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AN INVESTIGATION LEADING TO THE PRODUCTION OF
A NONLIFT TEA SERVICE

By

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Date: July 28, 1972

Advisor: Hans Christensen

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DEDICATION

There are many that need to be thanked for their help in aiding me to achieve a Master of Fine Arts Degree from Rochester Institute of Technology. Two of these people need to be mentioned within this thesis.

Hans Christensen, a man who loves to teach metals, must be recognized for his endurance and persistence which transforms the "stiff-necked" student into a metalsmith. Without the guidance of this master I feel my goal would have been extremely difficult.

I must also mention my wife, Gerri. She is truly a marvelous woman without whose persistence and help my graduation would not have been a reality.

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BACKGROUND AND INTRODUCTION

While trying to conceive an idea or ideal shape for a teapot, I had to refer to so-called standard shapes already used in the various textbooks. None of these books made mention why teapots were in various peculiar shapes. One thing was mentioned though which concerned the size of the pots. They all seemed to be small; the primary reason for this being that when tea was first introduced into Europe from China, it was very expensive.

The Chinese viewed the articles used to brew tea as an art form. The articles had a particular role to play in the brewing of good tea. The pot which I was interested in had to make certain sounds when the water began to boil. In order for these sounds to be produced, baffles were added to the pots. These baffles might be various sizes and shapes of stones arranged in a particular manner on the floor of the pot. Again, the pots were small along with the cups explaining why a person might drink seven cups or more at one sitting. Still there was no mention of a specific size or shape of a pot.

Since water temperatures differ at the various stages of brewing tea, this must be taken into consideration when approaching a design for a teapot. If we were

to use a pot with a flat bottom, all the water might not heat equally. This would cause bubbles to flow from only a certain spot. In the fine art of tea brewing, this was inexcusable.

The most logical form then seemed to be the round pot. Again, we could go astray in the design of this pot if we were to make it too large. It must be remembered that even though the pot be round, its size alone could cause unevenness in boiling. We are designing a teapot, not a boiling kettle. Therefore, I have arrived at the conclusion that the teapot should be round and not too large.

Next comes to mind how we use the teapot. When the guests are seated, normally the pot is lifted from the table, as well as the cup, and tea is poured for each person. I felt this was wrong. In the first place holding a teapot to serve possibly as many as eight people could be tiring. If this were so, the hand holding the cup could also become tired causing a spill and possibly burning one of the guests. The most logical method seemed to be a teapot that one would not have to lift.

I sketched various types of pots; some were similar to those of our modern coffee pot, but I thought these ideas were not suitable for a design which would show elegance for use of such a stately brew. I came up with the idea of a tilt pot. This would involve a stand on the table which would hold the pot. In order for this

pot to pour, we must also find the center point of the pot to attach the handle for balance while carrying. But the pot could not be centered while pouring, but must be slightly off center, otherwise it would not return to its upright position when finished.

The pot would be made of sterling silver in a modern design using wood for a base, as not to heat the table, and wood for the handle, so the hand would not be burned.

CHAPTER I

SKETCHING

When the idea for a piece of holloware is first conceived, the metal worker usually sees within his mind the finished product, or a similarity of a product he wishes to produce.[?] Before the actual production of a piece of holloware, months may be involved with rough drawings or sketches on scraps of paper while the artist is doing something else. Doodling while on the phone or engaged in activities other than production often bring ideas to the designer's mind. These "doodles" should never be thrown away. When the designer sees or gets an idea from a previous drawing, he should not erase a certain part, such as a handle or spout design, but draw another piece incorporating the new part with the old drawing. This way the artist may view both drawings, picking the best design or going on to another design. Continued drawings done in this manner often spawn new ideas.

Once the idea for the type of teapot is conceived,[?] from the basic shape to the spout, handle, lid and base, more detailed drawings must be done. If the pot is done on a commission basis, the customer would want to see the way the teapot will finally look. In order that we might

show him the design, a scale drawing must be done showing the size, shape and various angles of viewing the pot. This drawing should be neat and drawn to accurate scale for the drawing will accomplish several things. It will be shown to the customer in order that he may view the two dimensional pot from various angles and it will also serve as a drawing from which dimensions are taken for actual construction. From these drawings the metalsmith can reproduce templates which will aid him in reproducing the teapot accurately.

CHAPTER II

RAISING THE BOTTOM OF THE TEAPOT

Once a template is made from the scale drawings of the teapot, the metalsmith must use a type of formula to calculate the amount of silver he will need to raise and bring the flat piece of metal up into a hollow form which is the bottom of the teapot. The simplest way to do this is to take your ruler and draw a straight line on a piece of paper. Now, taking the template of the bottom of the teapot, put the edge of the template on the end of the line you have drawn. After this is done, roll your template along this line carefully, keeping the edge of the template exactly along the drawn line. When you have rolled the pattern to its half way point, stop and draw a small line across the straight ruled line. The distance you have moved from the beginning to the small line across the straight line is half the amount of metal needed to produce the teapot. To get the full amount of metal, we must obtain a large set of dividers or a beam compass. Put one end of the dividers or the beam compass on one end of the ruled straight line and the other end of your tool on the other mark. Swing a circle with the tool. This will give the correct amount of metal needed to produce the bottom of the teapot.

Often this amount of metal might be slightly excessive so the metalsmith could, if he wishes, trim, with a pair of metal cutters, one-half inch off the circumference of the metal. We then anneal the metal, soften it with heat, in order that it can be worked easier. The metal is properly softened when it is dull red.

