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Many thanks for your e mail dated 14th May 2001, which has been referred to me, as the daughter of Mr. A.A.S. Charles.

My father's health prevents him from replying to you himself. I have viewed your website with interest and I confirm, on behalf of my father, that you have his permission to publish extracts from his 1983 publication The Steel Pen Trade.

Regards

Malissa Stockbridge
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The Steel Pen Trade (1930-1980)

A record of the principal Manufacturers

A description of Manufacturing Processes

An insight into Selling Practices

by
A.A.S. CHARLES

CHAIRMAN OF
D. LEONARDT & CO. (HIGHLEY PENS) LTD.
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FOREWORD

THE STEEL PEN TRADE 1930-1980

Towards the end of the 19th century the book entitled "The Story of the Invention of Steel Pens", with a description of the manufacturing processes by which they were produced, was written and published by the late Mr. Henry Bore. This book was given to me by my Father when I entered the steel pen trade in 1930 and I have found, like many others, that it is an excellent recording of the subject from the year 1822 when steel pens were first made on hand presses, up to the date of publication approximately 60 years later.

As I have said Mr. Bore completed his book towards the close of the 19th century and 100 years have now passed since the book was published.

I can divide my experience into two parts, the first part was from 1930 to the outbreak of war with Germany after which there followed a gap of seven years, 3 1/2 years of which I spent as a Territorial

Officer in Japanese Prisoner of War Camps. The second phase of my industrial experience stretches from my de- mobilization to the present day.

During the first period I ran my Father's business of T. Hessin & Company which although still registered as a Private Company no longer manufactures pens. After the war I founded the Highley Pen Company in the village of Highley and in 1949 merged this business with the old established business of D. Leonardt & Company and thus D. Leonardt & Co. (Highley Pens) Ltd., came into being.

CHAPTER 1

NAMES OF MANUFACTURERS IN THE 1930's

I think at the outset it might be a good thing to place on record the names of the Manufacturers of pens (and by this I mean steel and non-ferrous metal pen nibs) in the year 1930 when I entered my Father's business of T. Hessin & Company in Wheeleys Lane, Birmingham, where we manufactured between 10,000 and 15,000 gross of pens per week.

At that time, and I give them in alphabetical order, the following firms were manufacturing pens and all of them had their factory in Birmingham, except E.S. Perry.

1. Baker & Finnemore Ltd.
2. British Pens Ltd.
3. C. Brandauer & Co. Ltd.
4. Joseph Gillott & Sons Ltd.
5. T. Hessin & Co.
6. Geo. W. Hughes
7. D. Leonardt & Co.
8. Macniven & Cameron Ltd.
9. John Mitchell
10. M. Myers & Son Ltd.
11. Perry Pens Ltd.
12. E.S. Perry Ltd.

BAKER & FINNEMORE LTD.

One of the smaller Manufacturers and in terms of output about equal to that of my Father's Company T. Hessin & Company. They were owned and run by the Barnwell family and I knew Mr. Arthur Barnwell and his son Edward who, alas, died at a comparatively early age.

BRITISH PENS LIMITED

One of the largest companies run by Mr. Studdy Hooper and afterwards by his son Brian Hooper and in 1930 embraced two well known firms, William Mitchell and Hinks Wells and occupied substantial premises in Bearwood Road, Smethwick. The firm of William Mitchell had for many years been famous for lettering pens, and like Joseph Gillott, pens for artists' use, that is drawing pens and lithographic pens, and this name is still famous throughout the world for these specialist products. At that time, in 1930, British Pens were the second largest firm of pen makers and had developed a very considerable business in making parts other than pens, such as metal parts for the hosiery trade.

C. BRANDAUER & COMPANY LTD.

Occupied premises in New John Street West and had a number of very well known pens which sold throughout the world. This Company was owned and run for many years by the Petit Family at this time a descendant Mr. Adrien Petit is Chairman of the Company.

JOSEPH GILLOTT & SONS LTD.

Occupied Victoria Pen Works in Graham Street, Birmingham, so named after a visit by Queen Victoria in whose honor a mahogany staircase was erected. In the early 30's the head of the firm was Mr. Bernard Gillott but after the second world war his son, and my friend and contemporary, Nicholas Gillott took over the direction of the Company. There was always a certain rivalry, which is referred to in the book by Mr. Bore, between Gillott and Mitchell as to who actually started the manufacture of steel pens, but the year was 1822 and it is not for me 160 years later to act as arbitrator in this matter. Suffice it to say that John Mitchell and Joseph Gillott were the first to manufacture pens on hand presses.

T. HESSIN & COMPANY

Owned by my Father the late Mr. T.H. Charles and apart from pens had very few other outlets. We found our business to a great extent in the cheaper range of the market and this will be understood more fully when I discuss the various outlets.

GEORGE W. HUGHES

Again a private firm which had been founded by Mr. George W. Hughes and at the time I came into the trade it was run by his son Roderick Hughes. Mr. Hughes produced pens of the highest quality and was a specialist in metallurgy, heat treatment and all the different processes which made up a steel pen. He was also widely traveled and was a student of far eastern languages. A particular feature of George W. Hughes was that they never made pens that did not bear their own imprint, a policy which stood them in good stead in later years.

