble. The combination of the chasing and wire on this piece were asthetically sound.

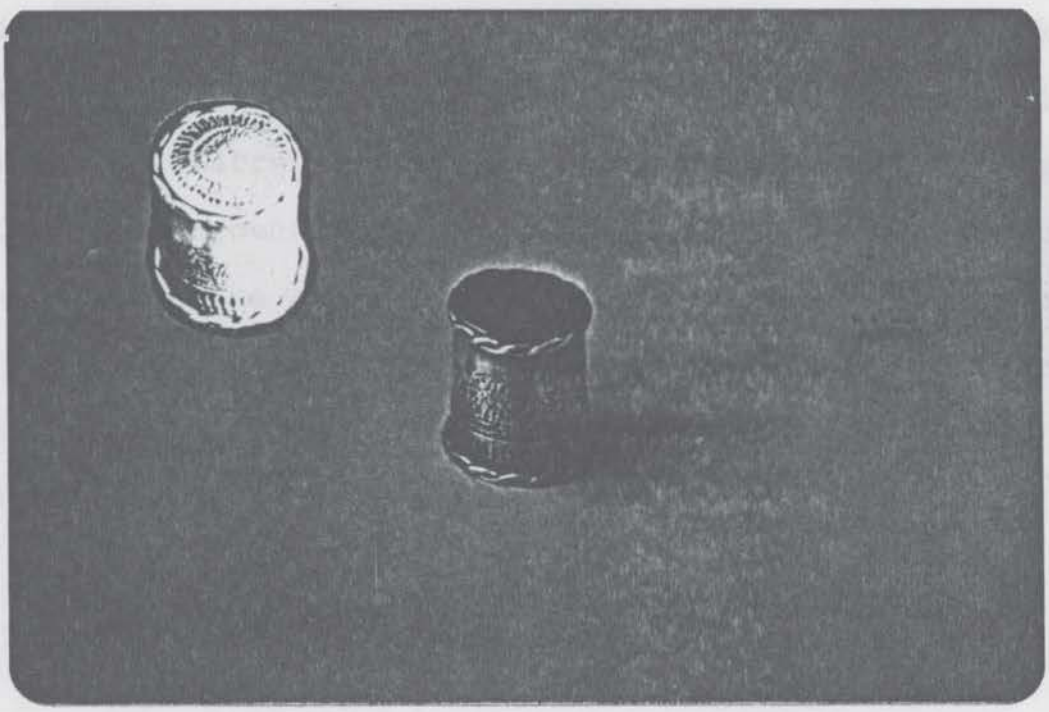

Figure 6: THIMBLE--SILVER

RING--SILVER AND TIGER EYE (Figure 7)

The band was chased and the face of the ring was a combination of chasing and repousse. A tiger eye stone was added in the center of the design.

The design was fairly simple. On either side of the stone were two dome shapes that had been achieved through repousse, and the rest of the silver was chased.

In making the dome shapes, the center of the silver buckled just enough so that the bezel wire could not be soldered without additional forming. The piece of silver had to be flattened, which was done by carefully and gently striking the center of the silver with a flat, large chasing tool, while the sides were taped down to a flat surface.

The repousse domes and tiger eye worked well together and the carry-over of the design throughout the piece produced a harmonious effect.

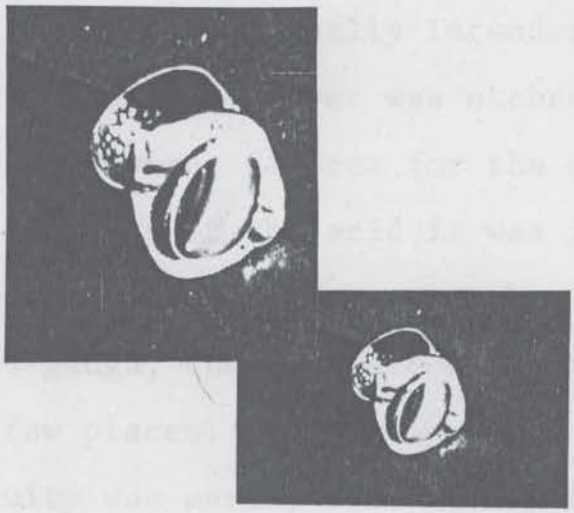

Figure 7: RING--SILVER AND TIGER EYE

BELT BUCKLE--SILVER LANDSCAPE (Figure 8)

With the farmer in mind, a belt buckle was designed using wheat field landscape imagery in keeping with the area in which we are living.

For this piece, three layers of silver were fused together which made a very sturdy belt buckle. The top layer was a combination of chasing, repousse', and piercing. On the left side some repousse' was done to form a silo and some very small repoussed' shapes to represent the tops of wheat. These shapes were filled with pitch and some chasing was done to get the wanted detail. When this was finished, portions of the silver were sawed out.