There are many stakes, which are shapes of metal, that the silver is hammered against in the metalsmith shop. In this particular teapot two will be used for the bottom. These two are raising stakes: one of metal and one of wood. The one stake cut from hard maple has one end cut on an angle to the shape of a rectangle and rounded out. This side will be used for raising the silver. On the other side the same stake is again cut on an angle, but this time there is an "M" shape cut into the wood. This side of the stake will be used for fluting, the process of crimping the metal into hills and valleys for the raising or compressing process. (Figure 1)

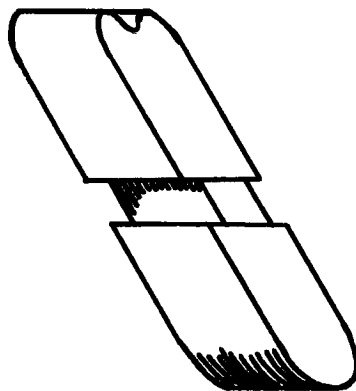


Figure 1

The wooden stake is put into the vise with the rounded end up. The silver disk for the bottom is then held in the left hand while holding the piece against the edge of the stake slightly off center. (Figure 2) A heavy raising hammer, which is somewhat like a triangle on both sides that has been rounded off slightly, is held in the right hand. Holding the silver against the stake, we hit the metal with the hammer continuously while the metal is turned so the blows are applied next to each other. This is done until a complete circle is formed and we have a slight raised area in the center of the silver sheet. The wooden stake is then turned around so the "M" shaped side is up. The metal sheet is then held at a right angle to the valley in the stake and again the metal is hit into the valley with the grooves going outward. This process is called fluting and is done with each flute rising next to the other until the whole plate is fluted. After this step the round flat silver plate should be raised up slightly from its original flat shape. Reversing the stake again to the round end, the plate is held on the stake with the bottom of the bowl facing us. The flutes should now be running vertically in relation to the edge of the raising hammer. The blows are struck against the high ridges of the flutes forcing and compressing them inward against the wooden stake. The blows are struck in the same spot while the left hand holds and moves the metal to the left for one complete course then



Figure 2.

is reversed for another course. This is done until the top of the bowl is reached. The reason for the reversal of blows is to keep the metal from twisting while the raising process is being completed. After going around the first complete course of the bottom, the metal will become work hardened and brittle from the constant hammering. In order to continue to work the metal, it must be softened. The piece is then put on pumice stones which in turn are in a movable turntable. Heat is applied until the piece has become a dull red. The piece is then allowed to cool. If it were quenched immediately, it might distort. After cooling the piece is put into the pickle, a mild acid solution, to be cleaned. All the oxides and scale are removed from the silver causing the color to become pure white. It is not necessary to pickle the silver after every annealing.

After cleaning the silver the raising process is started for the second time. This second raising is done just as the first only this time the pot gets a little higher. Again the pot is annealed after which the third raising starts. Continue fluting and raising in order to get the pot a little higher. Near the top of the piece care must be taken in order that the edge does not crack due to the raising and hardening of the metal. The edge can be raised in by hitting it with blows of the raising hammer at an angle, then crossing the blows in order that "x" type marks may be seen across the rim. Another safer

way is to use a rawhide mallet to hit the rim compressing it to the size of the body. This normally would not be possible unless the raising hammer is used until the blows are extremely close to the rim. The pot is annealed again, cooled, pickled and washed before the fourth raising starts. This raising is done just as the previous steps only now the cardboard template can be used. The bottom of the pot should start getting close to the desired shape. The raising process should shrink the pot enough that the template will fit tightly, or it might be better that the template be bent slightly to get it into the pot.

In the following raisings care should be taken because of the compression of the metal as it is being raised. The metal becomes tired after constant raising and annealing. When raising beyond this step, the template should be used often. The pot may not need raising from the bottom any longer if the template fits snugly at the bottom. Following raisings can start from a point higher on the pot where the template doesn't touch. Again, be careful near the edge to prevent cracking of the silver. The sixth and seventh raisings are done carefully for the pot should start nearing the desired form and height. Fluting should not be done with quite as much vigor.

After getting the desired form in the upper half of the bottom section, the bottom must be rounded out. (Figure 3) To do this a stake that has the rounded shape



Figure 3.

needed for the bottom is used. The pot is then held over a rounded form that has been cut in a tree stump. The stake is then used to pound the metal into the hole in the stump giving the desired bottom contour; remember it is important to keep the metal soft while working. If the desired bottom shape cannot be formed with one pounding, anneal before continuing with another. The template should now fit tightly into the bottom section touching everywhere.

CHAPTER III

PLANISHING

After the final raising and annealing, the bottom section is ready to be planished. Planishing is the process of smoothing the metal, taking out the ridges and indentations caused by the raising process. In order that planishing be done successfully, the proper tools and stakes should be used.

The planishing hammer may come in different weights. The right weight for each individual may depend upon their strength, thickness of the metal, or how rough the raising marks are on the piece. There are two faces on the hammer, both are polished smooth. On one side the planishing hammer is slightly convex. This side is used first to raise out the low areas and go over the whole piece. Once the piece is smoothed out with the round side of the hammer, the other side is then employed. This side is flat and when it is used the piece becomes smooth.

Without the proper stake it is hard to planish the form, keeping it to the shape dictated by the template. The same domed shape used to raise out the bottom of the pot is usually used in the planishing process of the bottom. It is important to keep as much metal of the pot touching the stake as possible. To finish the sides, a

stake should be used which takes the form of the pot sides as near as possible.

Sound is also very important in raising and more so in the planishing process. When the piece is held against the stake and struck with the planishing hammer, a dull or hollow type sound will cause the metal to go inward. A sharp or ringing sound will cause the metal to raise out. By holding the pot in either of the two positions when planishing will raise low areas or level high areas, giving an overall smooth surface to the whole pot. (Figure 4)

After the pot is somewhat smooth it must be checked for roundness. The centering mark should be visible on the bottom of the pot. Take a compass and make circles around the pot at close intervals. Cut off the excess material around the top of the pot. File the top smooth and emery slightly. Turn the pot on its top edge and place on the table. A height gauge is now used to determine the roundness. (Figure 5) The pot is placed against the base of the height gauge. The point of the height gauge is placed against one of the lines, carefully so it does not scratch the silver; then the pot is turned. Wherever the point doesn't touch, the pot needs to be raised out. Just the opposite is needed where the point touches too much; the pot should be raised in. If care was taken when raising by alternating the courses, very little adjustments will be needed to make

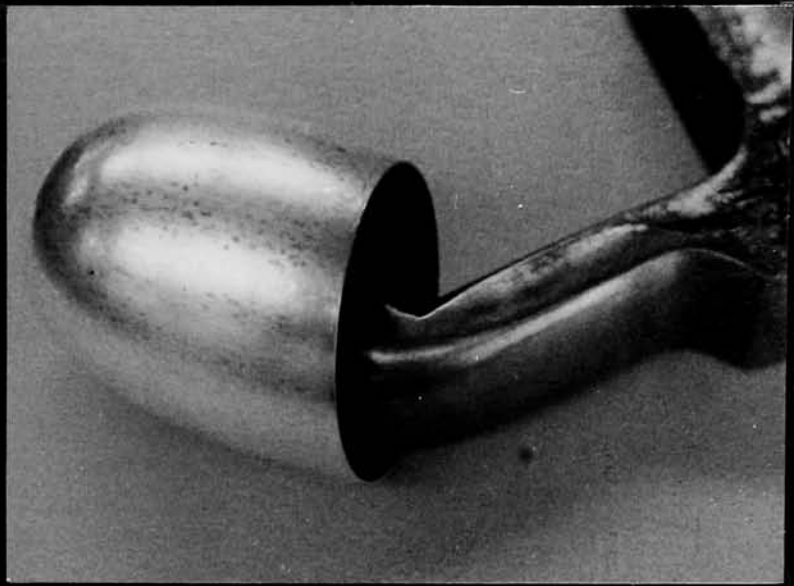


Figure 4.