D. LEONARDT & COMPANY

Again a private company, a partnership as opposed to a Limited Company, between Mr. Hewitt and Mr. Charles Leonardt who occupied premises in Charlotte Street, Birmingham, off Summer Row. They manufactured pens of the highest quality and their export market extended to South America and to the Eastern countries of Europe. I shall refer to this company later in my book because a merger was formed in 1949 between my own company and D. Leonardt & Company.

MACNIVEN & CAMERON

Run in 1930 by Mr. Duncan Cameron whose brother Waverley Cameron ran the printing works in Edinburgh. Perhaps Macniven and Cameron are best remembered by the advertisement which appeared for many years on railway stations which read 'They come as a boon and a blessing to men, the Pickwick, the Owl and the Waverley Pen', even today this clever advertisement is remembered by many people.

JOHN MITCHELL

A firm, as distinct from either a private or public limited company, the proprietor of which was Mr. Henry Mitchell. The day to day running of the business was conducted by his son Eric Mitchell. This firm occupied a large site in Moland Street, Birmingham, close to the Birmingham General Hospital.

M. MYERS & COMPANY LIMITED

Again an old company of moderate size which made a substantial weekly quantity of pens, but which in later years wisely developed their business in other directions and are now famous the world over for the 'Bull Dog' letter clip and make a wide variety of pressings for shops, including shop fittings. In 1930 this business was run by Mr. Ronald Myers and my contemporary is his son Malcolm Myers who has led the business very successfully for a great many years.

PERRY PENS LIMITED

When I entered the trade they were the biggest manufacturers of pens in the world and occupied very substantial premises in Lancaster Street, Birmingham and the head of the firm was Mr. Oliver Smith who was of an older generation than I but whose son John Smith I got to know very well as I grew up in the trade.

E.S. PERRY LIMITED

This Company was founded by Mr. Edmund Perry in 1921 and he had two sons, Michael and James. James actually produced the nibs and Michael was responsible for the marketing and administration. The factory of E.S. Perry is based in Gosport and still produces high quality hand finished stainless steel nibs. These are marketed as fountain pens and specialist fountain pen sets under the Osmiroid brand and enjoy a world wide reputation.

CHAPTER 2

RAW MATERIAL

In chapter one I have, to the best of my belief, listed the Manufacturers of pens as they existed in 1930 when I entered the trade and in my next chapter I feel that I should devote space to the raw material used and the manufacturing processes, as they were carried out in the early days, followed in a later chapter by the effect which automation has had in the 20th Century.

The type of steel used in the manufacture of steel pens has' not materially altered since the days of its invention and the following is a typical analysis:

Spring Steel CS/70

	Carbon	Silicon	Manganese	Sulphur	Phosphorous	Iron
Min.	0.65	0.05	0.50			BAL
Max.	0.75	0.35	0.90	0.045	0.045	BAL

In the early days it was a recognized practice for the older Manufacturers to buy in steel in the hot rolled condition, in short lengths, and roll it down themselves to the thickness which they eventually required for each particular nib. The practice in 1930 was to buy steel in coils from the well known manufacturers in Sheffield. This was an important change and a great step forward because in 1930 by reason of the fact that the steel was supplied in coil form by the Manufacturers, it was possible to feed it automatically through power presses, which resulted in the combination of operations, which hitherto had proved impossible. The thickness of carbon steel used for pen making varies from .003" for the manufacture of Lithographic or Drawing Pens to .025 " for the manufacture of Manifold or Copying Pens. Most pens are made from steel .009" - .010" thick.

CHAPTER 3

MANUFACTURING OPERATIONS: 1-17

The following are the operations which had to be carried out to manufacture a steel pen and in the following pages I shall try to give an account of each in some detail.

1. Cutting or Blanking
2. Piercing
3. Annealing
4. Marking
10. Grinding
11. Slitting
12. Point forming
13. Polishing

- | | |
|--------------|------------------|
| 5. Embossing | 14. Colouring |
| 6. Raising | 15. Lacquering |
| 7. Hardening | 16. Looking over |
| 8. Tempering | 17. Boxing |
| 9. Scouring | |

BLANKING OR CUTTING

In the early days the blanking or cutting operations were performed by women who fed steel strip through a hand press in approximately six foot lengths. Originally the blanking operations simply produced a plain blank which subsequently had to be formed up into the finished shape of the pen. The length of steel which had been sheared to the correct width to suit the overall length of the pen was pulled from the back to the front of the hand press by the operator and each nib was blanked out by means of a punch entering a die. Around the punch was mounted what is known as a stripper which had the effect of freeing the scrap material from the cutting punch so that the steel could be pulled forward to cut the next blank. The distance which the steel could come forward was controlled by what was known as a finger stop and the bar, or scrap material between each blank, came to rest on this stop before the operator made the next blow. As I have said the only operation being performed was that of plain blanking without a mark or pierce hole, but there was one exception to this, for in many cases an identification was put on the edge of the blank known as a raising bit, and this was achieved by filing a small recess in the edge of the cutting punch. The object of this will be better understood later on, but its purpose was to give the Raisers a means of identification so that they did not raise the pens upside down after they had been marked. In the majority of factories the Cutter, as she was called, generally cut 130 gross, or 18,720 nibs into a metal work pan which was supported underneath the press, and this was known as a 'lot'.

