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Mechanical furniture

Michal Rosen

Title of Thesis: Mechanical Furniture

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MECHANICAL FURNITURE

by

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PREFACE

This thesis is in two parts. The first part is the result of many months of research I did on mechanical furniture. What is here is not meant to be a complete treatise on the subject. To say it all would itself take a full length volume. I have highlighted some of the more interesting pieces that have been made, giving the reader a taste into the past.

As for the second part, it is about my own work. It is very subjective and I will let it stand on its own.

This was a strained period in my life and I would like to express my thanks to my wife Margie and my parents for their support and confidence in me.

CONTENTS

"Furniture that folds itself, transforms itself. Surprise and mechanical furniture which, by the simple pressure of a button causes...candlesticks, fans, drawers, and cubby holes to burst forth. Moving, because of all of the tales from the past. Mysterious, because of the secrets they conceal, which often stayed unknown for many centuries; and suddenly by chance, by a clumsy movement revealed concealed objects, letters..."[1]

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1 LePrat, Guy, ed. "Les Meubles a Transformation et a Secret" (Paris, 1975), p. 5

Since my first erector set I have been completely intrigued by things that move. How or why I came upon mechanical furniture I do not know, but now it seems only natural that I should have chosen this route. To further explain exactly what mechanical furniture is, I will turn to Webster. His definition of mechanical is: 1) of or relating to machinery, to manual operation. 2) done as if by machine, automatic. Mechanical furniture might then be taken to mean - furniture with moving parts, automated, serving a function other than what is apparent or obvious.

My thesis is divided into two parts. The first part deals with the extensive research I have done into the past; finding what has been done and by whom, how or why the idea of mechanical furniture came into being, and how the pieces worked. The second part of my thesis is to express my own sentiments from what I have learned, and how I have incorporated my feelings and desires into my work.

My research has led me down a long road. Besides using the resources in the library at Rochester Institute of Technology, I also used the Rochester Public Library, University of Rochester Library, Memorial Art Gallery Library, New York City Public Library, the library at the Metropolitan Museum of Art, and the private library of James Parker, Curator of Furniture at the Metropolitan Museum of Art. Several books that

I had a hard time finding in libraries I bought for myself.

Mr. Parker and his associate William Rieder were kind enough to give me access to both the Museum library and their private library. They also gave me the privilege of viewing several pieces that the Museum owns. Some of these pieces were on display and others were in the Museum basement. I was also permitted to actually see how the mechanical pieces worked and to photograph them.

I also went to see the antique furniture galleries owned by Alastair A. Stair; Stair & Co., and the Incurable Collector, each of which has five floors of antique furniture. Mr. Stair's favorite pieces are mechanical ones that he has collected mostly in Europe.

In charge of the Incurable Collector and of the mechanical furniture is Ms. Carol Bohdan. She showed me all the pieces in Stair's galleries and was kind enough to spend some time discussing mechanical furniture with me.

As part of my research I have also been to the homes of several people that own mechanical pieces. Of the pieces I have seen, the more notable ones will be discussed later in this paper.

From my research, I have come to realize that every type of furniture ever created has at some time in the past, been mechanized.

The obvious starting place is with one of the earliest mechanical pieces, the chair. The folding chair goes back as far as the Middle Ages. Because of the nomadic habits of the peasants and the taste for travel of the noblemen, much of their furniture was made to be disassembled in order to be carried with them. The chair, a piece for human comfort, has always been given movable parts in an effort to either make it more comfortable or serve an additional function. The simple folding chair the nomads carried in the Middle Ages (figure 1) progressed to a piece that was copied all over the world; a chair with the back folding over the arms to become a dining room table (figure 2).

At Stair and Co., I saw a chair that one straddles backwards. It had a brass rail running around the top on which a tray full of mechanisms slid. The tray either folded flat down against the back, rested horizontally or propped up on an angle to support a book. The tray also had adjustable brass bars that folded up to hold a book in place allowing the reader to have free use of both hands. This piece also had a tray on each end that slid out and held a candle,

L'ornementation gothique fut mise en question dès le milieu du XV[e] siècle. La société élégante et fortunée des « palazzi », jouant le rôle de protecteur des arts, favorisa l'épanouissement de la Renaissance dont l'influence fut considérable dans toute l'Europe.

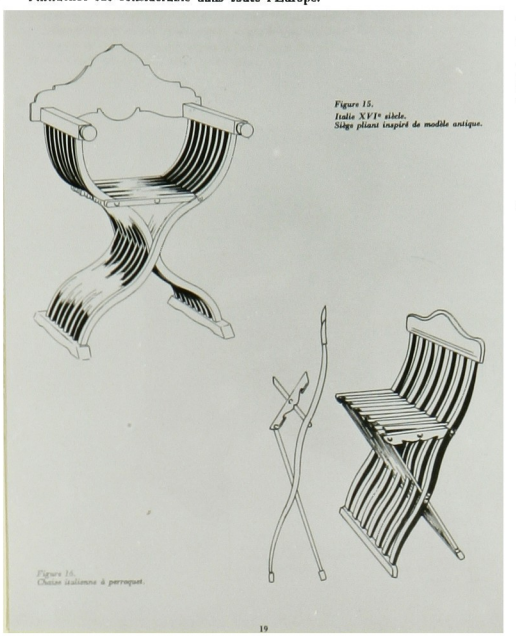

Figure 15.
Italie XVI[e] siècle.
Siège pliant inspiré de modèle antique.

Figure 16.
Chaise italienne à perroquet.

19

figure 1

figure 2

figure 3

figure 4

figures 3 and 4).

Most current examples of chairs would be a barber's chair or a modern strato lounger.

Tables in the Middle Ages were either very long, like those used in castles, or small for the homes of the peasants. During the renaissance in Europe the idea of expanding tables was developed. The earliest types were gate leg tables, with one or several legs swinging out to support an extra leaf that was hinged onto the top and folded down when not being supported by the swinging legs. An extreme example of an expanding table was devised by Johnson and Jeans in 1835. This table was reproduced until 1935, at which time it became too expensive to produce (figure 5).

The expanding table is another piece that has never lost its popularity through the ages. Every furniture store across the country carries an assortment of these tables from inexpensive ones to very expensive dining tables.

During the 1700's and early 1800's fancy dressing tables and washstands became very popular. (As indoor plumbing and bathrooms came about, the desire for these pieces faded). Most of these pieces had hidden commodes that slid out, wash bowls that were covered up, compartments that popped out to store toiletries, and mirrors that swung out and up (figures 6 and 7).