The middle layer was originally intended to be the bottom layer. The piece of silver was etched, using the outline of clouds and wheat figures for the design. When the silver was taken out of the acid it was in pieces. Because lines for the clouds had been rather wide and the metal was only 24-gauge, the acid ate completely through the silver in a few places.

This difficulty was easily remedied by the use of a third, or bottom, layer which was used as a background and support for the middle layer. The three layers were soldered together. Some square wire was added to the outside edges of the piece to form a sort of frame.

The final touch of the piece was the adding of liver-of-sulfur. Steel wool was used to rub the liver-of-sulfur off the flat areas so that the etched and chased areas were

the only ones to remain black, thus showing the detail more clearly.

This piece was highly successful because of the variety of techniques and the three-dimensional pictorial quality that resulted. The darkened areas contrasted nicely with the brighter areas, and the overall quality was one of a unified design.

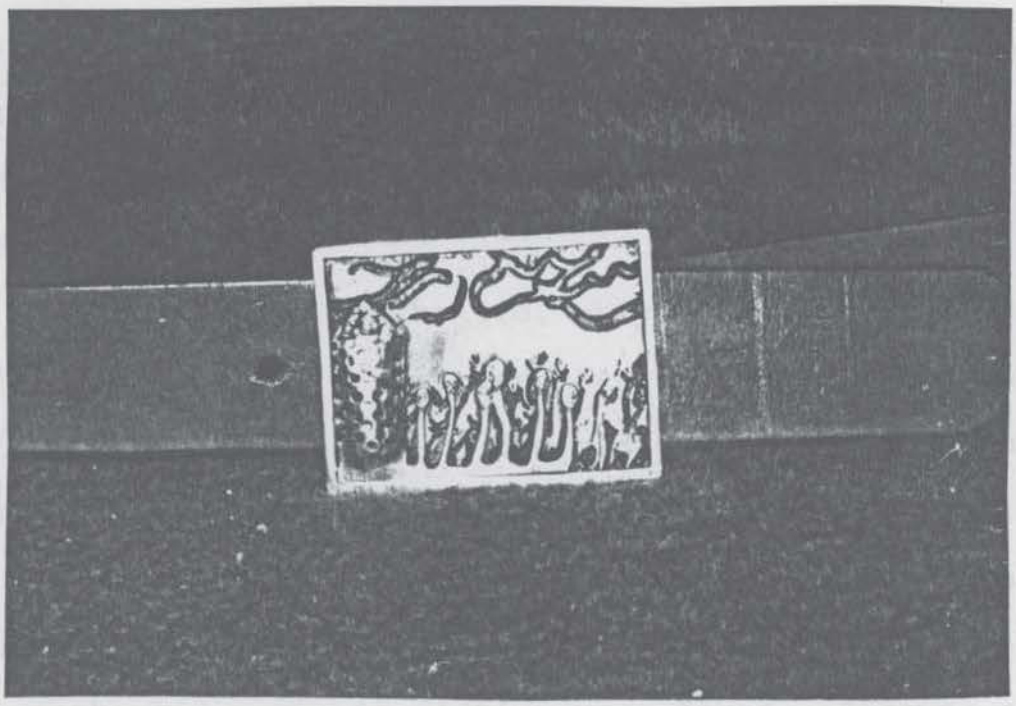

Figure 8: BELT BUCKLE--SILVER LANDSCAPE

PILL BOXES

Pill Box #1 (Figure 9)

A series of pill boxes using different shapes and surface textures on them was used to provide a little variety in the basic idea of the pill box.

The first box made was an oval shape. After soldering the box in this form, the top portion was cut off to use as the top of the piece. This way a perfect fit was assured.

The next step was to solder the bottom of the box to the sides. A flat piece of wire was soldered to the inside of the box with the extreme edges extending above the sides. The wire would hold the lid in place when the piece was finished.

Work then began on the lid, which was to be the decorative part of the box. Some repousse was done on the top of the lid and then soldered to the sides of the lid which had already been cut off the sides of the bottom of the box.

There was no problem in the repousse design in the top, but when that piece was being readied for soldering to the rest of the lid, gaps in fitting were found. Because of the raised design, the top piece would not fit tightly against the sides.

The first step was to solder a flat piece of silver on the top of the lid. This would give the inside of the box a more finished look and provide a surface onto which the repoussed piece could be soldered. The final step was to solder a piece of wire which had been flattened to the top of the piece.

The finishing touch was the adding of liver-of-sulfur to the piece in the low and textured areas.

Pill Box #2 (Figure 10)

This box was constructed in a fashion similar to the first box, with the exception that wire was not soldered to the inside of the box as a hinge and latch were to be used for this particular piece. Another difference was the setting of a stone in the middle of the repousse area.

Adding the stone posed a small problem. The repoussed design had distorted the middle of the lid just enough so there was no longer a flat resting place for the stone. The spot had to be very carefully flattened, taking care not to ruin the design that had been achieved.