PIERCING

In nearly all steel pens there is a pierce hole in the centre of the pen and very often ornamental piercing or side cracks, the purpose of all of which is to give flexibility to the nib when it has been finished. Again in the early days pens were pierced on hand presses and the operator or Piercer used to pick up the nibs one by one and place them over a piercing bed locating them by means of adjustable guides which ensured that the pierce hole would be placed exactly centrally in the pen. As in the case of blanking as each pen was pierced the piercing punch came up and was released from the pen by means of a stripper. It was the duty of the piercing toolmaker to see that at all times the piercing tool was kept properly ground so that no burr appeared on the edge of the pierce hole.

ANNEALING

When the pens were blanked out and pierced the raw material was in a hard rolled condition because it is easier to maintain a burr free blank and to pierce a burr free hole from hard material than it is from soft material and the next operation was the annealing of the pierced blanks prior to the marking operation.

Annealing was done in the following manner:-The blanks were packed into what were called annealing pots which in the early days were made of cast iron, and the pens were laid on top of one another and with a pommel they were kept in the flat condition. When the pot had been filled a plate was put on top of the blanks and was held down by a spring. The inner pot as it was called was then inverted and put into an outer pot head first, after which the gap between the inner and outer pot was filled up with silver sand. The annealing pots were then ready to go into the annealing furnace which at that time was heated by coal. The pens were brought up to a temperature of 700°C and were soaked for two hours. The furnace was then turned off and the pots were allowed to cool down inside the furnace overnight. Next morning they were withdrawn and were in a fully annealed condition. The fact that they had been protected from the atmosphere by reason of the inner and outer pots meant that they were still free of scale and were ready for the fourth operation which was the process of marking.

MARKING

Regrettably this process placed the operators at considerable risk and I am happy to say that nowadays this has been completely eliminated. In the early days, however, a pen was marked by means of an operator who picked up the blank which had now been pierced and annealed, and placed it in a guide in the marking stamp. This stamp consisted of a foot operated stirrup and a pulley wheel over the marking tool. A weight was then lifted by the

operator by means of the foot pulley and when a pen had been placed in the guides she released the pulley and allowed the weight to crash down upon the correctly located blank. As the Reader will understand it was inevitable that from time to time the operator inadvertently left her finger over the pen when freeing the weight and as a result many crushed fingers occurred which thankfully are now a thing of the past.

EMBOSSING

Most pens were marked, but under my heading of Operations I have included a process of embossing. Many of my Readers will be familiar with the famous 'J' pen which had a capital 'J' embossed on the centre of the pen. This embossing was done in the same way as the marking, but it was done with a Male and Female tool which produced a clearly visible raised capital letter such as the 'J'. Regrettably the same risks which applied to the marking operation also occurred in the operation of embossing.

RAISING

The raising, or forming operation, was described by Mr. Henry Bore with great accuracy in his book and it is true to say that 100 years later the same process is followed. In his book Mr. Bore explains with great clarity how the raising tools are assembled, but I think the extreme skill which was required by raising tool makers to produce the correct shape needs clarification.

When I first entered the trade there was great rivalry between the raising toolmakers and the cutting toolmakers. The cutting toolmaker always said 'any fool could raise it', whereas the raising toolmaker used to say 'there is nothing in cutting out a blank, the greater skill rests in the forming of that blank'. My sympathies I must confess are with the raising toolmaker. For example, if one was requested to produce a pen that one had never made before, the toolmaker you first approached was the Raising Toolmaker to whom you gave the sample, with the request: "Please develop a blank." This toolmaker had the skill to make a raising tool which would produce the shape of the sample. To do this he had to create his own blanks, which required him to take a piece of steel or metal and file it by hand until he created the correct blank to produce the finished article. Having made his raising tool he tested the filed blanks in it until he established the correct size of blank, after which he said to the Cutting Toolmaker, "I want a blank of those dimensions." The Cutting Toolmaker, because of his experience and skill and because he was able to copy - the blank which the raising Toolmaker had filed up, was able to produce a cutting tool which produced blanks suitable for the Raising Toolmaker, although he was not concerned with the original development.

To raise a pen one must have a raising tool, both punch and die, but one must also remember that there must be a gap between the punch and die to allow for the thickness of raw material which is being used for the manufacture of the pen. If the punch and die exactly fit one another the effect will be a squeeze which as applied will make the raw material thinner on each side of the pen. The method used therefore to make a raising tool was first of all to make a drift, and these master drifts were greatly cherished by the raising toolmaker, who had filed them up by hand, and had hardened, tempered and polished them so that he could produce from them a raising die.