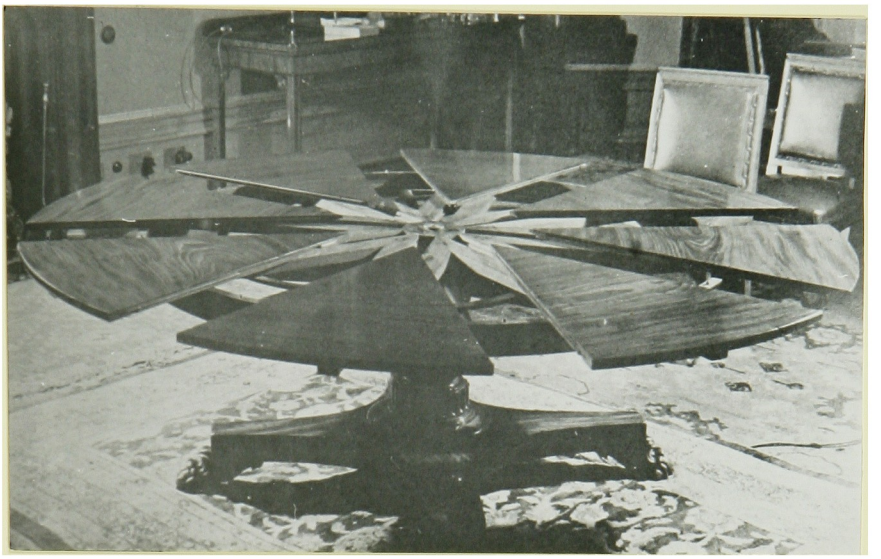

figure 5

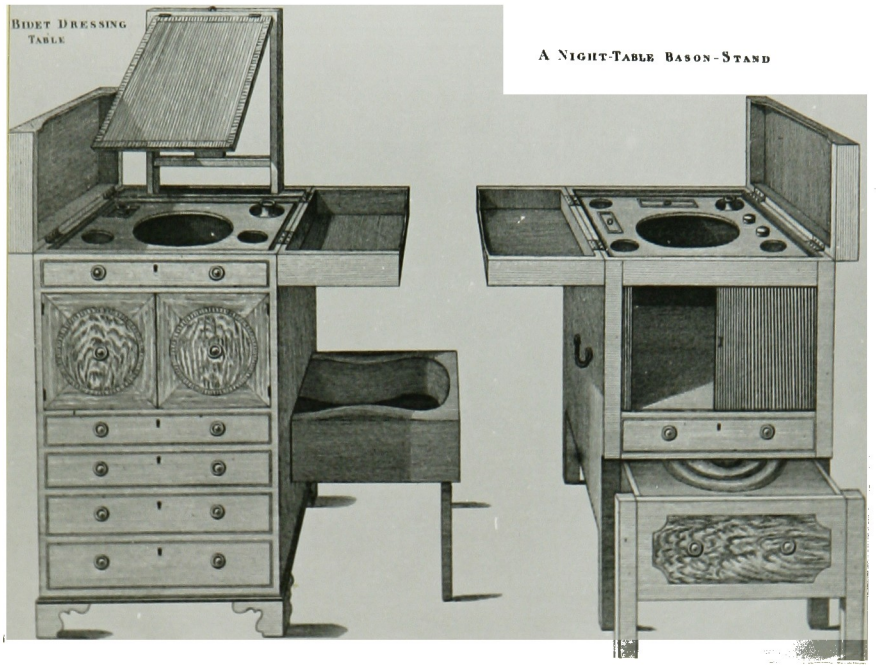

figure 6

figure 7

In the late 1700's and throughout the 1800's pieces of furniture were made that had ladders concealed in them. They were seen in all of the finest homes in Europe and America. These ladders were used primarily in libraries because the rooms were small and lacked space to have an extra piece of furniture in them. The ladders were generally concealed in chairs, desks and coffee tables. I find it upsetting to see that these types of pieces are not made anymore. They were extremely unique pieces and quite exciting to use. They were so popular that people far removed from furniture making and as notable as Ben Franklin were designing their own concealed ladders. One extremely unique piece was a small square table in which a chair pulled out so that the table could be used as a desk. The desk then folded over to become a ladder, (figures 8 and 9).

Game tables or harlequin tables, were most popular in the 1700's and early 1800's. Most had 3 or 4 tops that folded over to reveal different functions, (figure 10). This particularly clever game table was one that I saw at Mr. Stair's gallery. It had 3 folding tops. When closed it was a console. The first flap accommodated cards, chess or dining; the second backgammon; the third was a writing desk with a rising till, or nest of drawers for the storage of papers, pens, etc. From these little

figure 8

figure 9

figure 10

desks came an assortment of writing desks, both for men and women. These desks had rising tills, secret compartments and writing surfaces that slid out and tilted.

At the Metropolitan Museum of Art I saw several desks and game tables. The most notable piece was a table made for Marie Antoinette by Riesener in 1778. The entire top rode up and down on 4 brass rods with gears in them. Turning one crank raised all 4 rods at once. The top had 6 secret compartments that opened by means of small brass buttons laid into the edge of the top. It also had a tilt-up writing surface that pivoted around to display a mirror (figure 11).

Another game table I saw was the property of Robert Wilson of Buffalo, New York. This table was made in the United States, probably in the 1920's or 1930's. The mechanism in the table was made of tin, and not very well made. But nevertheless, it did work when I saw it and was extremely interesting. Upon putting a deck of cards into a slot in the side, the mechanism (which operated electrically) grabbed the deck, shuffled and dealt it out to play bridge, 13 cards to each player (figures 12 and 13).

figure 11

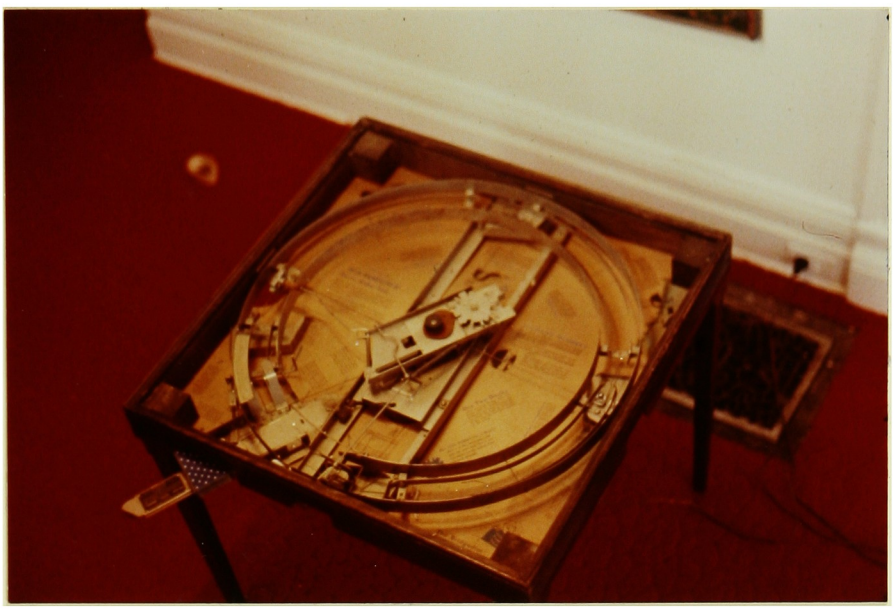

figure 12

figure 13

The Middle Ages in Europe was a time of great unrest. Wars and social disorders required the frequent relocation of the family. The furniture of this age reflected the life style. Each piece of furniture was required to serve as many functions as possible as well as being easily transportable. (Perhaps this was the beginning of "knock-down" furniture). Very few pieces are left from this age, and it is necessary to rely on the drawings of this period's furniture.

As I moved on to the renaissance period I found that the furniture was better conserved so examples were available, and that more varied pieces had been made.

The insecurities of the 15th and 16th centuries led to the need for locks and secret compartments. Boxes were always provided with locks, and secret mechanisms for opening them. Poisons, the obsession of the day, as well as jewels and love letters, required hiding. Hidden panels and secret doors operated by a hidden lever or button were put in everywhere.

"The coffre or bin was one of the earliest pieces of furniture that served many functions..."[2] and can be followed as it was transformed into many other pieces through the ages. Originally it served to carry clothing and dishes. It served the same people as a table, seat, sleeping bench and storage bin.