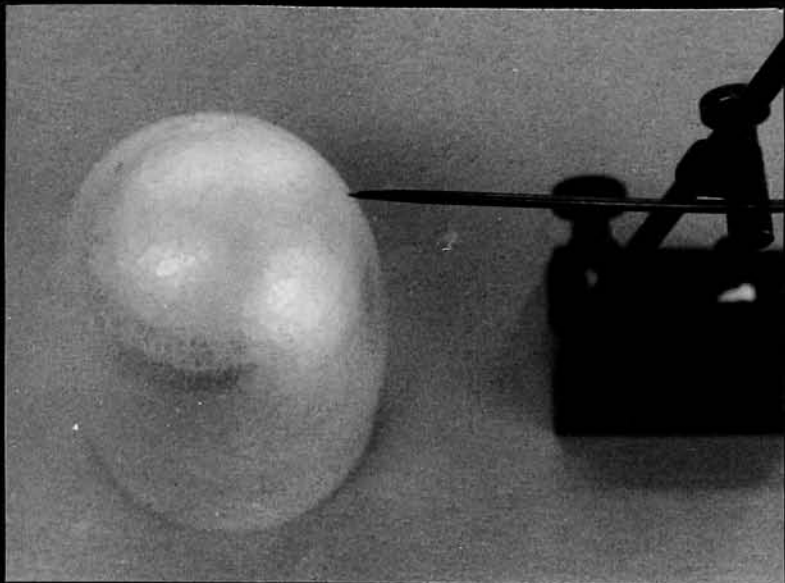


Figure 5.

the pot round. Once the pot is round, planishing is done carefully with the flat side of the planishing hammer. Lighter strikes are used as the pot nears perfect smoothness. To check for slight low or high areas, the pot is held up to the light. Waves in light lines will indicate high or low areas. A shadow should be marked with an "O" showing that the area should be raised out. The opposite is done with high areas. They should be marked with an "X" showing that they should be raised in. After each course of planishing, anneal and pickle the piece. Emery with fine paper in order that the high and low areas show up better. After final planishing check for high or low spots and roundness of piece, although none should exist at this time. Anneal the piece, pickle, wash and scratch brush the bottom section.

Since this particular teapot will slant, it must now be determined where the cut will be located. The template is laid down and turned to the angle of the cut. In order to get the same angle cut in a round piece, the pot is turned over on its rim and one side is raised up until the right angle is found. This being done a piece of flat wood is laid down beside the piece. On top of the piece of wood a pencil is laid to mark the line to which the cut will be made. A pair of cutting shears are then used to make the cut, being sure to stay away from the line. After cutting a file is used to smooth the pot on the rim.

CHAPTER IV

LID CONSTRUCTION

The lid of this teapot is raised almost the same as the bottom of the pot. A template is used to determine the amount of silver. The piece is annealed and the fluting process is started. Anneal the piece between each raising. Continue to check the shape of the lid with the template. (Figure 6)

After the lid is raised, the top must be hammered out in a similar way as that used in the bottom section. The difference between the two is the shape of the lid. The top section is slightly off center so it should be hammered in the stump indentation off center. This will give the lid the shape it needs and will also keep the rim round and flat in relation to the bottom section.

After the proper shape is reached planishing is done in the same way as the bottom section. The last step is to anneal, trim the edge and file it smooth.

The top of the teapot is offset when attached to the bottom of the pot. In order to cover this offset a wide section of metal would be needed to span the distance between the edge of the lid and the edge of the pot. A heavy gauge stock should be used such as seven gauge sterling.