The way in which this raising die was made was to cut off a section of steel, in my day it was Jessops best cast water hardening steel, and to heat it to a temperature of around 800°C. This piece of steel was then put into what was known as a 'drifting press' and the drift which the toolmaker had made was driven into it and formed a shape. The raising bed was at this stage red hot and as soon as the shape had been imprinted into it by the raising drift, it was removed from the drifting press and put under a quench and a jet of water was directed into the centre of the raising bed which hardened it. I shall describe this in more detail when I discuss the question of hardening and tempering.

The raising toolmaker then took the bed which had been drifted, cleaned it and polished it, and then manufactured a punch which fitted the internal radius of the component which was to be raised, and this punch was smaller by the extent of the thickness of raw material of the pen than the raising drift. The raising toolmaker then had a punch and a bed which Mr. Bore so rightly describes fitted in a hand press. The bed was fitted in a bolster and the punch in what was known as a 'false nose'.

As in the case of piercing, the pens were raised individually and fed into the raising tool by hand and the average output of the 'Raiser' was one lot of pens per day, i.e. 18,720. In the early days, and this is what I am dealing with for the moment, when the pens were fed into the raising guides, as they were called, the 'Raiser' pulled the handle of the fly press and the raising punch descended with considerable force on top of the pen. The presses used for this operation were double-sided hand presses which exerted a very considerable pressure. As in the case of the original marking operations the 'Raisers' ran a considerable risk of pinching the forefinger of the left hand in the raising tool and this was a very unpleasant injury which by insistence upon the use of hand press guards has now been virtually eliminated. One of the difficulties in raising a pen was once the pen had been formed by the punch it had to be extracted from the raising bed, and although in most cases there was a spring loaded peg in the bed, this did not push the pen out of its position laterally. To do this the women raisers used to hold a stick in their right hand and at the end of the stick there was a leather pad attached by a pin and as the raising punch went back the operators used to sweep this bit of leather across the die and sweep the pen away with it.

The timing required very great accuracy because not only were they concerned with sweeping away the raised pen, but they also had to pick up the next pen with their left hand to put into the die. I have remarked in my paragraph on blanking that pens were identified in some cases by a raising bit so that the operator could make certain that the mark which was already on the pen was placed downwards. Some Raisers were known as bit raisers and some as mark raisers. In other words the bit raiser went by feel and the mark raiser went by eyesight. When the Reader stops to think that 18,720 nibs had to be selected from a pile on the left of the press, transferred to the raising die, raised and actually extracted by means of a bit of leather on the end of a stick, at the rate of 18,720 a day, he or she will appreciate that whatever was earned was truly earned.

HARDENING

Before describing the ways in which these two operations have been carried out over the last 50 years, I think I should start off by telling a story which I was told in 1930. Before the days of gunpowder, during the course of a battle, two soldiers were one night using their swords for a purpose quite unconnected with killing the enemy. They had impaled a piece of meat on their swords and were cooking it over an open fire. Suddenly and unexpectedly the Orderly Officer of the day was heard approaching on his rounds. Both Soldiers immediately scraped the pieces of meat off the ends of their swords and one put the red hot sword tip into a bucket of cold water which happened to be standing nearby. The other soldier threw his sword with the red hot point into the undergrowth, and when the Officer of the Day arrived both soldiers were simply sitting round the fire. Next day they both went into battle and when the first soldier used his sword in anger the point snapped off, the second soldier when he too used his sword against the enemy found that instead of skewering his assailant his sword bent at the point.

A lesson may be learnt about the process of hardening and tempering carbon steel from this story. In the case of the first soldier the sword was red hot, probably at about 800°C, but because he put it into a bucket of cold water the instant cooling had the effect of hardening the tip of the sword. In the case of the second soldier the fact that he threw the sword away into the undergrowth had allowed it to cool slowly, having the effect of annealing the sword, that is making it soft. In order to harden and temper carbon steel in the 1930's, and I say this because methods have changed in recent years, it was necessary to heat the pens to a temperature of 800/850°C, then to quench them into either cold oil or water to make them brittle, and then to temper them back which meant submitting them to a temperature of approximately 280°C until the necessary spring temper was achieved. When I entered my Father's business at the age of 16 one of my first tasks was to work in the hardening shop. At that time we used a coal fired 'fire brick' muffle in which to heat the pens for hardening. This heat was achieved by shovelling coal into the lower part of the furnace, rather like firing a steam engine, and the dampers were opened by hand mechanically and when the correct

temperature had been achieved the furnace was damped down. The raised pens, which it will be remembered at that time were soft, were then placed in cast iron hardening pots with a lid and these pots were put into the chamber above the coal heated chamber to heat up to a temperature of approximately 800°C. This temperature was judged in those days by eye and was known as 'cherry red' and when the man working the hardening furnace could see that all the pots were 'cherry red' in colour, he allowed the work to soak at that colour for at least 20-30 minutes. Then by means of a long steel rod with a hook the pots were drawn to the front of the furnace and were seized by the hardener with a pair of tongs and were quenched. This was done by carrying the hardening pot containing the pens over the quench tank which generally consisted of whale oil or seal oil. The lid was removed by hooking it over a stake above the quench tank and by a quick turn of the wrist the pens were discharged from the hardening pot into a basket which stood in the oil quench tank.