The final stage was the latch and hinge. Some very small silver tubing was cut into three pieces. Two pieces were soldered to the bottom of the piece and one to the lid. One end of a wire was melted into a ball and the wire was run through all three pieces of tubing. The excess was cut off and that end of the wire was hammered enough to widen it so that the hinge would not come apart.

For the latch a balled piece of wire was soldered to the bottom wall of the box for a catch. A hook made from wire was riveted to the sides of the lid. Working of this hinge mechanism revealed a "wiggle" that could have been prevented with a five piece hinge.

Pill Box #3 (Figure 11)

For the last pill box, something a little different in shape, construction, and surface treatment was desired. The box was scored and bent to obtain the desired shape. The shape was first tried out with a piece of very thin cardboard to make sure it would work, and then cut out of silver. The places in the metal which were to be bent were sawed part way through in order to achieve the bend. The metal was grasped securely next to the scored line and bent to a right angle with finger pressure.

A texture was applied to the metal using two different chasing tools, and a rather free-flowing, unstructured design. The box was then shaped by bending it on the scored lines and soldered.

A hinge, similar to a door hinge, was made to hold the top of the box on. This time a five piece hinge was made and it was much more stable than that devised for the previous box.

For the catch, the ends of three pieces of wire were balled. Two of them were soldered on the side of the box, the third was soldered to the lid of the box so that when the lid was closed the wire on the side would catch the other wire and hold it in place.

The resulting piece was very satisfying. No difficulties in design or construction were experienced and the texture was just right for the piece.