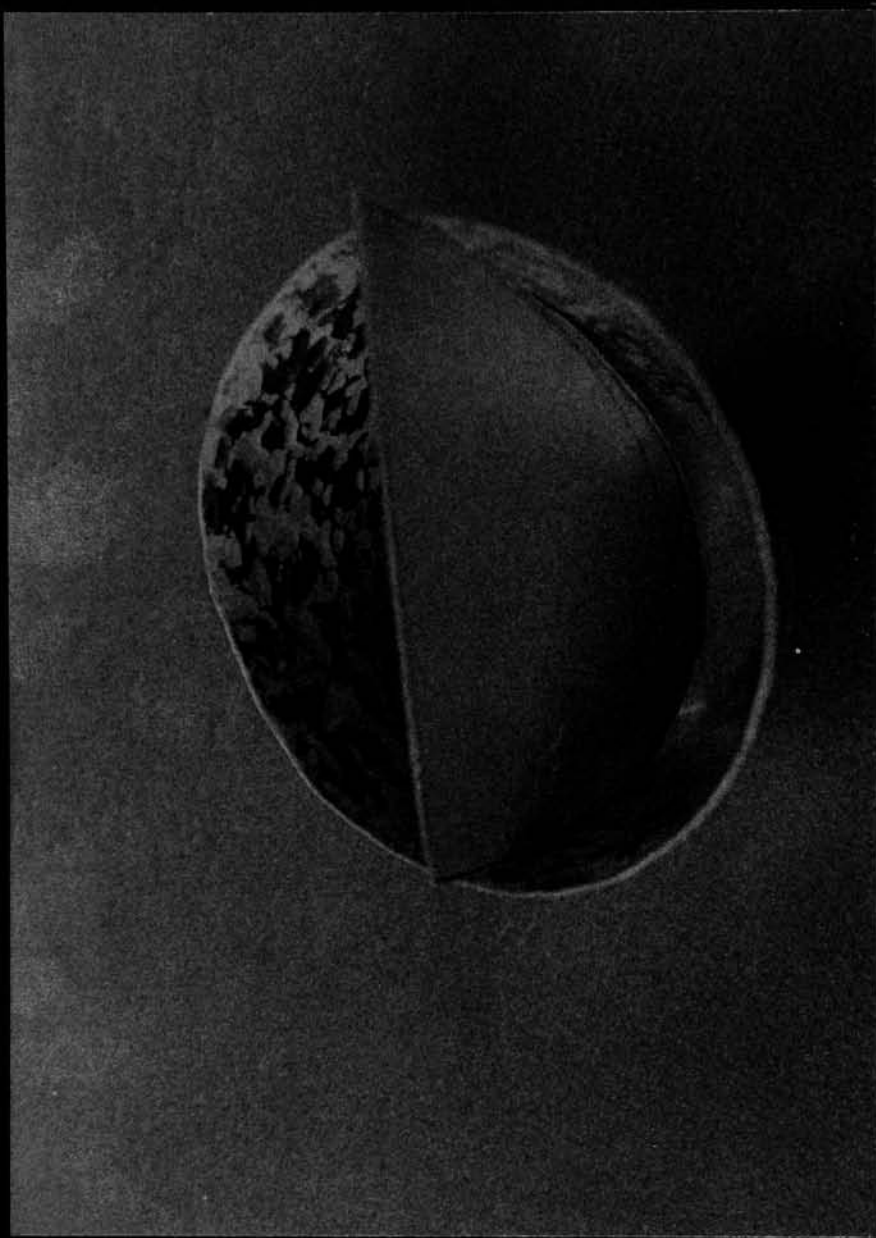


Figure 6.

When cutting the sterling it is not necessary to keep it exactly smooth at this time. A saw would give a good straight cut but would take too long, so heavy bench shears are used. Two pieces are cut, one for the lid and one for the bottom. The pieces cut should be long enough to by-pass each other when forged together and still slightly larger than the rim's edge. After the pieces are cut they are filed and annealed.

To bend heavy gauge sterling in a circle against the width of the piece is quite a task. Again the wood stumps in the shop can be useful, especially one with a large crack. Hold the stock on edge over the crack while hitting it with a heavy hammer which has an end similar to that of a raising hammer. Continue the blows on the metal while moving it over the crack until the whole piece has been hit. (Figure 7) After the first course the shape will start into a circle but will be rough with the hammer marks showing. Lay the piece on an anvil on its flat side and hammer down with the flat end on the heavy hammer. This will cause the piece to open slightly. Anneal that piece and, while it is cooling, start the lid section of the rim in the same manner. Annealing should be done often due to the thickness of the metal. Continue working these two rims until they close, by-passing each others' ends. Lay each section over the lid and bottom remembering that each should be slightly larger than the place it fits. Use the jeweler's sawframe to cut through the metal



Figure 7.

where it will be soldered. After cutting be sure to scrape the metal on both sides to get rid of all oxides insuring a good solder fit. Use hard solder on the first soldering for both pieces, fluxing the area well. Heat the whole ring well until the flux liquefys, then place the twisted double strands of solder over the joint. Start heating the piece again then concentrate on the solder joint until the solder flows. Let the rings cool before quenching in water. Hot water will dissolve the excess flux quickly. Check the seam for faulty soldering. If the seam is soldered well, put it into the acid to clean.

After the two rims have been cleaned both must be planished round, smooth and level. Put the ring over the horn of the anvil and planish with heavy hammer until round. A stake with a flat table is used to make the two rings flat. If one end is high the other side must be hit. Remember the high pitched sound for bringing up low areas compered with the dull sound for raising in high areas. When finished, no light should be seen between the stake table and the rims. Another way to tell if the rims are flat is by holding your finger on one side. If the other end does not raise up the piece is flat.

CHAPTER V

FITTING BOTTOM AND TOP RIMS

To fit the bottom section ring into the pot the opening of the pot must first be traced on a piece of cardboard, then cut out. After this is done the cardboard is laid on top of the ring, making certain that it is centered, and a pencil line is drawn on the ring. The excess metal is then cut, filed or ground off. The inside circle must then be determined. This will be difficult because of the offset lid which will cause one side of the ring to be wider than the other side. The lid is now used by placing it so the back or hinged side touches the one end of the rim. It is also wise to remember, at this time, that the solder seam should be to the rear. Now draw a line around the ring using the lid as a pattern. The lid will close on this line when completed. Another line must be drawn inside this outer lid line which will be the actual opening of the teapot. When the distance is determined, the excess material is cut out with the saw and filed smooth and square-edged.

The ring must now be fitted to the bottom. Remembering that the pot slants, the outer edge of the rim must also be filed to fit that angle of the pot. File carefully, fitting as often as needed to insure that the

ring fits well, with no large cracks. The ring must also sit at least one-eighth of an inch inside the pot. This is done in order that small flaps may be cut into the rim of the pot to be bent over the flat ring to hold it down while soldering. There is another purpose for the indentation of the ring, it being a place to put the solder for later joining of the ring to the pot.

After the ring is fitted and the flaps bent over, binding wire must be attached to hold the ring from falling into the pot while soldering. First a ring of wire is tied around the smaller bottom of the pot. Another piece of wire is then woven over the rim, bent under, then over and under the bottom wire, back over the rim until the whole piece has been circled. The piece is now ready for soldering. Flux is applied liberally to the joint to be soldered. The piece is then set in position on the pumice stones and heated overall until the flux starts to melt. Paillons of twisted medium solder are quickly put over the joints between the rim and edge of the pot, heated again; the flame is then directed right at the joint until the solder flows. Remember that hard solder has been used, so the piece cannot be overheated or the hard solder will flow again, causing an open joint when cool. After the piece has cooled, put into hot water to dissolve the flux, then cut off the binding wire. Check for bad soldered areas. If there are none, the piece is then put in the pickle to clean. After

cleaning saw or file off the flaps. Emery the piece on a flat surface to get the rim of not smooth.