It was only in the case of what were known as 'common pens', that is pens which were sold in the cheapest market, that water was used as an economy measure in which to quench the work, but the quality of the hardening, that is the grain structure, was not as good as the pens which were quenched in whale oil.

TEMPERING

This operation follows immediately after hardening and the first step was to clean the oil off the pens which had been quenched in oil in a hot degreasing solution and dry them off. They were then ready for the tempering operation. The equipment used for tempering was a gas heated revolving barrel which was mounted within an outer casing. The temperature was controlled by four or five gas jets which could be regulated from the front. Whereas the temperature used for hardening was in the range of 800/850°C the temperature required for tempering was in the range 280/350°C. The Reader will recall that the pens had been put through the earlier operations in what were known as lots of 18,720 pens and the tempering barrels were designed in such a way that they held one lot of pens. The barrels could be tilted or inclined backwards and the pens were put into a hand chute and put into the small aperture in the front of the barrel which was then brought back to a horizontal position. The process of tempering would normally take about 20 minutes to 1/2 an hour per lot and it must be remembered that in those early days there were no pyrometers and a physical check had to be taken to see that the pens had reached the correct temper. This was done after the first quarter of an hour by extracting a few pens on a ladle which was usually referred to as a 'spoon', and crushing the pens with a pair of pliers. The normal measure of the correct temper was that the pens had to crack longitudinally from point to heel for about half the distance from the centre in each direction. In other words if the pens were too brittle they snapped from end to end and fell apart in two pieces; whereas, if they were too soft they could be flattened quite easily without any cracks showing in the surface. From experience those who had been doing the job for a long time could very easily tell when the pens had the correct spring, by the use of a pair of pliers, and indeed to some extent by eye through noting the colour, which gave an indication as to whether the Vickers hardness of the pens was roughly in the range 392/440. It was important as we shall see later when we deal with the operation of colouring, that the pens were discharged immediately the correct temper had been achieved. So the barrel was tilted and the pens fell onto a long metal tray on which they were evenly spread so that the heat did not continue to be generated and soften the pens. When the pens had been allowed to cool they were tipped from the tray into the work pan and were then ready for the next operation which was known as wet scouring.

SCOURING

Following tempering it was necessary to remove the scaling which had been caused by the exposure of the pens to the atmosphere during the process of hardening. This was done in my early days by immersing the pens in a 1-10 solution of sulphuric acid and water or alternatively by immersing them in neat hydrochloric acid and the latter was found preferable because it did not cause embrittlement of the pens. The acid immersion served to loosen the scale after which the pens were put into revolving steel barrels with spikes inside with a mixture of dehydrated lime, water and pebble, and they were run in these barrels at an approximate speed of 30-35 revolutions per minute for a period of 12 hours. This operation was known as wet scouring. It served not only to clean the pens but to barrel off any frays which had been caused in the blanking operation. It is interesting to note that after the wet scouring operation was finished the pens had to be dried off, and this was done in a gas heated barrel containing wood dust. The normal type of dust was

Deal which could readily be obtained from sawdust merchants. Deal was an excellent absorbent and dried the pens, thereby preventing any rusting.

GRINDING

Not all steel pens were ground but the more expensive and higher quality pens were not only "cross ground" but often "straight ground" and "letter ground" as well. The process of grinding was not essential to the use of the pen and many pens in the cheaper markets of the world were sold without any form of grinding at all.

What is meant by grinding is that a strip approximately 1/4" in width was ground off the hardened and tempered pen from side to side a short distance back from the point prior to slitting in order to give greater flexibility to the point, this was known as "cross grinding".

The straight grinding was applied chiefly for the sake of appearance and the straight grinding was taken from the point towards the heel of the pen. This too has the effect of marginally decreasing the overall thickness of the pen in order to achieve greater flexibility towards the point.

The third type of grinding was known as letter grinding; for example in the case of the well known 'J' pen where the 'J' as I have described previously was embossed on the pen, the surface of the 'J' was ground in order to make the letter stand out from the rest of the pen.

The way in which grinding was done was as follows: A 'lot' (130 gross) of pens was taken by the operator to the grinding room and placed on the left hand side of the grinding wheel. These grinding wheels were made of wood, and emery powder was glued to the wheel in order to form the grinding surface. Each pen was then picked up and placed in a pair of hand pliers and with a circular movement of the wrist the operator drew the pen across the surface of the revolving wheel. One of the most important things was the maintenance of the grit and the redressing of the wheels at regular intervals in order that the grinding pattern should remain constant. One of the unpleasant things about this operation was the dust which was created during the process but 50 years ago when I entered the trade extractors were provided to remove this dust and these were quite efficient and exposed the operator to little or no risk.

SLITTING

We have now reached the stage where the pens have been manufactured, hardened and tempered and polished up to the stage of slitting.

Slitting is the operation which divides the point of the pen into two equal parts so that when the point is applied to paper the points spread and produce a thick or thin stroke according to the pressure exerted.