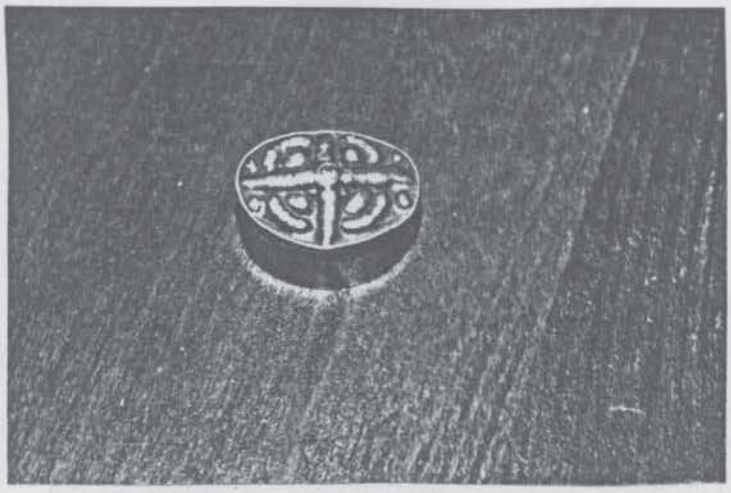

Figure 9: PILL BOX #1--SILVER OVAL WITH REPOUSSÉ

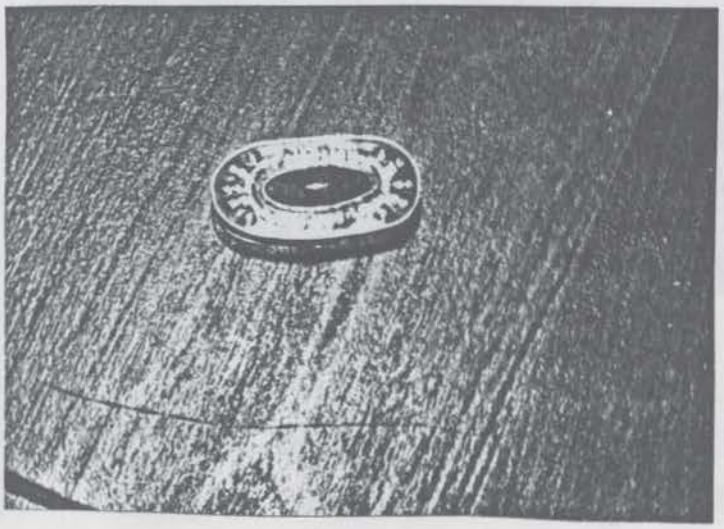

Figure 10: PILL BOX #2--SILVER WITH STONE

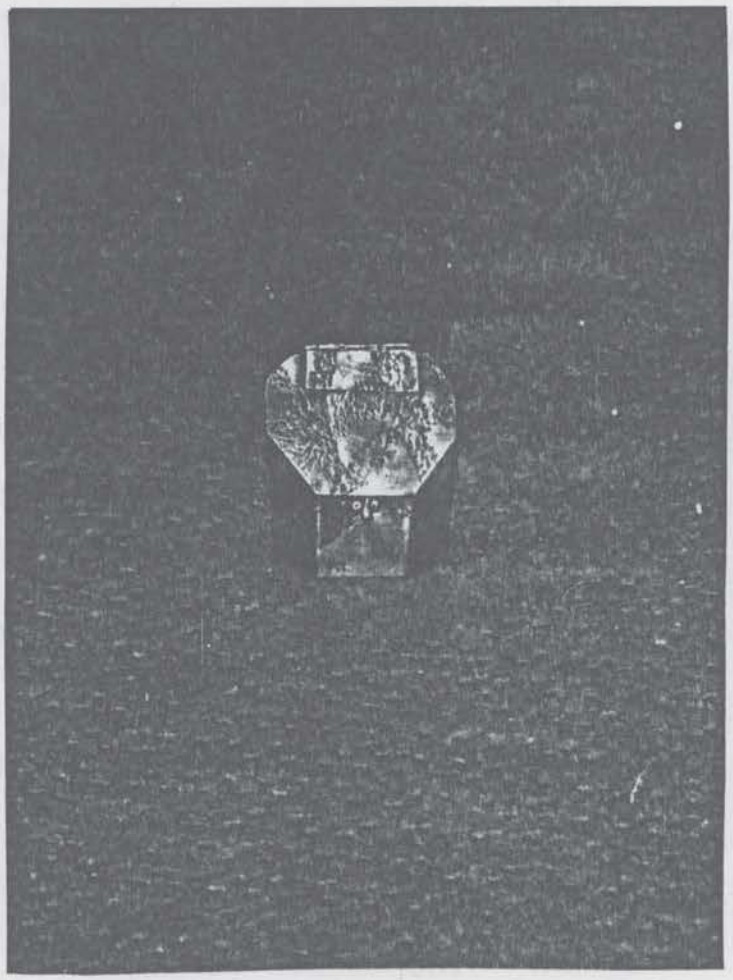

Figure 11: PILL BOX #3--SCORED BOX, SILVER

VULTURE--STEEL (Figure 12)

The material used in the construction of this piece was a very thin gauge steel; something that could be easily manipulated with a pair of pliers.

The body of the bird was the first step, and rather small pieces of steel were used to obtain the desired shape. These sheets of steel were welded on to a very basic frame made of welding rod. The wings were constructed in the same manner.

For the wings, feathers were made with a cutting torch and the beaded edges were left on the metal for contrast. The smooth, natural surface of the metal contrasted to the rough, yet interesting beading left by the torch.

When the actual construction of the vulture was finished, it seemed fitting to somehow treat the metal so that it would take on a black coloration. The method of heating the metal and pouring oil on it to obtain a desired coloration was attempted. The metal was not getting hot enough with a torch to have the oil burn into the steel. The only way to heat the metal hot enough was to put the bird in a fire which would turn it red-hot. The metal was such a thin gauge that the idea was abandoned.

The decision was then made to coat the bird with stove black. This was done and then the bird was buffed with a soft cloth. It was coated with a layer of satin-finish varnish, and the outcome was very pleasing. The bird was not quite as dark as it would have been had the oil method worked, but pleasing just the same.

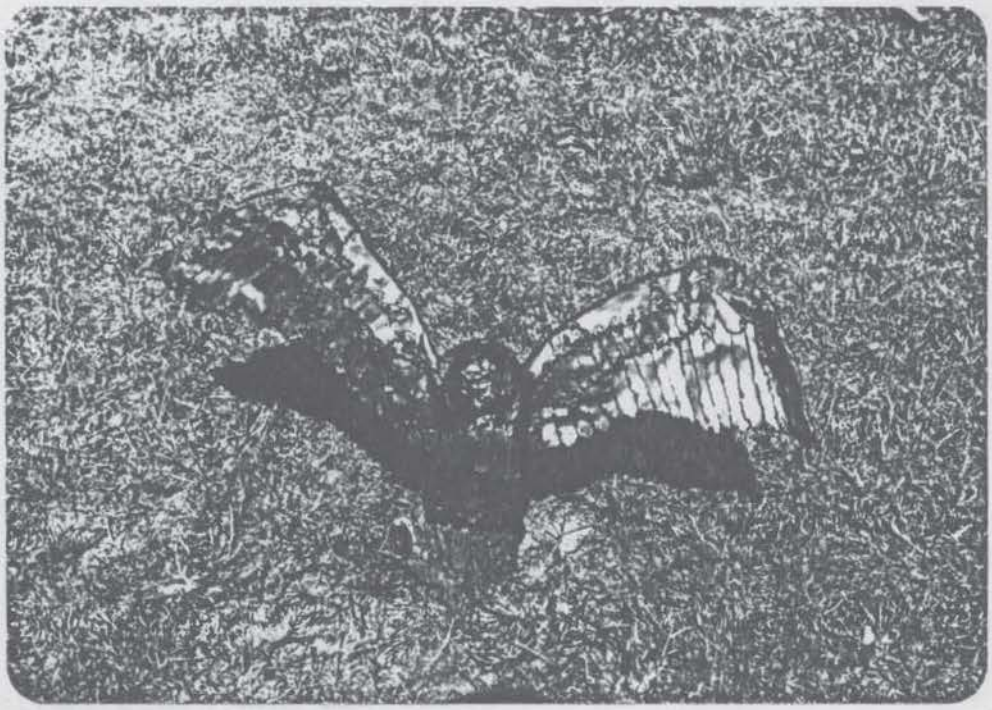

Figure 12: VULTURE--STEEL

INDIA PARADISE FLYCATCHER AND NEST--STEEL, BRONZE, COPPER AND FEATHERS (Figure 13)