Another mechanical piece dating back to the 16th century was the arm chair or monk's bench. It was a chair with a hinged seat to reveal storage space below and the back pivoted up onto the arms to become a table. This piece can be followed all the way to Colonial America. It is of ecclesiastical origin. It was also used at one time by fabric merchants who locked their wares in the base and used the table to cut fabric on.

All of these factors were, in combination with each other, the cause of the earliest creation of mechanical furniture.

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2 ibid., p. 9

With the dawn of the renaissance period, the first truly great masters began making mechanical furniture. As furniture became more elaborate so did the mechanisms used in them. The masters, taking example from the past, as well as trying to offer their clientele something a little more varied or unusual, studied both furniture making and clockmaking, thereby having a mechanical background to add to their fine art of cabinetry.

I think it would be valid to look at the lives of several of the great masters. Those select few who chose to produce mechanical furniture had a more difficult time earning a living than the average cabinetmaker. How they lived, and what they had to do to earn a living may prove to be useful to someone today venturing to produce mechanical furniture. As this thesis is not a history book on mechanical furniture or its makers, I will keep the accounts of their lives brief.

The truly great cabinetmakers, Jean Francis Oeben (c 1720-1763), Jean-Henri Riesener (1734-1806), Abraham Roentgen (1711-1793), and David Roentgen (1743-1807), were all Germans relocated in Paris. All of these

cabinetmakers had clockmakers and mechanics working with them to help install the mechanical devices in their pieces.

Oeben, Riesener, Abraham Roentgen all were known in their day but none of them were able to make a good living just on mechanical furniture. In fact Oeben and Abraham Roentgen died almost paupers. Riesener took over Oeben's shop and did slightly better with it. The only cabinetmaker in the group to retire wealthy was David Roentgen. What was interesting about his life was that he was the only cabinetmaker in his time to expand in every possible direction in order to get business. David realized if he wanted to stay in business, he had to have a wider clientele and also had to offer the public a variety of styles. When David took over his father's shop, it was deeply in debt and he first held a lottery to sell off a large part of the stock. He then started travelling throughout Europe trying to secure orders for his work. He advertised in a friend's paper, "Correspondance Litteraire" which kept all the crowned heads of Europe up to date on the current events in the art world of Paris. David ended up doing little more than designing and supervising his shop, which employed as many as 25 workers. David's shop eventually turned into a factory that produced standardized parts for many of his pieces.

Thomas Sheraton (1751-1806) reknowned for his furniture and "The Cabinetmakers and Upholsterers Drawing Book" made only a few pieces in his lifetime. His Drawing Book was widely publicized, and many cabinetmakers copied his designs, thus supporting the idea that he himself made a great deal of furniture.

Sheraton died a pauper, as did many of the great cabinetmakers. Several other notable craftsmen worthy of further study are: Jean Mace, Andre-Charles Boulle and Giovanni Socchi. The list of cabinetmakers who made only a few mechanical pieces goes on and on. These pieces, such as those made by Socchi, were so fine that one should really study all these men in order to get a truly excellent picture of what was done with mechanical furniture in the past.

A fairly complete listing of the cabinetmakers whom I found to have done something with mechanical furniture will be included in the bibliography.

As I stated in my introduction, I am intrigued by mechanical furniture. During my research I saw many mechanical gametables, chairs and desks. Ninety per cent of them were in fairly good working order. This fact lends great credit to the craftsmen who made them as well as the craftsmen today, whose job it is to repair these antiques into working condition. Speaking

with the craftsmen who repair furniture at the Metropolitan Museum of Art I learned their procedure for repairs. When a piece comes to them, very often it will first be x-rayed to show where screws, nails and mechanical parts are, then it is taken apart, piece by piece, until all secrets are exposed. Each piece is then delicately repaired and put back together.

While many of the pieces are literally falling apart, it is amazing that they are here and can be restored into working condition after existing for up to 300 years.

As Mr. Parker stated to me, and as I now realize, I have merely scratched the surface regarding the work that has been done on mechanical furniture. To date, I have been able to trace much of what was done mainly in Europe to the beginning of the 1900's. During this time there were also many adaptations being done in America. One period that I recently became aware of is the prohibition era in the United States. Many tables and cabinets were made with secret compartments to hide liquor. There were also many tables that concealed roulette and crap tables.

At the time of this writing, I have found nothing written on mechanical furniture made during the prohibition era. I have concluded that the source of my information will have to be through people who own pieces that were made during this period. I do plan to continue my research because these pieces intrigue me and I am constantly getting design ideas from them.

As a contemporary designer and craftsman, I have set high standards for myself concerning the craftsmanship put into each piece I make. The high quality work that goes into each piece of furniture leaves me with the feeling that I can produce a piece of furniture today that is made as well as any antique I have seen. I also feel that my pieces are capable of lasting as long. With the technological advances that I have available today, I do feel I have a certain advantage over past craftsmen. I can produce a piece of furniture faster than ever before, enabling me to produce more work and sell it at more reasonable prices. Another technological advantage is that my mechanical pieces should be able to last longer than my predecessors without breaking down.

In addition to my maintaining a high level of craftsmanship, I feel it is necessary to make full use of all today's technology, yet, I must be careful how I utilize these advances, such as to only substitute new materials in places that would work better than wood.

We are in the last quarter of the 20th century. Our technology has expanded more in the last few decades than in the last several centuries. The horizons for my work are limitless. I am learning from the past not only what was done well, but also what failed.

Many veneered pieces have completely fallen apart. There were many causes; inferior glues, veneering onto solid wood, and veneering over joints where the wood moved more than the veneer, causing the veneer to crack. Modern advances have made available uniform laminates, plywood, and particle board. All of these are far superior to solid wood as a base material to apply veneer on. They eliminate the problem of veneer cracking due to solid wood movement.

Modern adhesives are impervious to almost all atmospheric conditions, including time. Once a veneer is glued down it can almost certainly be expected to never lift up. Today's improved finishing products and methods also help to keep that veneer from being stained by water and alcohol or from lifting up.

With the help of kiln dried timber, the woods I am using are of a higher quality, which is extremely critical when working with moving parts in furntiure. The Forest Products Laboratories in Madison, Wisconsin and many other private industrial and governmental agencies are constantly making available new findings

relating to woodworking. I can now look at a chart which shows the average moisture content of almost any species of wood in the world. Another chart shows the amount of expansion and contraction to be expected both radially and tangentially in every species of wood. Thus, when I need to make moving parts in a piece of furniture, I can find the most stable woods available to do the job with. Then, with my own moisture meter I can check every piece of wood put into a piece of furniture to make sure that all the wood is of the same moisture content, a most important factor to help prevent checking and excessive movement in a finished piece.

Another factor affecting the longevity of a piece of furniture is the type of metal used. Wherever it is necessary to add metal into a piece, (as it often is in mechanical pieces) I use brass. Many antique pieces have moving parts of steel and tin. These pieces have fallen apart or do not work because in a relatively short period of time the steel and tin rusted. Steel will rust without ever being in contact with water. There is enough humidity in the atmosphere to affect the metal. Brass will never corrode, rust or oxidize, and so, always works smoothly.

Even the most stable woods will expand and contract a little with seasonal change. Where two pieces are in constant contact, rubbing against each other, I can

again take use of modern technology. Plastics that are available today are as hard and dense as many woods. They will not expand or contract. They have permanent dry lubricants bonded into them so they will slide easily on another surface.