Before the lid rim can be fitted a separate ring must be made which will be the lip of the top rim and fit into the bottom rim. This piece may be of lighter stock, sixteen or eighteen gauge sterling sheet. The piece will be as wide as both seven gauge rims are thick. The circumference of the bottom rim hole is measured and a straight piece is cut to that length. About one-quarter to one-half inch is deducted from that strip due to stretching. When planishing both ends are squared and scraped, then joined together with hard solder after which it is pickled and scratch brushed. The ring is then planished on the horn of the anvil to get it round. The final light planishing is done on a beakhorn stake to make it smooth and to reach its final size. The ring is then filed smooth and fitted into the rim on the bottom section. (Figure 8) After fitting it is then used to measure for the hole in the top rim. The ring is placed on the top rim and traced around. The saw is then used to cut out the hole slightly inside the line. After this is accomplished, both ring and rim are scraped, fitted together, fluxed and soldered with medium solder. After cleaning, the bottom ring template is used to measure the fit and the outside diameter of the top ring. A line is traced from the template on the top ring and all excess material is sawed or filed off.



Figure 8.

The top rim and ring, having now been joined, must be soldered to the top. The rim is fitted exactly as the bottom section rim. A mark is made on the front and back of the rim in order that the center can be seen. The finished top ring is then put into the bottom rim opening and marking lines are drawn on the bottom pot, front and rear. The pot is held or braced up while the pot top is laid on top of the ring and viewed from front and rear to determine whether the top lines up with the bottom. When they line up, marks are made on the front and rear of the lid. The rim can now be fitted one-eighth of an inch into the top and wired the same as the bottom for soldering. Solder with medium solder, but extreme care must be taken since medium solder has already been used. After soldering, cleaning and scratch brushing are complete, file the flaps carefully staying away from the lid's rim.

CHAPTER VI

SPOUT

To make the spout for the teapot, again the master drawing is consulted. Although the spout may be curved in the drawing, it must be drawn straight to accurately reproduce the form in silver. A line is drawn down through the center of the spout in the drawing. Along this line, depending on how extreme the shape is, a small line or dot is placed at regular intervals of one-quarter to one-half inch. On another piece of paper another line is drawn with dots or small crossing lines spaced at the same intervals as those on the blueprint. A ruler may now be used to measure the distance between the sides of the spout with the dot in the center. Each of these measurements is marked down. After all the distances are recorded at each dot, they are transferred to the ruled line on the other paper. In order to get the proper size of the spout, the distance between the outside spout edges at each of the dots must be tripled. This will allow for the all-lapping seam and for the true round shape to be formed from the two dimensional drawing. After all lines are tripled in length they are connected along their outside edges. The final shape of the spout

when done and cut out of the scratch paper should somewhat resemble a fan.

Another way of measuring the distance between the sides of the spout on the blueprint is to use a strip of paper. By laying it across each dot and drawing a small line on the strip where each side touches, transfer the size to the ruled line in triple. It is easier then using a ruler and the same results are obtained.

The pattern taken from the scale drawing is now used to trace the shape on the silver. The pattern is cut out of nineteen gauge silver with the bench shears, keeping close to the lines, after which the sawframe or hand shears may be used to get a more accurate cut with very little wasted material. The sterling is then annealed and pickled. The sterling should then be scraped at least one inch back from the edge on both sides. This will get rid of oxides and fire scale to permit easy soldering later.

An overlapping seam must now be made. This seam is used because of the strength needed when working the straight spout back to its curved form. The piece is held on the edge of the desk while a hand file is used to file an angle on the edge of the silver. (Figure 9) The angle should be smooth and straight, with no rounded or crooked sections and the whole edge should be sharp. After one side is done the reverse opposite side is done in the same manner. The reason for that is when they are raised



Figure 9.

around they must overlap each other. Even though the seams overlap they should be made even stronger by sawing a flap at each end. The length of the flap should not exceed three times the thickness of the metal.

The spout is now ready to be raised to its intended round shape. The raising hammer is used to strike the piece at its widest end, using the wood stump as a stake. The end will start to lift up while the raising hammer continues to hit towards the center and along the length of the spout. When the center is reached, the other side is worked in the same manner. The spout is then put over a small spout stake where the two overlapping seams are worked together. The two flaps are bent out of the way until the seam is perfectly tight along its whole edge. The two flaps are then planished over to lock the seam in place. Flux is then put along the whole seam and the piece is soldered with hard solder. After checking the seam for flaws, it is cleaned with hot water and then put into the pickle.

All the excess solder must now be filed away. If this were not done, later planishings could cause a crack to form or the metal at the seam would not be the same thickness as the rest of the spout. Care must be taken to get all of the solder off the seam and surrounding areas without removing any silver. If all the solder is not removed from the inside and outside, the solder not being pure silver will show a discoloration when the spout is

finally polished.

The spout is now ready to raise into its final form. A long straight stake is placed into the vise upon which the seam will be pounded down with a heavy hammer to get a uniform thickness. After hammering the piece must be annealed before continuing. Various curved stakes which take the shape the spout should now be are used to raise the spout to its final form. If stakes are not available, usually they are not, iron rods must be bent to the proper shape, filed, and polished to make the shapes desired. These stakes can always be used again. If new stakes are not made, pitch can be used as a stake to refine the spout. To fill the spout with pitch, one end is tied with paper and a commercial pitch is melted and poured into the spout; when cool the spout can be layed over a crack in the stump and raised to its proper shape.

After the spout is shaped the piece should be planished smooth over the stake or the pitch. The disadvantage of pitch is that it must be melted out after every planishing for annealing, then put back again. Also, there is a waiting period for the pitch to cool. After the spout has had its final planishing it is ready to fit to the bottom of the teapot.

The teapot must have holes in order that the liquid can be poured out. The spout is lined up against the pot and a line is traced around the edge of the spout. The spout is then removed and a grid of squares or triangles

is drawn within that circle. Where every line crosses, a small hole is drilled. That area is then emieried on the inside and outside to get the holes clean and to clean the pot for soldering. The spout is lined up over the holes but it is also lined up with the bottom and top of the teapot in order that all may be straight. Another line is drawn around the base of the spout. Stitches, which are small humps of silver raised up with an engraving tool, are placed around the line. These stitches will help hold the spout in place. To further aid in holding the spout, it is held to the pot with binding wire in order that it does not move. The spout and pot in the area of the spout base is then fluxed. Twisted paillions of medium solder are then placed into the spout and moved in place with a thin, long iron pick. The whole piece is heated carefully and a final hot flame is brought to bear on the edge of the spout where it and the pot join, until the solder flows. Extreme care must be taken because of the many solderings already done. After soldering, cool and then dissolve flux in hot water to take off the binding wire. The pot should then be pickled and scratch brushed.