A tree limb was constructed from welding rod as a support for a bird and nest. The construction of the nest was next. Trying to obtain the appearance of a nest with steel was a difficult problem. Several different sizes of welding rod were used in a manner similar to the way a bird uses twigs to construct the nest. The end result was a nice representation of a bird nest.

The bird was the last step. It was made out of copper so that the copper could be brazed. The finishing touch to the bird was the adding of real feathers to the top of the head and the tail. This was done for the contrast of the two materials. The result was that it worked rather well.

The steel was brazed to unify the bronze and steel portions. It worked well. A rough texture on the tree was achieved by letting the bronze build up in places.

A chemical patina (page 9) was attempted on this piece to turn the bronzed metal to a blue-green color. A steel brush was used to rid the bird and limb of any foreign materials. Then the patina was applied.

The outcome was that the chemical patina did not result in a satisfactory effect so the bird was again cleaned with a steel brush and coated with liver-of-sulfur which turned the entire piece black. Steel wool was then rubbed on the surface so the piece would be a combination of black and gold in color. It was coated with varnish to avoid any change in color over the years.

Figure 13: INDIA PARADISE FLYCATCHER AND NEST--
STEEL, BRONZE, COPPER AND FEATHERS

BIRDS IN FLIGHT--COPPER AND BRONZE (Figure 14)

Remaining with the bird theme, a wall hanging was chosen for the change of scale. Two pieces of steel were used to make an interesting framework for the piece.

Copper birds of about three or four different sizes were cut out with hand shears. They were brazed to the framework to resemble a flock of birds in flight. After several birds were in position the copper on steel appeared displeasing, so brazing rod was used to coat the entire steel frame. The rod was melted on the steel rather thickly so the frame would be textured, rather than smooth.

After the brazing of the steel was finished, the rest of the copper birds were placed on the frame. The heat of the torch left a nice color in the birds; from copper color to red, to a bluish-green. Unforturnately, when the metal was cleaned after finishing the piece, the colors disappeard, with the exception of some of the red. The piece was coated with a satin varnish and hung.