Aside from using modern materials and technology in my work, a large consideration is to make each piece completely accessible to service the mechanisms in the future. This is a major problem in restoring pieces made in the past. By stipulating that I want my pieces accessible for service does not mean that I expect them to fail. But, being realistic, anything that is mechanical and frequently used, faces the possibility of some functional failure. Therefore, my pieces must be serviceable.

As a designer, my first requirement is to meet the needs of today's society. If I do not, my work will not sell, which serves as a constant gauge to evaluate my work. In choosing to make mechanical furniture I am trying to direct my work, as specific as it is, at a wide range of clientele. An apartment dweller can certainly make use of a table which functions as 2 or 3 different game tables as well as a dining room table. This same table will appeal to those living in more expensive homes as an imaginative game table or novelty piece.

I think there are several reasons for making mechanical furniture. One is the number of apartment dwellers prevalent today. Living this way myself, I am constantly reminded of the lack of available space. Any piece of furniture that could serve two functions would be well worth having.

My goal is to make small limited editions of mechanical pieces. Many people are infatuated with pieces that have a "mystique"; hidden drawers, secret compartments, sliding trays. These are all put into a piece to serve a function, yet there is also a certain amount of gimmick appeal. I also have a selfish reason for making mechanical furniture: I want to make pieces that are different from what everyone else is doing. I also want to enjoy and be challenged by what I am doing.

I believe that many fine pieces made in the past should be rejuvenated into contemporary pieces. For example, let us get rid of that steel step ladder in the kitchen that my wife needs to reach the top shelves. A contemporary dining chair that folds over to become a step ladder would be much more pleasant. A small table that could become a ladder, game table or buffet cart would be another useful piece of furniture. A ladies vanity with a fold-up illuminated mirror and compartments for all her necessities would keep the piece compact and neat.

Keeping in mind each of my considerations for a piece of furniture, I will try to explain my work. This thesis is not to explain furniture techniques which can be gotten from any cabinetmaking book. I will, however, describe how the mechanics evolved, how they work, and explain my own feelings about each piece.

The desk I made evolved as a form in my mind long before I became involved with my thesis. Once I developed the form, which is composed of steam bent and coopered segments or staves, I let it rest for awhile as I was not quite sure where to go with it. I had several ideas for the shell: a chair, cradle, and a desk. The idea of a desk excited me the most because of the unusual shape that I knew would result. I knew I would have various problems, but I was confident I could resolve them.

The Bauhaus School of Design was based on the premise that form follows function. There is a reason for that premise, especially in cabinetmaking. It is easier. In a logical course of events a designer will have certain requirements for a piece of furniture

that go into design before the form. Starting backwards I had immediate problems: lack of knee room, lack of storage space, and no way to close the desk when not in use. This was where I decided to add mechanical devices. It was at this point that I left the desk to do research on pieces of furniture with mechanics in them.

Appealing as it was to work with a pure form with no restrictions, there were drawbacks. It can often be difficult to fit particular functions into a form. Also, adding an assortment of mechanical devices verges on insanity.

I took my shell and put my requirements for a desk into it: 1) It had to close; 2) It had to have a writing surface approximately 30 inches off the floor; 3) One should have knee room when sitting at the desk; 4) It had to have storage space.

My first step was to design a means of closing the desk. I took a quarter section of the whole shape and made a pivoting point on each end to roll it back inside the main shell. However, I found that I had to design and manufacture my own hardware for the quarter segment to pivot on (figures 14 and 15).

Including a writing surface necessitated installing complete inner bracings to support it, while letting the pivoting segment pass behind it (figures 16 and 17).

Because of the shape of the shell, there was not

figure 14

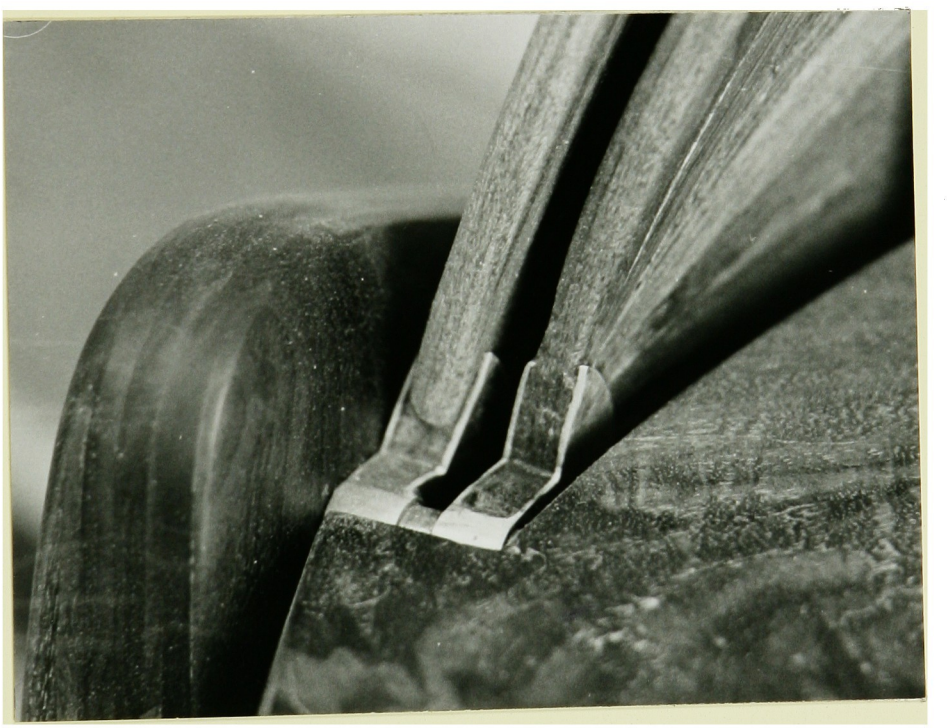


figure 15

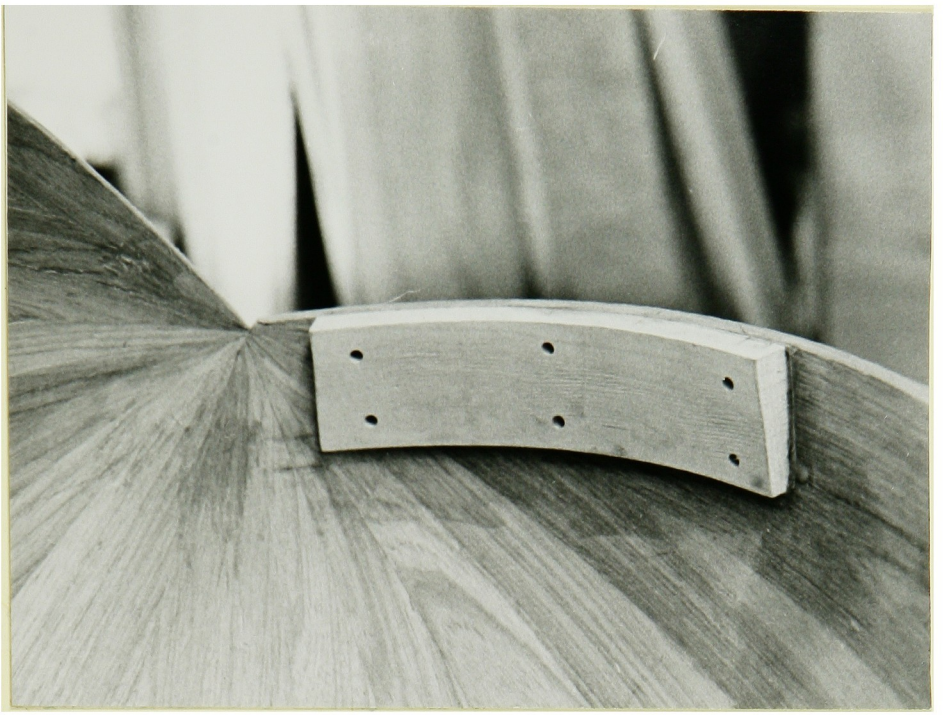


figure 16

figure 17

sufficient knee room to pull a chair up to the desk and write comfortably. A writing surface that could be pulled out far enough to insure knee room when sitting at the desk became essential. Thus, more inner structure for the writing surface to slide on (figure 18).