When I first entered the trade, slitting was all done on hand presses, and the slitting tools consisted of two cutters which worked together in the same way as the blades of a pair of scissors. The cutting edge of the bottom cutter was horizontal and that of the top cutter was ground at an angle so that it sheared through the point of the pen first and worked its way back to the pierce hole until the pen point was slit right through.

The pens were located above the bottom cutter by means of guides, a table guide was provided on which the heel of the pen rested and the point of the pen lay over the bottom horizontal cutter. To control the point of the pen exactly centrally over the bottom cutter, two spring guides were provided which could be adjusted one way or the other, and as the top cutter came down the bottom point guide moved down under spring pressure under the top cutter giving clearance for the cutter to move along the horizontal length of the bottom cutter.

When the pens had been slit in this way it was normal to get a fairly high percentage of the pens with the right hand point depressed, known as 'clickers', and to rectify this the girls who operated the presses put the pens into what was known as a 'shaking bag' and with one girl at each end of the 'shaking bag' they shook the pens vigorously which had the effect of clicking the depressed point back into position. It is worth

noting that whereas the work was issued as in other cases to the slitter in lots of 130 gross, or 18,720 pens, I have known a slitter on a hand press who could slit 260 gross in a day of 8 hours or 28,800 seconds which means that the operator in question was picking up and putting into the hand press pens at the rate of 1.3 per second throughout the working day - it would in my view have earned a place in a book of records.

The slitting operation was much faster than the raising because the movement of the tool was much shorter. It is interesting to note that in the case of slitters there were two types. One method of slitting was for the operator to push the fly of the hand press with the back of the wrist of the left hand. The other method was to pull the fly of the hand press towards her with the right hand. In the first case the pens were fed with the right hand and the movement of the press controlled by the left hand. In the second case the pens were fed by the left hand and the movement of the press controlled by the right hand.

It was interesting that these two methods developed and I think it was mostly caused by the personal inclination of the operators, although in my experience the fastest slitters were those who used the wrist of the left hand.

POINT FORMING

Following slitting the next operation if required was that of point forming although this applied to a limited number of pens only, but those that were point formed sold in very large quantities, and probably the most famous pens were Macniven and Cameron's Waverley pen and D. Leonardt & Co.'s ball pointed pen which was the subject of a patent.

In the case of the Waverley pen the point forming consisted of turning up about $\frac{1}{32}$ " of the extreme point so that it stood away from the paper and prevented scratching. Although in fact this was known as 'turning up the point' the way in which it was done was by feeding the pen into the guides of the point forming hand press upside down and depressing the point so that in the writing position the point was clear of the paper.

In the case of D. Leonardt & Co.'s ball point pen, which as I have mentioned above was the subject of a patent, the object was to make a convex writing surface which was extremely smooth and this ball pointing as it was called was done by making a raising bed in a piece of steel into which a punch fitted with due allowance for the thickness of the raw material. These balling beds were very exactly made and the toolmakers concerned took great care of the drifts which were used in the same way as the raising drifts were used so that the exact form could be repeated.

There were several other pens which had this point forming operation and I remember one in particular which was a Manifold pen, that was made of thick material and which was used for making carbon copies. It was purchased in great quantities by a firm called J. B. Mallat of Paris and this, again, had a ball point in order to avoid scratching as much as possible. Strangely one of D. Leonardt & Co.'s customers in Iceland called for a series of pens in 4 point widths on which the points were turned down towards the paper, thus producing a very clearly defined line.

POLISHING

We have now reached the stage where the pens are ready for their final polish before colouring.

In the early 1930's the most usual form of media for burnishing the pens was white granite chippings which came from Welsh stone. These granite chippings were available from recognised pebble and stone suppliers in Birmingham. One of the best known names in this particular trade was the firm of E.W. Richards of Park Road Sand Mines, Birmingham and it was a boast of this firm that they never had to send out a traveller to get orders, so great and consistent was the demand for their polishing stones in all grades.

It was customary to put into the stone a very small quantity of lard oil and the consistency of the stone was judged to be correct when one could pick up a handful of the mixture, and observe the oil and stones slightly clinging to each other before separating.

The pens were put into the same type of barrel as we used for the wet scour operation and were run for approximately 12 hours, after which they had a deep lustre and after further barrelling in polishing dust they shone as though they had been hand polished, which showed up after the final colouring operation which I shall deal with next.

Unlike the deal dust which was used for drying off the pens following wet scouring, the type of dust used for burnishing the pens in their final polish was a hard dust, such as 'beech' or 'birch' and here again these grades of dust could readily be bought from sawdust merchants who kept the dust from different timbers separately.

COLOURING

The final colour for pens was of course dictated by the Customers and they could be either bronze or blue or indeed gold plated should the Customer demand them. I will deal with each in turn.