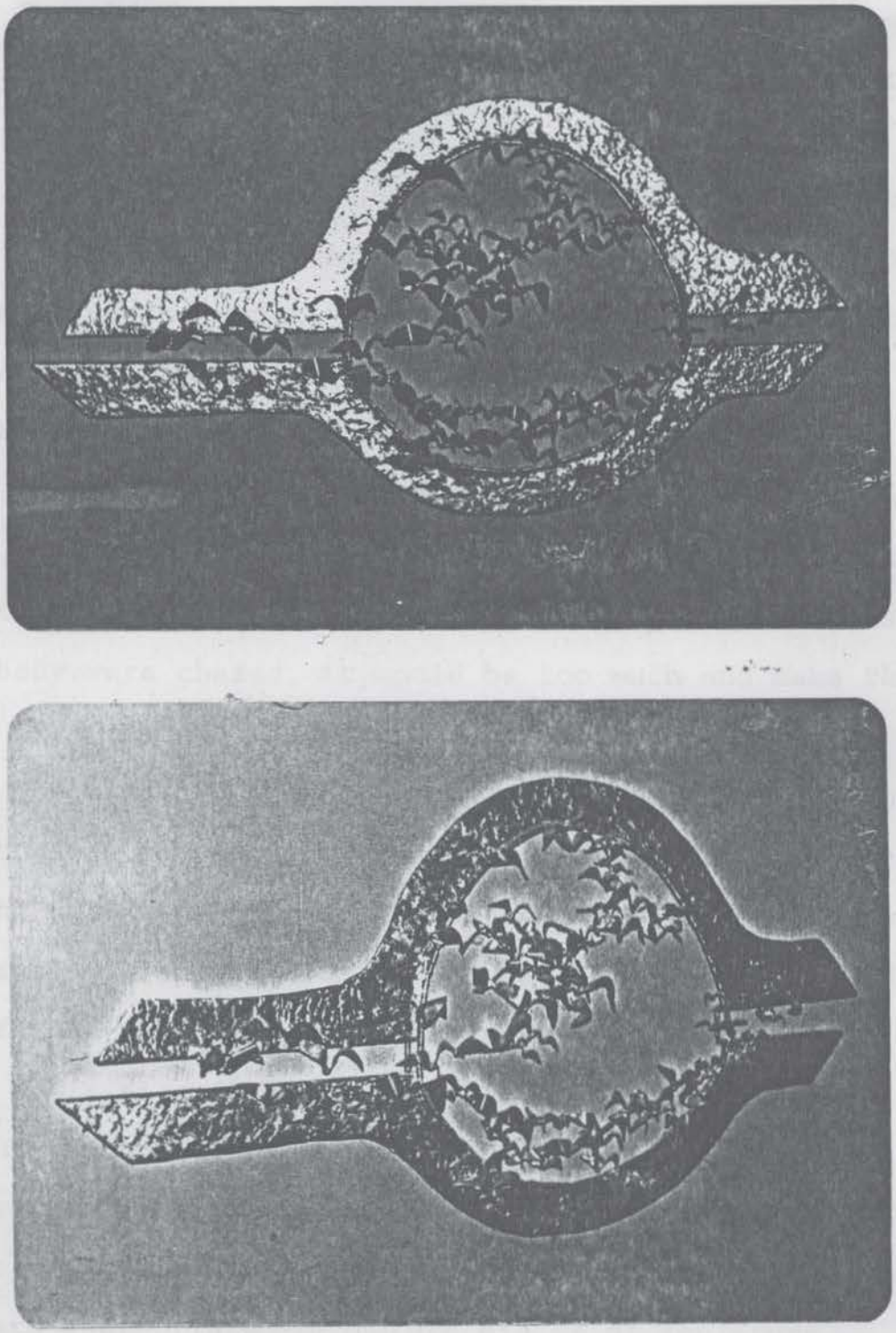

Figure 14: BIRDS IN FLIGHT--COPPER AND BRONZE

LOONEY BIRD--COPPER AND BRONZE (Figure 15)

This bird was constructed of copper, with chasing and repousse' used. This had not been previously done in the sculpture area.

The eyes were repoussed' and the entire face of the bird was left plain. The back of the bird's head was composed entirely of individual copper feathers that had been chased. Three different designs were used on the feathers for variety and an occasional plain copper feather was placed for contrast.

The wings and body were made up of individual feathers also, but were left plain because the breast of the bird was to be brazed. There was fear that if the feathers on the body were chased, it would be too much and make the bird look like it had been over-worked.

The final step was to make a nest for this odd-looking creature. The nest was constructed of welding rods, similar to the nest made previously, only this time the nest was not as dense with rods. Some twine was combed so it would be fluffy and was woven in the rods to finish the nest.

I was dissatisfied with this piece. The assemblage of the piece did not seem to be unified. Additional chasing and repousse' would have enhanced the surface and brought the piece together. More work combining chasing and repousse' appears appropriate for future pieces of sculpture.