With the writing surface installed and sliding, the problem of access to the lower half of the shell was solved. This area became extra storage space. I had to build a separate structure to hold the compartment that would fit under the writing surface (figure 19). It also had to be made to knock down, to facilitate access to the bottom of the shell in the event of any repair work. Thus, the writing surface is screwed down and all compartments in the bottom are screwed together. All metal pieces in the desk are brass to prevent corrosion and rust. Cubby holes were to be installed in the back of the desk. When I began to hang the doors I again had to manufacture my own hinges, as I could not locate any small enough to fit.

These were my basic requirements. Then, as I worked on the desk, other mechanisms became a necessity.

I could not design a handle I was satisfied with. I devised a slide which was operated from beneath the desk. The slide was a camera cable release that, when pushed in, pushed a brass rod up through the writing surface against the bottom of the pivoting shell. It

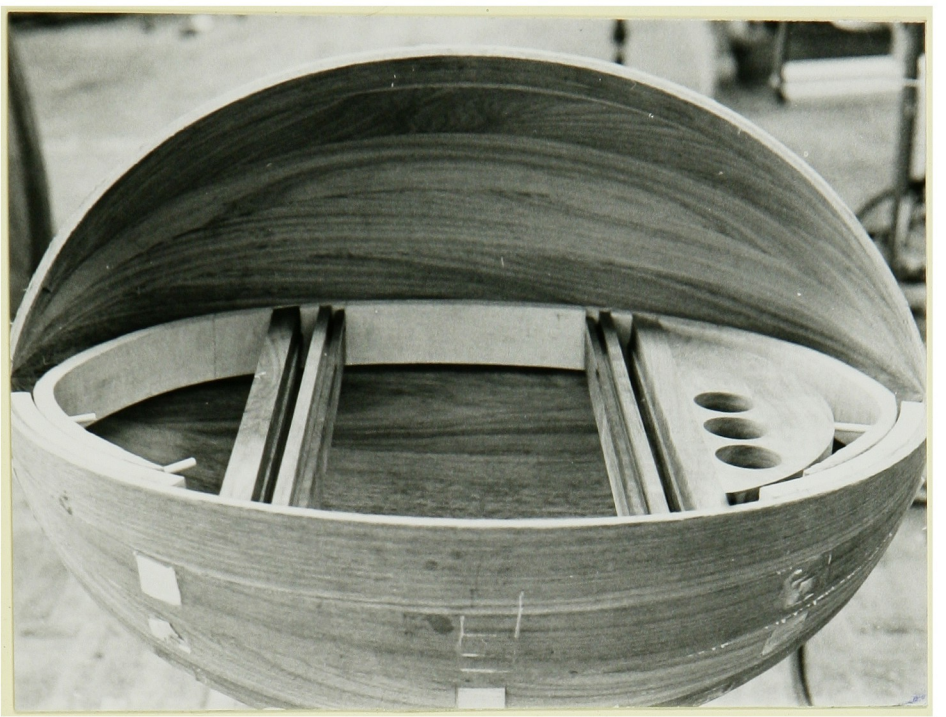


figure 18

figure 19

raised the front up enough to put my fingers under it and open it the rest of the way. The slide that rubbed against the button on the cable release was made of wood and delron, a self-lubricated plastic. The delron made the slide run against the metal smoothly and it will hold up much better than wood. In addition, it was quiet. That may not seem important, but any enclosed space in the shape of a shell and with a small opening in front acts as an amplifier for any noise made within (figure 20).

I now needed some way to lock the desk. The most obvious place to install a lock was in front. However, I did not want to mar the writing surface with a lock. I also wanted an unobtrusive locking mechanism. I decided to install a locking device similar to the mechanism I had installed for opening the desk. This time I had to use a heavier cable. I found that the cable release was not strong enough to run 3 feet through the desk and still have enough force to push a brass rod up into the pivoting section to lock it (figures 21, 22, and 23).

Another feature I needed was a mechanism to extend the writing surface. I did not want to put a handle on it to pull it out. For this I designed a spring mechanism (figures 24 and 25).

I had to experiment with different springs and rod lengths until I found the right combination with enough

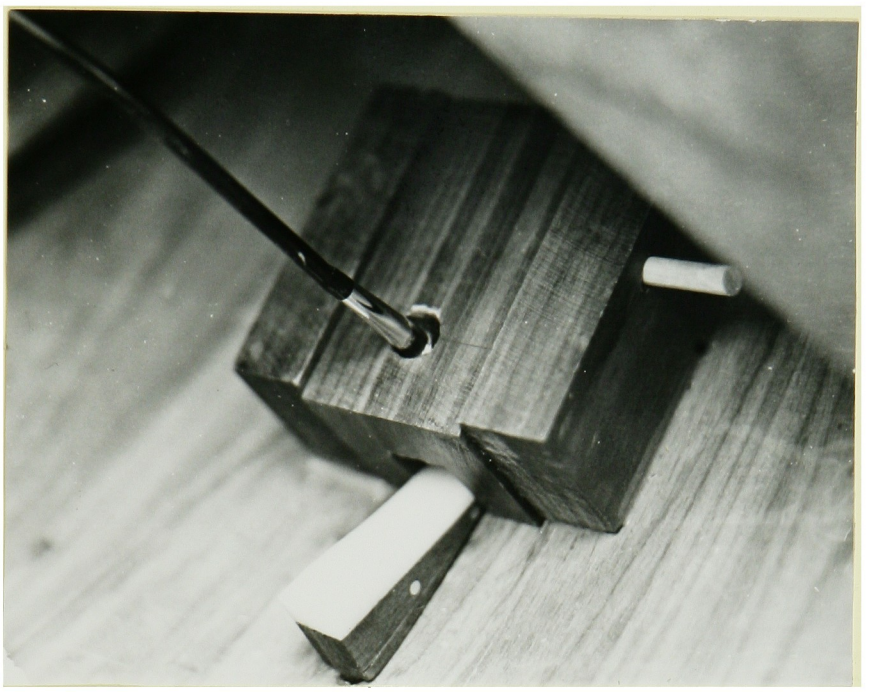
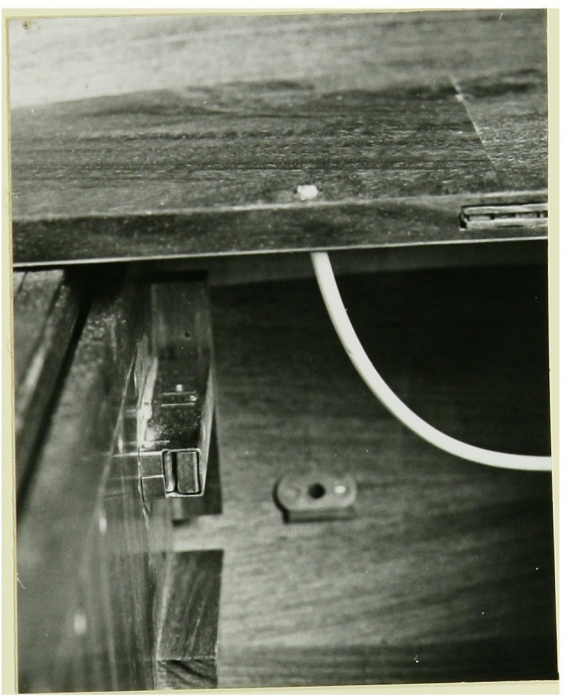