CHAPTER VII

HINGE

Assuming that no commercial tubing is available for making hinge knuckles, one must be fabricated from twenty gauge sterling silver. Cut the silver about five inches long by one-half inch wide with a point at one end. A crack in the tree stump along with the raising hammer is used to pound the metal down the edge and in the center until the strip of silver starts forming the tube. A planishing hammer may then be used to bring the two sides together.

The drawplate is then put into a vise with the larger holes up. The plate should be low enough in the vise that only the top row of holes show because of the pressure exerted when drawing tubing. The draw plate and the silver is then oiled well in order that a smooth pull may be done. Insert the pointed end of the silver tube into the smallest hole it will fit. Draw plate tongs, which look like large pliers with one handle bent to help maintain a grip, are used to grasp the pointed silver tube. A knife held by someone else is inserted into the tube crack on the reverse side of the drawplate to keep the seam straight. When all are ready, a quick steady

pull is required to draw the tubing through the hole. After the first drawing the piece is lightly oiled, then pulled through the next smaller hole. The knife blade need not be used after the first few drawings. After three drawings the tubing should be annealed. At this time the right size sterling wire is picked that will fit into the tube snugly when done. The tube is then continually drawn down until it reaches the size wanted. The tubing will usually be five to six times its original length by then.

Four plates will be needed to make the desired hinge on this teapot. The two inside hinge plates must totally equal the thickness of the tubing. The two inside plates should be one and one-quarter inches square. Two more plates, about two inches long by one inch wide are then filed at an angle of forty-five degrees on one end of each plate. The angle is needed when the hinge is opened to ninety degrees or straight up. One top and one middle

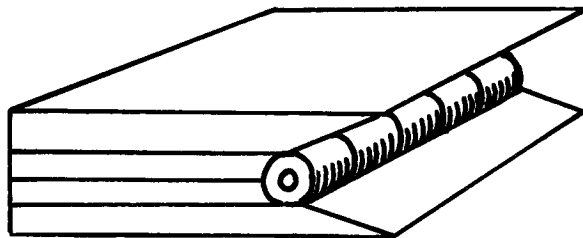


Figure 10

plate are then joined together and held there while the tubing is fitted. The tubing must not go out any further than the inside of the forty-five degree angle. When both plates are fitted properly inside to outside they are soldered together. (Figure 10)

The tubing used to make the hinge is now measured and cut with a tube cutter and sawframe, to be slightly wider than the hinge plates. That piece of tubing is then measured so the three inside pieces are of equal size while the two outside sections are slightly larger. After the hinge is complete the excess will be filed off. Five sections of knuckles are used to make a stronger hinge. The knuckles are now pushed on the iron wire, which is being used as the pin while soldering, and the hinge is set within the two hinge plates. A small pick or scriber is then used to turn the knuckles so the seam will be on the bottom of the plates. Very small paillons of medium solder in a small amount of flux is put on two knuckles on the top side and three knuckles on the bottom plate. Heat is then applied carefully until the paillons melt. The two plates are then separated after carefully pulling the wire pin. The two sections are then fluxed very little and a single larger paillon of solder is put on to each knuckle. The wire is then put back through the knuckles on one-half of the hinge and soldered. The same steps are done for soldering the other half of the hinge. The two sides are then cleaned in the pickle and joined together

with the pin. They should fit perfectly flat and open straight to the upright position.

The top and bottom of the teapot should be lined up at this time. A stiff piece of paper is inserted into the center of the hinge plates. The paper with the plates is then put between the pot top and bottom sections. The hinge is left out as far as wanted. The part with three knuckles goes to the bottom. A pencil line is then drawn by tracing around the top and bottom of the pot against the hinge. The hinge is then removed and the excess is sawed off. A half round file is then used to bring the hinge to the outside shape of the pot top and bottom. The thin strip of paper is then inserted between the hinge plates and the pot top and bottom. The pot is laid on its face in the pumice stone in order that the hinge may stand straight up to be soldered. Flux is put around the hinge and pot. Then the whole pot is heated until the flux starts to melt. The medium paillons of solder are then placed at the bottom of each hinge plate. The pot is heated more; then carefully a hot flame is directed at the base of the hinge until the solder flows. The pot is then cooled, soaked in hot water to dissolve the flux and opened. If it will not open, the flux must be soaked longer in hot water. After opening the lid, pull out the pin, pickle, and scratch brush both sections.

CHAPTER VIII

LID HANDLE

The last part to be added to the pot is the lid handle. The size needed is taken from the blueprint and reproduced on scratch paper in the same manner as the spout. The handle is then raised to the proper shape over a crack in the stump. A small stake, possibly one of the ones fabricated for the spout curve, may be used to further raise the handle to the right shape. Cut off most of the excess material and check against the center-line on the lid. File and fit the lid handle carefully making sure that it is straight. Emery the area to which the handle will be soldered. Place the handle against the lid and draw a line around it. On this line four stitches should be made, similar to those used when attaching the spout, to hold the handle in place. The pot too is then braced in the pumice stone and the area to be soldered is fluxed. The handle is put between the stitches and the lid is heated. When the flux flows easy, solder is placed around the handle. Four pieces of solder should be enough if the handle was fitted properly. Heat is then applied until the solder flows around the whole handle. The pot is then soaked in hot water. Excess

32.

solder must now be filed off after which it is sanded smooth with emery, pickled and scratch brushed.

CHAPTER IX

STANCHIONS TO HOLD POT

After the experience in making the spout, the stanchions to hold the teapot can be made much faster. (Figure 11) The two stanchions are constructed in the same manner as the spout, the only difference being that they are much larger. After the stanchions have been planished for the final time, the bottom is prepared for further work. Remember the seam of the stanchions will face inward.

The template of the wooden base is now used. The bottom of the stanchions is roughly cut with the hand shears until it fits the template of the wooden base. The bottom of both are then filed smooth.