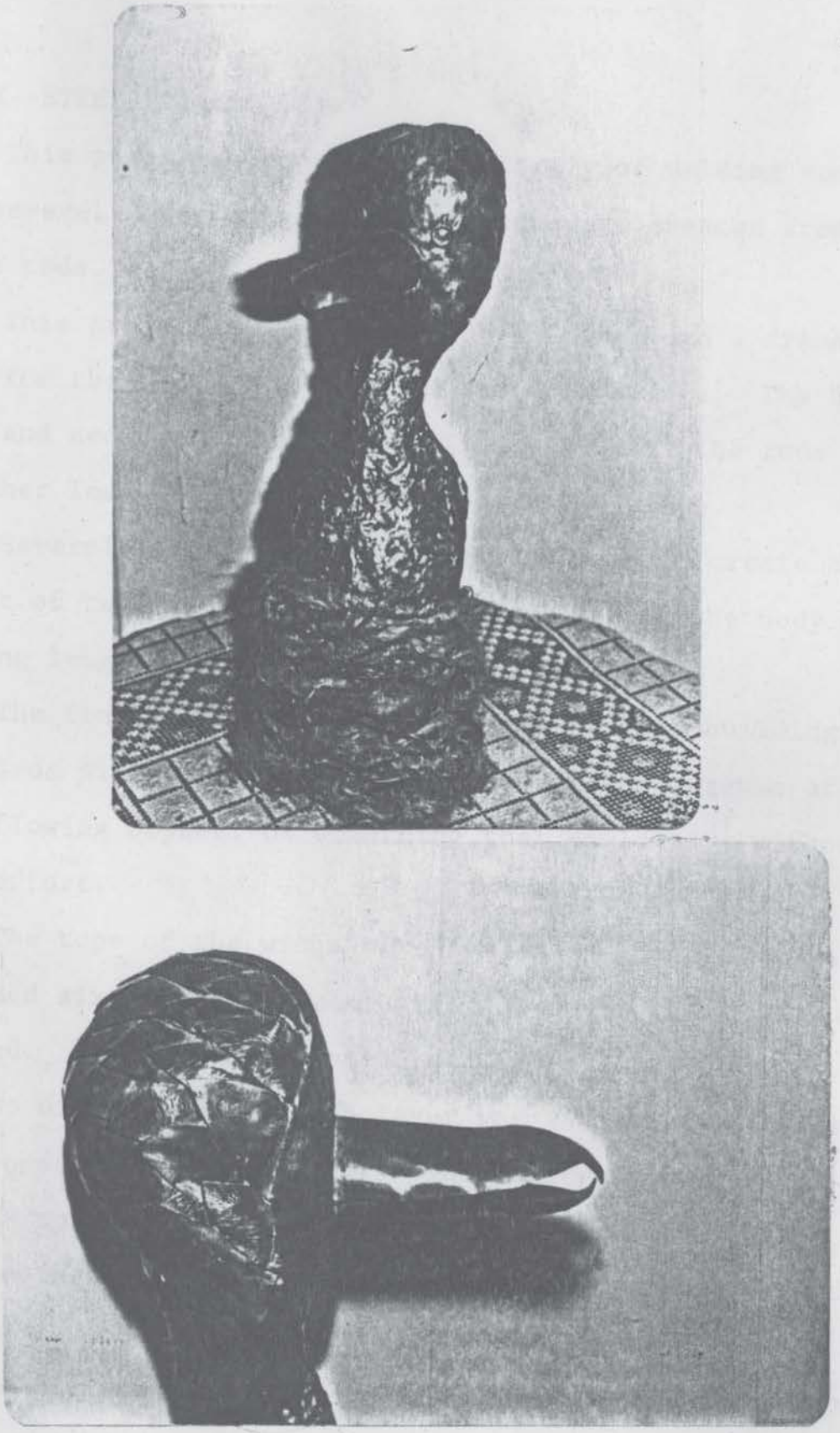

Figure 15: LOONEY BIRD--COPPER AND BRONZE

STORK--STEEL (Figure 16)

This piece was constructed entirely of welding rod, and several different surface effects were created from these rods.

This project was started with the legs and a framework for the body was placed on top of the legs. The body, head and neck were then made solid by welding the rods together leaving a beaded effect on the surface.

Several sizes of welding rod were used to create the effect of tail feathers. They were welded on the body in varying lengths to obtain a layered appearance.

The final and most difficult step was the building of the birds wings. They needed to give the appearance of a free-flowing object, of something that could move without much effort.

The tops of the wings were formed and heated, bent and reformed six or seven times until the desired effect was reached. Five layers of steel rod feathers were welded to the top of the wings. Each layer was a different length, with the longest being the center. The construction of this piece was the most successful sculpture in the bird series.

Another chemical formula (page 10) was tried to patina the stork a blue-black. The piece was cleaned with a steel brush, and the formula indicated under patinas was used. The chemicals turned the bird a rusty-orange color instead of the desired blue-black. Attempts to take the color off the bird were only partially successful. The remaining color on the bird was then painted with a satin varnish to retard rust.