figure 20

figure 21



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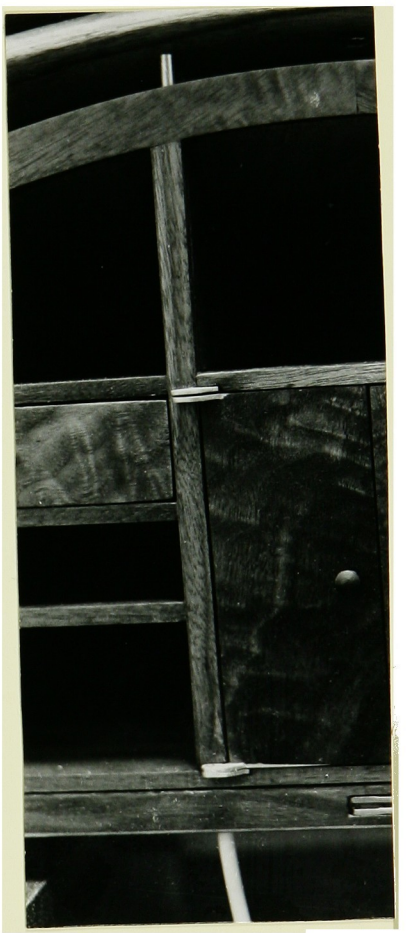

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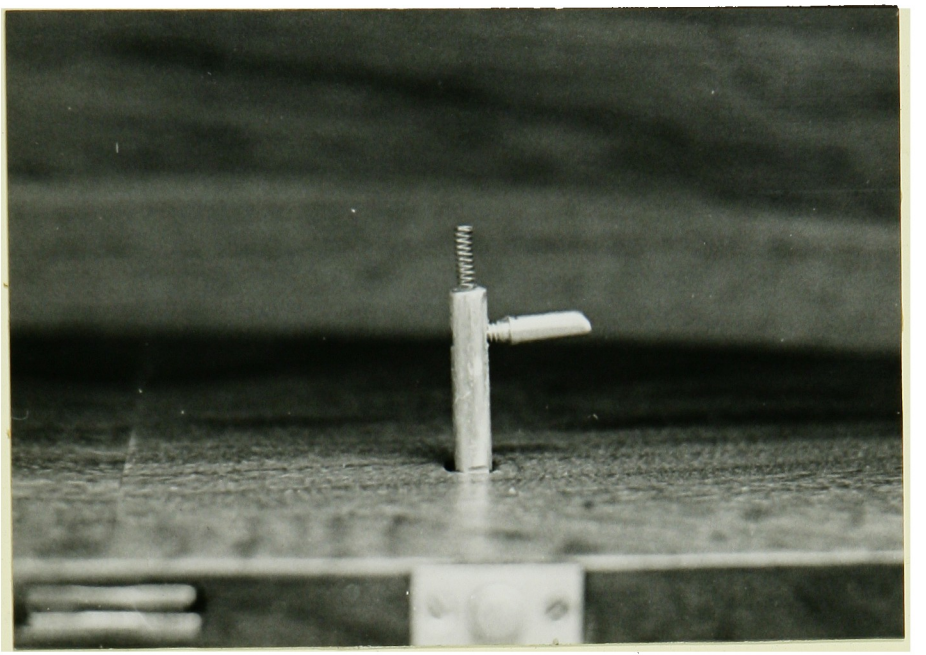

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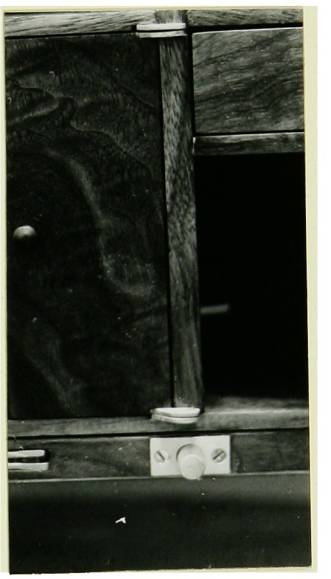

figure 25

force to extend the writing desk, yet be supple enough to retract with a minimum amount of pressure.

Another minor touch which adds to the overall beauty and professionalism of the piece was the installation of a sliding dust panel or tray. This fits in directly under the sliding writing surface, so when the writing surface is pulled completely out there is still a neat clean appearance to the piece. Only when it is necessary to extract a sheet of paper or an envelope would one slide open the dust panel to have access to the file folder compartment below. I tried to make the cubby holes somewhat asymmetrical and enjoyable to use. The doors with 2 drawers behind and the pivoting drawers were designed with this in mind.

There are several other secret compartments in the piece, but to reveal them all would be to disclose the true heart of any mechanical piece.

I never really looked at the desk as a complete piece of furniture until it was finished. When I did, I realized that it needed a chair. I knew I would never find one commercially made which would match, so I played around with several ideas. I realized that a full-sized chair was too much to add to the desk. I still liked the desk as a form and was very cautious about what to add to it. Very few designs complimented the desk. I finally decided on a stool that would

slide under it. It had to compliment the desk both under it and in front of it. I feel that my final design is as successful as any stool or chair could be (figures 26, 27 and 28).