BRONZING

The bronzing of the pen was done in exactly the same type of barrel as that used for tempering the pens and it may be of interest to some readers to give the colour which is obtained through various degrees centigrade:

Degrees (C)	Color Of Steel
221.1	Very pale yellow
226.7	Light yellow
232.2	Pale straw-yellow
237.8	Straw-yellow
243.3	Deep straw-yellow
248.9	Dark yellow
254.4	Yellow-brown
260.0	Brown-yellow
265.6	Spotted red-brown
271.1	Brown-purple
276.7	Light purple
282.2	Full purple
287.8	Dark purple
293.3	Full blue
298.9	Dark blue
337.8	Light blue

It will be seen from the above table that a certain heat produces a certain colour but of course in those days there were no controlled pyrometers and one could not do as one can today, that is immerse the pens in a tempering solution at a controlled temperature, but one had to do it by eye, and just as one tested the pens during the tempering operation by fishing a few out of the revolving barrel with a metal spoon, so one did the same with colouring. What one had to be very careful about was that one tipped out the pens onto the tray before they had reached the colour needed, because colour continued to deepen even after they left the barrel because of the heat which they were holding.

LACQUERING

The final operation before 'looking over' or 'viewing' and subsequently boxing and labeling was the lacquering process.

In the early 1930's and indeed later the lacquering department was a special room which was kept completely free from dust. The actual lacquering solution was a mixture of methylated spirits and orange or lemon shellac and this solution was prepared by the man in charge of the lacquering shop. The process was

as follows: - The pens were put into an open top wire basket and were then dipped into the lacquering solution, they were then removed from the solution, allowed to drain for a few moments and then the basket was put into a spinner which was operated by a motor driven belt which threw off the surplus lacquer, which was used again. Following this the pens were put into a horizontal wire basket and were spun round at a considerable speed until the lacquer dried. As it dried the pens were left with a white coating and when this had been achieved they were again tipped out onto a tray and put into a gas heated, open fronted barrel similar to the coloring barrel and the tempering barrel. This barrel was heated by gas jets and had the effect of baking the lacquer. Not only did it bake the lacquer till it was quite dry but the effect of this was to produce a sheen on the nibs of a high standard. At this point the processes for the manufacture of the steel pen have been completed.

ELECTROPLATING

I am by no means an expert on the processes of electroplating and throughout my commercial life have always relied on the experts made available to me by W. Canning & Co. Ltd., of Birmingham and have never hesitated to avail myself of their laboratory advice whenever this has been necessary.

Nickel Plating

When I first entered the trade the process of barrel nickel plating was very poor compared with what it is today and in my own business we had earthenware barrels which revolved in a nickel solution. In those days it was not a bright nickel solution, and in order to obtain brightness steel stars were mixed with the work so that they had a burnishing effect as the nickel was being applied electrolytically, but the result was very poor compared with the very high standard of brightness which is achieved today by modern solutions. Furthermore a great disadvantage was that after plating the steel stars had to be separated from the work by hand on sorting trays. One of my earliest recollections of nickel plating is of a nickel anode being suspended in an open fronted hexagonal barrel which revolved and applied the nickel plate electrolytically to the work to a depth of approximately .0002".

Copper Plating

It was not unusual for pens to be sold with a barrel copper finish and this was done in the same way as nickel plating, it also provided a base for gold plating, or barrel brassing on top of the copper.

Barrel Brassing

This was a finish which was used for very cheap markets where a gold colour, i.e. 'couleur d'or' was applied which, although not containing any real gold, gave a gilt finish which satisfied the demands of the cheap markets. As far as I was concerned one of the most usual markets for this types of finish was Greece.

Gold Plating

When I first went into the trade there was a considerable demand for gilt pens. The normal practice was to copper the pens before applying the gold, and having coppered them, the pens were then threaded back-to-back through the pierce-hole onto wire, with a glass bead between each nib to prevent nesting. They were then immersed in an enamel "gilding bucket" into which the electrical current was fed, and shaken about by hand on their wires until the correct deposit had been achieved.

LOOKING OVER

The name given to the inspection of pens was 'looking over'. This was done on a well lighted bench and the pens to be looked over were placed at the back of the bench and were drawn down by the 'Lookers over' over a piece of frosted glass.

It used to take a number of months to train 'lookers over' because they had to look for a great many things. Nibs were lined up by them with great dexterity along the edge of the glass and they virtually had to pick

out a defect in any of the manufacturing operations which made up a steel pen, and as the reader now knows there were many operations.

For many years the categories for 'lookers over' consisted of 'perfect' nibs which were dropped over the edge of the glass down a chute into a container, and 'seconds' which were dropped into another container alongside. These 'seconds' were pens which would write correctly but had some other minor defect which made them less than perfect. For example a bad mark, bad colour, slightly twisted raising, grinding which was uneven, which although not turning them into defective writing instruments made them less than perfect. In the case of my own Company these 'seconds' pens were sold in less sophisticated markets where orders depended more on price than perfection of quality. Very often these 'seconds' pens were sold as an assortment in an assorted box of one gross, but care had always to be taken to see that only those pens which bore the imprint of the Manufacturer were included in these sales of 'seconds' pens and great care had to be taken to see that all 'seconds' pens bearing a Customer's imprint were scrapped. In fact when these specially marked pens were 'looked over' there was no distinction between a 'seconds' pen and a scrap pen! The only category which was allowed to pass through were pens which appeared to be perfect.