In order that the stanchions can take the proper angle to the pot, the wood bottom must be made. The bottom is formed from black walnut which is ten inches long by five and one-half inches wide by two inches thick. The side view of the bottom is traced on a piece of paper and cut out. This pattern is then laid along the side of the wood base and traced to the wood. (Figure 12) A bandsaw is then used to cut off the excess top pieces. A tracing is then taken from the blueprint of the top of the

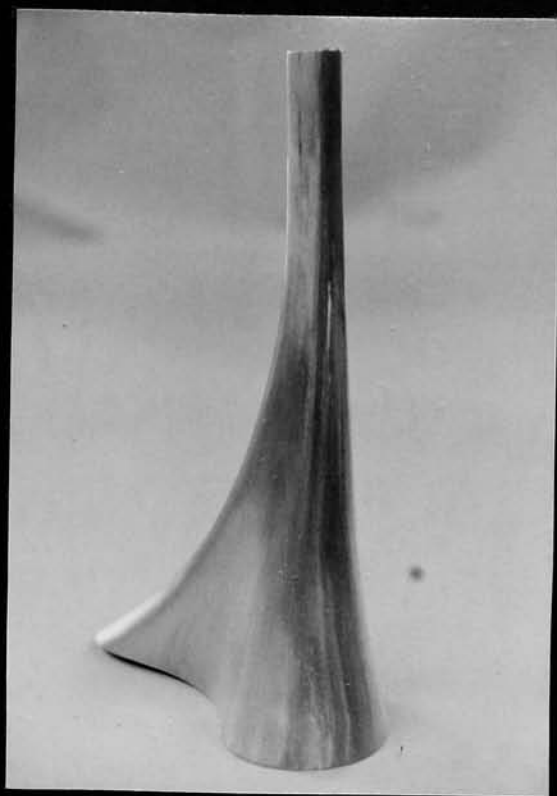


Figure 11.



Figure 12.

base. It also is traced on the wood base. Again the bandsaw is used to cut off the excess wood.

A small block of wood is needed to sand the curve in the base. The block of wood should have one side slightly curved like the bottom of a rocking chair. This shape will permit us to sand the base in a smooth curve. To get the base perfectly smooth, three types of sandpaper should be used; coarse, medium and fine. All sanding should be done with the grain. To get the surface of the wood very smooth, dampen it with a cloth which will cause the "hair" or grain of the wood to lift up after the wood is dry. Sand this "hair" off with fine sandpaper.

Some method must be devised to hold the stanchions to the wood base. It is decided that the stanchions will be bolted to the base. Two small pieces of seven gauge silver are fitted to the bottom of each stanchion. These pieces will attach to each side of the bottom and will cross the width of the stanchions. Since the stanchions will have an angle when tightened down on the base, a method must be found which will permit the nuts to stay level while being tightened. A piece of twenty gauge sterling is used. The length is equal to the amount it takes to wrap around three sides of the nut; the fit must be tight. These four pieces of silver are then attached with hard solder to the back side of the four braces which go across the bottom.

The inside of the stanchions and braces are then scraped clean of all firescale. The pieces are then fitted tightly, slightly below the rim of the stanchions. A scribe is used to mark their positions. After their removal an engraver is used to make two small stitches under each side of each piece. These stitches will hold the pieces up while soldering. The area to be soldered is then fluxed and the pieces fitted. Be sure that the nut holders are facing the inside of the stanchions, solder the stanchions with medium solder, soak in hot water, then pickle and scratch brush.

Four thumbtacks will be needed with some masking tape to find the center of the holes for the bolts. The thumbtacks are centered over each nut hole and a small square of masking tape is pushed over the tack and taped to the brace. All that should be showing is the point of the tack. This method is followed with the rest of the braces. The stanchions are then carefully placed in their proper position on the wood base and pressed down. When taken away the tack imprint remains. A small drill bit is then used to drill through the wood. After the tacks are taken off, the stanchion is held in place while an iron pick is put through the holes in the base to see whether the bolt holes line up with the brace holes. When the holes are aligned, a drill the size of the bolt is used to make those holes larger. When those are done a drill the size of the bolt head is used to counter sink

a hole just below the surface of the wood bottom. The stanchions can then be bolted to the wood base without the bolt head scratching the table.

The stanchion tops must be made from heavy gauge sterling to hold the large pivot which will be attached to the teapot sides. These tops must also slant forward because of the angle of the stanchions; three-eighths inch square rod is used for this purpose. The rod is cut into three pieces for each stanchion. The bottom piece must be larger than the opening in the stanchion top. A small groove is then filed out of the bottom piece in order that it will fit tightly into the top of the stanchion. (Figure 13)

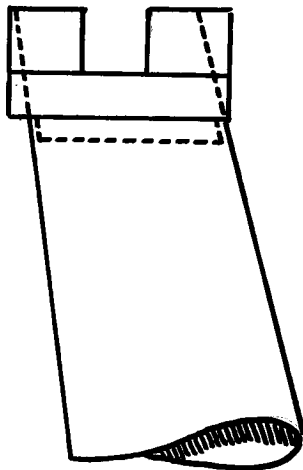


Figure 13

The other two pieces are then soldered with hard solder to the bottom piece, one on each end. The oversized length of the stanchions is then trimmed to the proper angle. The inside of the stanchion is then scraped and fluxed.

The top section is then fitted and soldered with medium solder. The excess material must now be filed away.

Masking tape may be used around the stanchion while filing to prevent scratches remembering to file away from the stanchion. The inside section of the stanchion will be filed after fitting the pivots on the pot.

CHAPTER X

POT PIVOTS

The centerline for the balance point of the pot can be found by first finding the centerline on the pattern. After this is found, the pot can be closely balanced by holding your fingers in the area determined by the pattern. Start lifting the pot gently. If the pot balances, the fingers should be moved to the front of the pot. The pot should be slightly off balance to the rear. This will permit the pot to come upright even when empty. Mark the spots where the pot is slightly off balance. These marks will stay there until the bottom fittings of the top handle are made.

Two pieces of seven gauge sterling three-quarters of an inch wide by two inches long are cut for the bottom of the handle. The two pieces are raised with a heavy planishing hammer into a curve which takes the shape of the bottom section of the pot. After the pieces are placed against the pot side and checked for proper fit, they are next cut and filed to take the angle of the stanchions. The angle of the stanchions and handle should be in one continuous slanted line with gentle curves at each end.

After the pieces are held at the right angle on

the pot, they are marked close to the bottom. A small drill hole is then made in each piece. A pin will go in these holes to support the pivot arm while soldering. The outside surface should then be filed to have a "fair" outer curve.