figure 26

figure 27

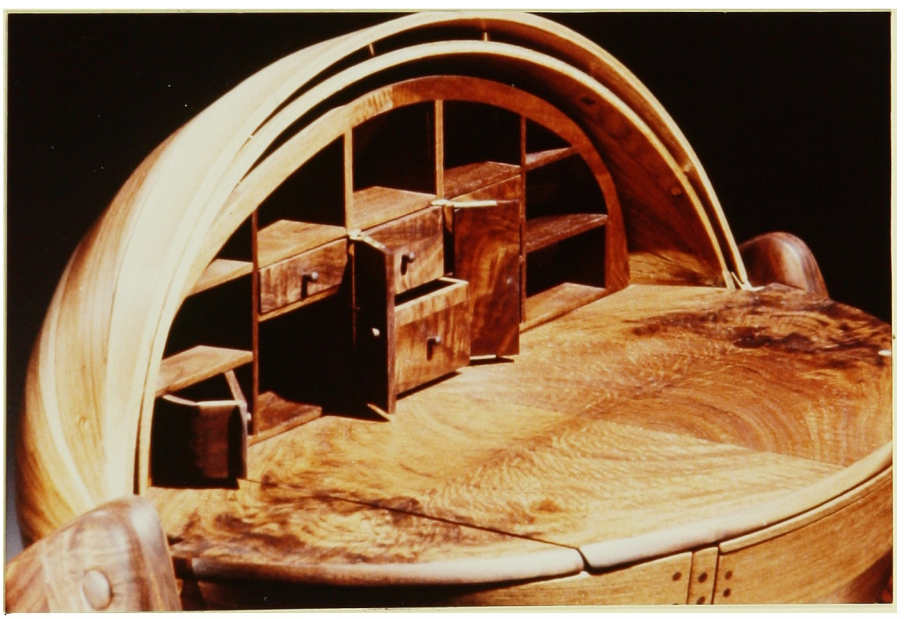

figure 28

For my third piece I chose a harlequin table or mechanical game table. This table is for my parents, who will shortly be moving into an apartment. I designed it with the idea of using it as a prototype. I wanted to create a piece that would take up a minimum amount of space, yet serve as many functions as possible. I feel it is a beginning; I can and will go much further with it. This piece unfolds in one direction to be a chess-checkers table or used for cards. Its size is 38" x 40". In another direction it can unfold to become a backgammon table, also 38" x 40". The table can then unfold as a dining room table 38" x 80". There are no extra leaves to store. Everything is compactly fitted into it. When closed, the table is only 20" x 38".

This table was very exciting to do after the desk. What I wanted to attempt was to approach the problem from the opposite direction of my approach with the desk. I started with a function (or series of them) and made a stick style piece to accommodate all the requirements. Then I sat down and tried to add form to it.

I tried rounding over all the edges, subtractive changes and additive changes. The table always appeared very architectural and with help I evolved a design for the legs and top that I felt complimented it. Again, with this piece, I left all of the mechanisms accessible for repair in the future. I also used only

brass where sliding parts were necessary. When opening the table, the bottom leaf of the four has to slide all the way over, so that the other three leaves can unfold properly. I designed the use of a brass sliding dovetail to slide the top over (figures 29 and 30).

An idea I borrowed from the past was to use a small block of wood that pivots up to support the top panel when the table is flipped over for chess. This was necessary because when the table is set up for chess there are 3 leaves on one side of the base and one leaf on the other side, and that one leaf has nothing to sit on (figure 31). The only other necessary mechanical part needed was a means of locking the legs together. The table has 8 legs. When closed they are together in pairs and need to be locked to give the piece extra rigidity and give it a clean visual appearance. When open, I wanted the locks to retract back into the legs to make the legs smooth. I did not want small metal or wood nubs sticking out where one could catch pants or stockings on. The mechanism I devised retracts back into the leg when open (figures 32, 33, and 34).

I also put 2 drawers into the table. One drawer holds chessmen, the other backgammon pieces. I made the drawers so they come out of their tracks and sit on the table top for easier access to the playing pieces. Felt was put on the bottoms so they would not damage