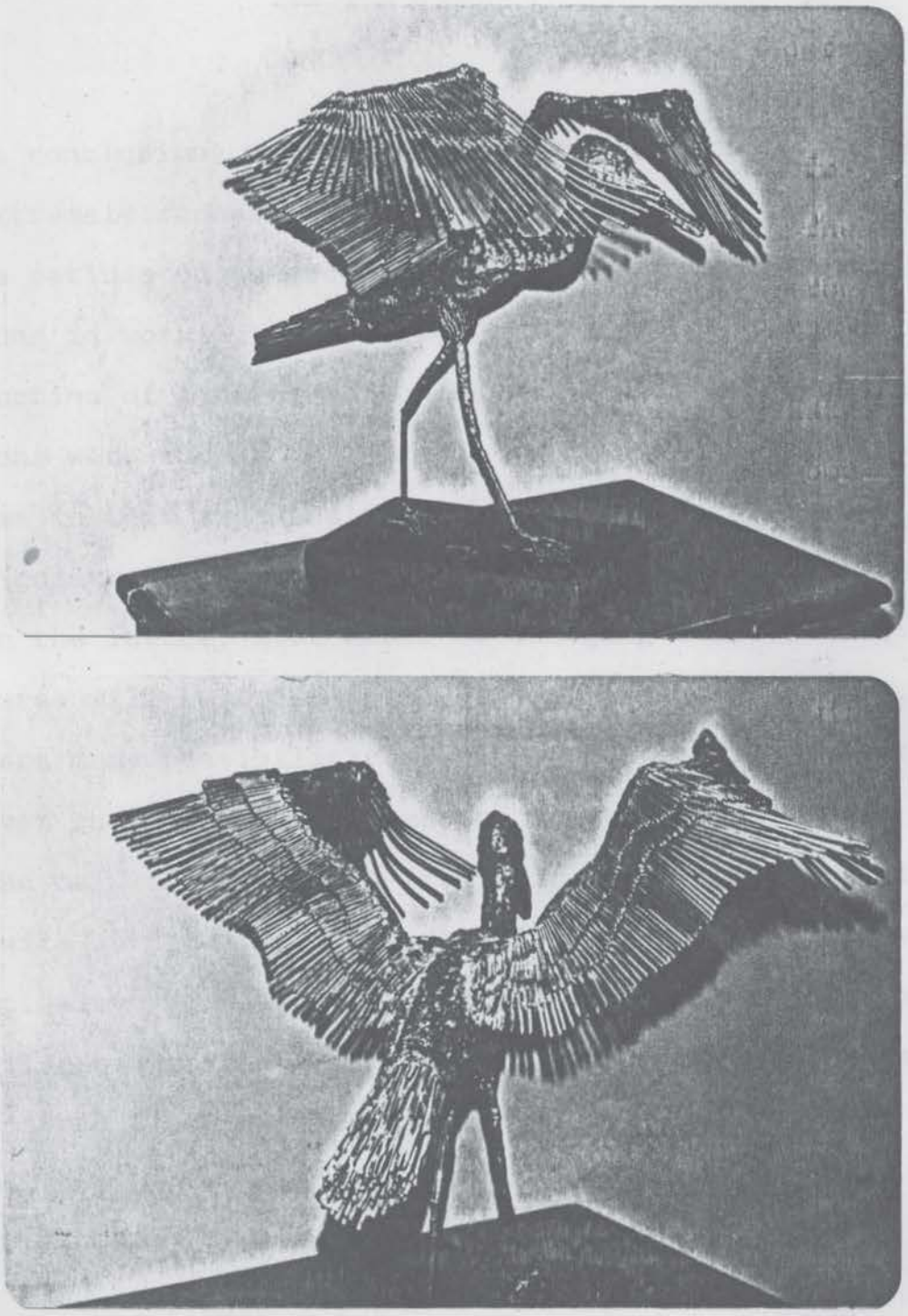

FIGURE 16: STORK--STEEL

CONCLUSION

In conclusion, most of the silver pieces in this program were extremely successful as far as the surface treatment; but the patinas on the sculptures were most unsuccessful. It was found in working with silver that more thought about the construction of a piece was necessary at the same time that decisions were made about surface decoration. Most of the problems in that area dealt with the lack of forethought in actual construction of the piece.

In the future, more means of changing the surfaces of sculptures will be tried, other than relying on patinas. There are many possibilities which coincide with the work in silver and also with the use of a forge.

The main thing learned from this research has nothing to do with surface treatment at all. One achieves a level of complexity in their work where careful planning and sketching of ideas supersede spontaneity; this will be critical to future success. New techniques need to be explored and incorporated in order to avoid the qualities of dullness and staleness.

FOOTNOTES

[1]Wilhelm Braun-Feldweg, Metal Design and Techniques; Van Nostrand Reinhold Company; New York, Cincinnati, Toronto, London, Melbourne; page 11.

[2]Oppi Untracht, Metal Techniques For Craftsman; Doubleday and Company, Inc.; Garden City, New York; page xiv--Introduction.

[3]Braun-Feldweg, Metal Design; page 20.

[4]Philip Morton, Contemporary Jewelry; Holt, Rinehart and Winston, Inc.; New York, Chicago, San Francisco, Atlanta, Dallas, Montreal, Toronto, London, Sydney; page 81.

[5]Untracht, Metal Techniques; page 485.

[6]Untracht, Metal Techniques; page 482.

[7]Untracht, Metal Techniques; page 208.

[8]Marcia Chamberlain, Metal Jewelry Techniques; Watson-Guptill Publications, New York; Pitman Publishing, London.

BIBLIOGRAPHY

Bick, A. F. Artistic Metalwork. Milwaukee: The Bruce Publishing Company.

Braun-Feldweg, Wilhelm. Metal Design and Technique. New York, Cincinnati, Toronto, London, Melbourne: Van Nostrand Reinhold Company.

Chamberlain, Marcia. Metal Jewelry Techniques. London: Pitman Publishing; New York: Watson-Guptill Publications.

Coleman, Ronald L. Sculpture. Dubuque, Iowa: Wm. C. Brown Company Publishers.

Davidson, P. Wylie. Educational Metalcraft. London-New York, Toronto: Longmans Green and Company. 1932.

Morton. Comtemporary Jewelry. New York, Chicago, San Francisco, Atlanta, Dallas, Montreal, Toronto, London, Sydney: Holt, Rinehart and Winston, Inc.

Untracht, Oppi. Metal Techniques For Craftsman. Garden City, New York: Doubleday and Company, Inc.