The two hollow oval sections cut as extra material from the top of the stanchions are then soldered to the two pieces just made. The seam of the hollow oval sections should face inward. These two pieces are then pickled and scratch brushed. The bottom areas of the two fittings should now be scraped to prepare them for soldering to the pot. The pot is emieried lightly where the pieces are laid and binding wire is tied around the top of the pot holding the handle pieces in place. Before they are soldered they are checked for alignment with both stanchions and checked if the pot is centered in the stanchions. The binding wire is then twisted tighter, flux is added and the whole piece heated. Twisted paillions of solder are added and a hot flame is directed at the area. As soon as the solder flows, stop the heat. The piece is then cooled, soaked in hot water, and the wire is removed. The pot is again checked for center alignment and pivot alignment.

Two pieces of three-eighths by two inch square silver rod is cut for the pivot arms. They are filed to the angle of the arm braces for the top handle. A small hole is then drilled into the center of the pivot which

matches the hole in the handle pieces. A small pin of silver wire is inserted into the handle. The handle piece is cleaned, then the arm with the pin is fitted into the pin hole in the handle piece. The pot is then laid on the pumice stones on its side, fluxed and soldered with easy solder. After cleaning, the pot is then turned over and the other arm is fitted. Before it is soldered it is checked for alignment on the stanchions. When everything lines up, solder that side on. The arms must now be filed in a half round shape on the bottom in order that the pot can roll back to the upright position. After that is done, the arms must be fitted into the stanchion tops. A height gauge is used to mark a level line on the stanchion top and at the groove bottom which will take the pot arm. Another line is marked using the square to get the straight up and down marks shown with the dotted lines. (Figure 14)

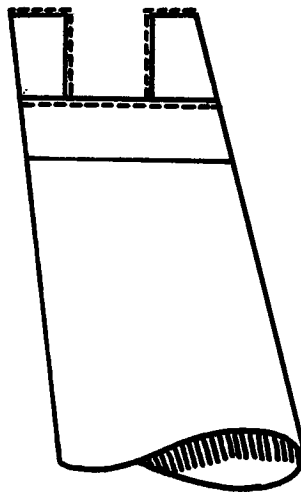


Figure 14

A sawframe is then used to cut away excess material. The parts should all be filed and emieried smooth.

CHAPTER XI

WARMER

Like the rest of the sizes used in figuring the amount of silver needed, the blueprint again is used to figure the size of the warmer. A rectangle of silver five and one-quarter inches by two and one-half inches is used to mark the holder for the candle. The piece of silver is squared and filed smooth on all sides. The silver is then annealed. Both sides of the plate, the two and one-half inch side, are filed on an angle for the overlapping seam. The same type of overlap was used with the spout and the stanchions. After scraping and filing, the piece is put into a small crack around a half inch; the crack is just big enough to accept the metal. The metal can then be bent on both sides. After bending the metal is wrapped around a conductor stake to close the seam. The seam is worked tight, then fluxed and soldered with hard solder.

After checking the seam and cleaning all excess solder off with a file, the heavy hammer is used to pound the seam down making it equal with the rest of the metal. The piece is then annealed again. After cleaning, the tube is put on a conductor stake and planished round and smooth. The tube is then set upright and checked with a square.

After squaring, the inside of one end is scraped.

A small piece of eighteen gauge sterling is then fitted for the bottom. The piece is planished level and emieried. A line is then traced around the tube on the plate and one-quarter inch is also added. This additional material will be sawed to make small flaps to hold the bottom tight while soldering. The metal for the flaps is cut in toward the tube circle but not the circle. A right turn is made with the saw and the cut is continued for another one-quarter inch. The end result of the cut should look like the letter "L". About eight cuts are made equally distant from each other. The tube is then put into the center and the flaps are bent up lightly at first, until all flaps are touching. Keep the circle in sight when tightening the flaps. The piece is then fluxed and soldered with medium solder. After cleaning the saw-frame is used to cut off the excess material and flaps. The piece is then filed smooth so there is no rim.

A ring is now needed to go around the heater which will hold it from falling through the wood. The ring is measured three times the distance across the tube and the material is cut from eight gauge square wire. The ring is formed on a conductor stake and fitted together by pressure. The piece is then fluxed and soldered with hard solder. The ring will now be planished round. The inside of the ring should then be filed at an angle in order for the ring to rest on the top of the wood base. After the

ring is fitted over the warmer, the tube is fitted into the hole made for it in the center of the two stanchions. The warmer is pushed down in the hole until it reaches a depth around one-quarter inch above the base bottom. The tube is then marked with a scribe. Remove the tube and put stitches on the scribed line. Flux and slide the ring down to the stitches, remove and solder with easy solder. After cleaning and filing smooth, the whole piece is polished.

CHAPTER XII

WOOD HANDLES

A pattern is cut for a side view of the top handle of the teapot. The drawing is transferred to a piece of black walnut five inches square. The grain in the walnut should run in the direction according to the length of the handle arms. The side view is then cut out with the bandsaw. Front view is then traced on the wood. It too is cut out. None of the lines should be cut away. By leaving these lines on the wood it gives a little more material to work with. The last pattern to be traced on the wood is the top view. It too is cut with the bandsaw. Care must be taken with the machine. With all the curves in the handle, there is a possibility of the blade grabbing and jerking the wood.

The bottom of the handle is then filed and fitted carefully into the holes made for them. After they are fitted, the rest of the handle is lined up and filed to its finished stage. Sandpaper is then used to make the handle smooth.

For the wood section of the lid handle, a small piece of walnut is filed until it fits into the hole at the bottom of the lid handle. The curve against the lid must be exact so no crack shows. A line is drawn to make

the handle level. The piece is then taken out and finished.

This will end all soldering and fitting on the teapot. All the firescale should be filed off and emery used until the pot is smooth. The whole pot is then polished on the buffing wheel. If a satin finish is wanted, the pot is scratch brushed then wiped dry with clean paper towels.

The stanchions are then bolted to the wood base. The wood handle and wood lid handle are then epoxied into place. After they dry the wood handle, wood lid handle, and wood base are soaked with linseed oil from a rag and hand rubbed to a semi-gloss finish.

CHAPTER XIII

CONCLUSION

There are many ways in which the design and construction of this teapot could be improved. These improvements would nearly always occur after the piece is started, when it is almost impossible to change the design.

It is natural for the artist to want a better finished product, to continuously strive for the best design. If he does not get other ideas for a better pot than the one just completed, he will become stagnant.

This thesis involves the design and construction of a particular teapot which will operate in a specified way. It is not a general instruction paper dealing with the construction of all teapots.

It is hoped that the student who wants to create a nonlift teapot will understand the problems and see areas where changes could be made in the design and construction of his own teapot.



Figure 15.

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