figure 29

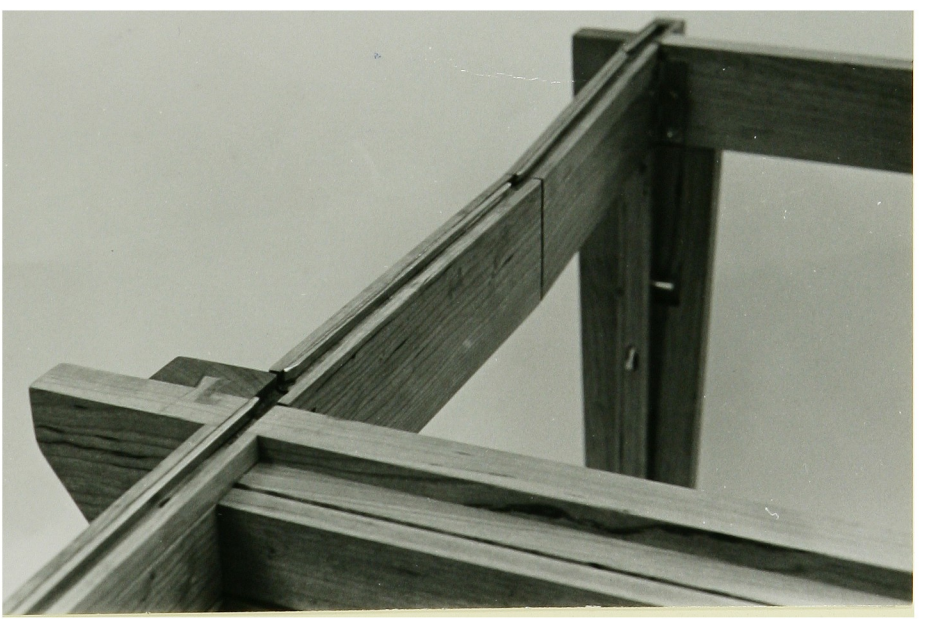

figure 30

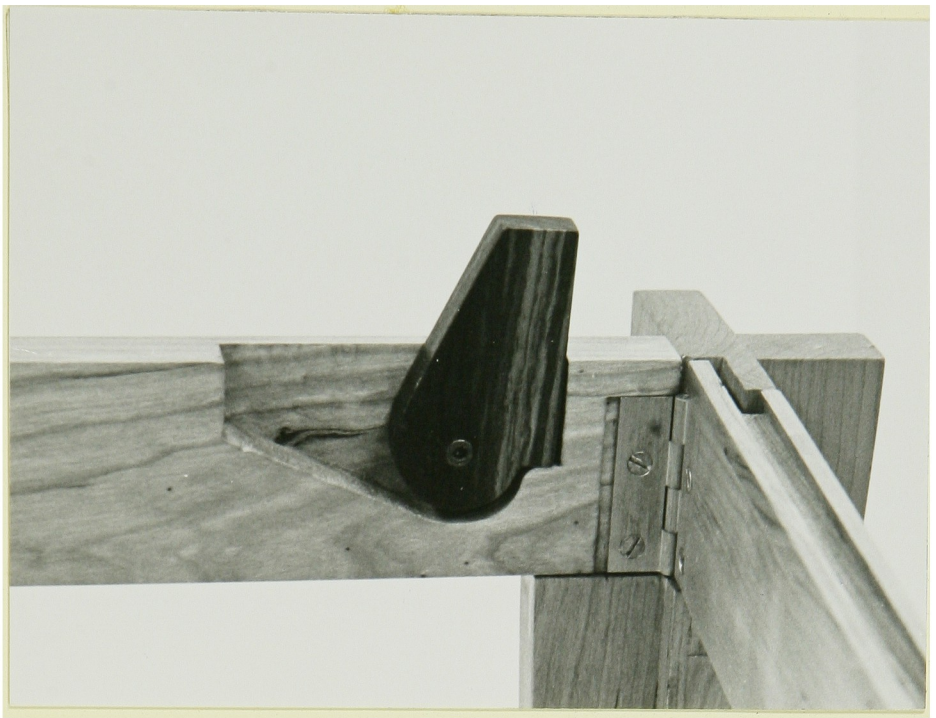

figure 31

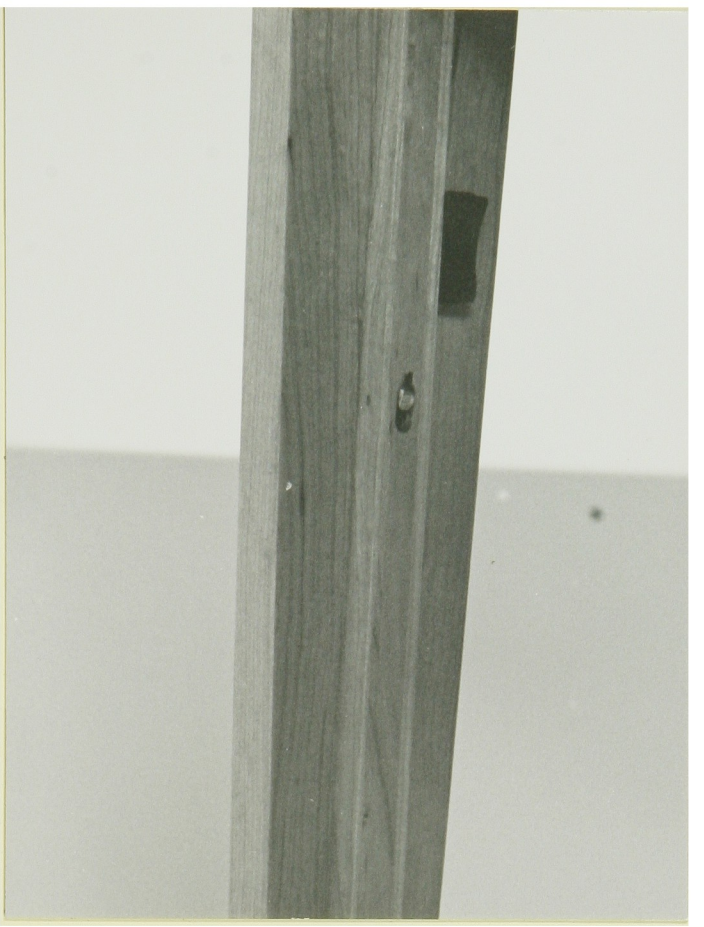

figure 32

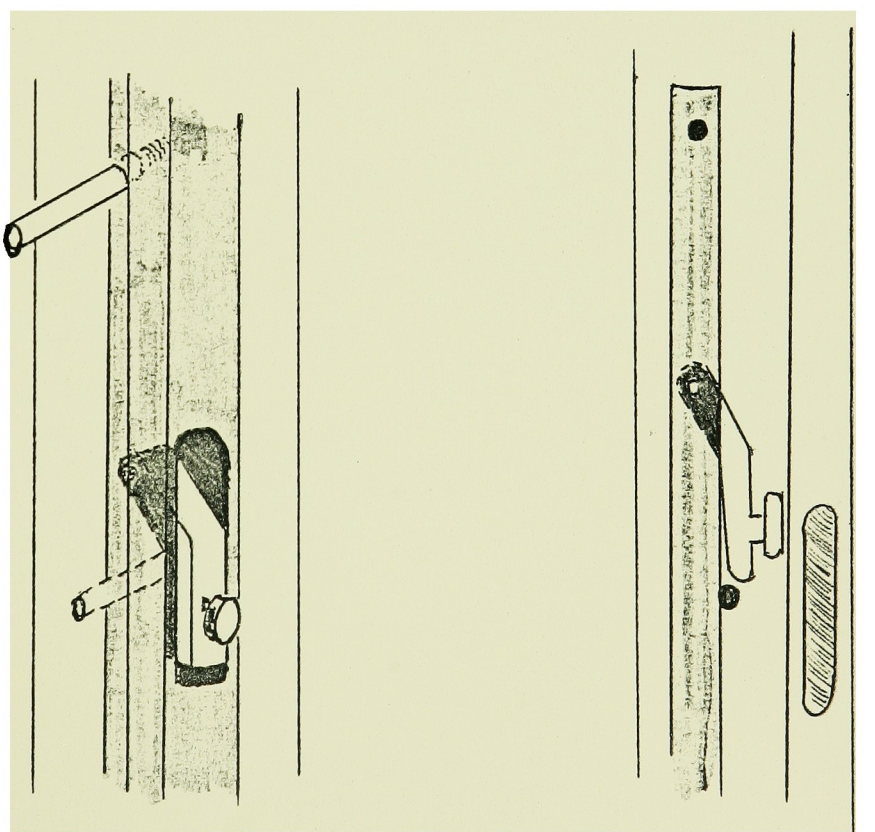

figure 33

figure 34

the playing surface. I also made a combination locking mechanism and touch latch to keep the drawers shut and it can open without the use of a handle (figure 35).

I feel the table is very straightforward. There are no secrets in it; I would not want any. The piece is definitely mechanical, and it is made to be used. Anyone could buy it and use it with no difficulty (figures 36, 37, 38, and 39).

figure 35

figure 36

figure 37

figure 38

figure 39

The game table, for me, is very successful. I have future ideas to add a writing surface with a pop-up till, drawers and cubbyholes, or perhaps a tilt-up writing surface. All of these would be along with what is already there. This piece is one I can produce quickly in a variety of different designs, and sell at a reasonable price. I would like to develop several other mechanical pieces that I can also produce quickly and at a reasonable price. I will also be designing more complicated pieces but I do not like the idea of making furniture exclusively for the wealthy. I would like to produce furniture for young people who live on a tighter budget.

Future plans include a complete line of mechanical jewelry boxes, from the simple to the elaborate. I will manufacture my own hardware for each piece, as each will be a prototype. Eventually I will try to devise a mechanism which I would have produced in a machine shop in large enough quantities to lower my cost, and the final consumers' cost. I also have plans for several mechanical chairs; simple collapsible ones, chairs that

become ladders, and ornate one-of-a-kind pieces such as a giant scallop shell that opens up on a hinge (such as on a real scallop shell) to become a love seat. A traditional desk that would be full of mechanical devices might also be made.

My research has led me down a long road. The more I have looked for mechanical furniture the more avenues I found open to me. In fact, even though this thesis is done, I am continuing to find new pieces and will continue to research them.

I had an unusually difficult time finding material for my research. One can find references to mechanical pieces in virtually any furniture history book. The best books were extremely hard to procure, and in some cases, translations were needed. Therefore, I will list my bibliography in order of importance as a reference for mechanical furniture rather than listing it alphabetically. There is no definitive book written in English on mechanical furniture. The one I found written in French is truly excellent but it was not by any means complete as a reference for what has been done throughout the world. I have contemplated writing such a book, but there is extensive research still to be done.

In essence, as I look back over this, I think I had no single reason for choosing mechanical furniture. I have been trying to find a niche for myself that is

not what everyone else is doing. I was also trying to find pieces to work on that were challenging, fun and continuously inspiring. These pieces are. Each time I get an idea for a piece of furniture, as I contemplate it, I get ideas for other pieces and variations of the original piece. I think anything can get boring and monotonous. It is up to the individual to create energy in his work. If I do not have excitement and challenge in what I do, after a period of time, I grow bored. I am highly motivated right now with this work and I think that as I continue to explore new devices my excitement will continue to grow.

APPENDIX I

Listing of cabinetmakers specializing in mechanical furniture.

This list is only a reference for further study. The cabinetmakers are listed alphabetically.

Boulle, Andre Charles
Boutry, J.
Canabas
Cochois, J.
Delanois, L.
Denizot
Dufresne
Hache, J.
Joubert, G.
Leleu, J.F.
Mane
Migeon, A.
Migeon, P.
Oeben, Jean
Riesener, J.
Roentgen, A.
Roentgen, D.
Roussel
Sheraton, T.
Socchi, G.

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