Sometimes for very cheap markets the only fault which was looked for was that pens had not been slit and to detect this, instead of lining the pens along the edge of the glass, the 'lookers over' were trained to drop them on the glass and the non slit pens would make a loud tinkle compared with the muted sound of a slit pen. It was obvious that a pen which had not been slit would not write at all, whereas although a pen which had been slit slightly out of centre would not write as well as a correctly slit pen, it would write and therefore was allowed to go through.

When the pens had been looked over the next stage was the process of boxing and labeling.

BOXING

The normal practice was to use small cardboard boxes containing either one gross, (i.e. 144 pens) or 100 pens. These boxes were made from straw board and normally lined with white paper and in the case of my own Company the boxes were bought from a Manufacturer of cardboard boxes. Many firms actually manufactured their own boxes.

The process of boxing was done by girls who were trained in the use of jewelers balancing scales, that is they counted out one gross of pens, or 100, whichever the case was, and balanced a gross against the counted gross, by depressing the thumb lever on the balancing scales. The indicating needle told them whether it was overweight or underweight and they very quickly acquired the habit of adding or subtracting to arrive at the correct balance.

The 'Weigher' as she was called tipped the balanced quantity into a small scoop which was then passed to the girl who was doing the actual boxing and she again with great dexterity directed the pens into the cardboard box using the cupped hand to prevent overspill.

In some cases the labels were already stuck to the boxes but in most cases a plain box was used and what was known as a strip label was put round the box to secure the lid. The normal pack for pens was 25 boxes each of one gross with the exception of India for it had been the custom in the Sub Continent of India to invoice pens as 'great grosses' which consisted of 12 boxes of one gross and this pack was used exclusively for India as far as I can remember. In the early 30's the self adhesive labels were not used and glue pots were used by the Labelers when they put the strip labels round the boxes. These cast iron glue pots were put into an outer container of boiling water to keep the glue solvent and the girls with the glue brush spread the glue on the back of the label ready for the Labeler to put them on the box.

As far as the boxes themselves were concerned great importance was attached to the fact that the boxes should be dry before being used because most of the pens were made of ferrous steel and were therefore subject to rust in spite of the protection of the lacquering process and any damp coming out of the cardboard added to the danger of rust. Nowadays it is possible to put small pieces of rust prevention paper into boxes containing steel parts, which prevents the damp spreading to the contents.

I hope that in the previous chapters I have been able to convey a fairly realistic picture of the operations required for the production of the steel pen as it existed in the 1930's and I shall now write a chapter in which I shall try to show how pens were marketed in the 1930's.

CHAPTER 4

SALES

When I entered the Pen Trade in 1930 the output from the Birmingham Pen Manufacturers was estimated to be 10 million gross pens per annum. Although this quantity seems very large it must be remembered that at that time there were no ball pens or fibre tip pens, only the fountain pen was there to challenge the sales of the dipped pen nib.

The World was our market and the number of patterns ran into many hundreds, for pens were produced to meet the requirements of the style of handwriting which different Countries preferred. For example the school pens used in France were very fine pointed, whereas pens used in schools in Arabic writing Countries were stubby and broad. In some cases the difference in patterns was considerable, whereas in others a very small difference in shape or style occurred, but the width of point could vary considerably.

I have mentioned earlier in this book that some of the larger Companies specialized in the advertising and sale of pens marked with their own name, and the larger firms like Perry Pens built up an enormous demand for pens with their own imprint which suited requirements of the local markets. In some cases particular pens had a style which was patented, for example in the case of D. Leonardt & Company their famous range of ball pointed pens, and by this I mean a convex tip which made the writing smoother, was protected by patent. These particular pens were sold mostly in the Countries within the old British Empire, such as India, Australia, New Zealand and many others, and a story has been told that Mr. Glass of the firm of Ormiston & Glass who had the sole selling rights for the British Empire went round the World with a box of pen nibs in his pocket as his only samples and booked vast orders for the famous number 516 pen which was known throughout the Empire. It is also said that on one occasion Mr. Glass rode down the Mall on a horse and scattered what looked like sovereigns onto the road but which were in fact advertising discs for his pen.

As I have mentioned earlier Macniven and Cameron built up a vast sale for their 'Pickwick Owl and Waverley pens', and in the case of the Waverley this has a turned up point rather than a convex point, which again took the extreme point of the pen off the paper and made writing smoother.

John Mitchell sold pens in France and Belgium which were known as 'Les plumes ballon.' These were very fine pointed, beautifully made, steel pens and on them was an embossed balloon and they became almost a household name in Belgium and France. Joseph Gillott became famed for his drawing pens, among them the famous numbers 303 and 404.

William Mitchell were known especially for their Gothic pens which were pens covering about 12 different writing widths and generally mounted on a card and sold with a pen holder. Another famous pen was Hinks Wells 'J' pen which was finished blue or black with an embossed 'J', which was very often ground to make it stand out. C. Brandauer were known throughout the world for certain patterns among them the 'Times', 'Mail', and 'Review' which were sold in Australia and elsewhere.

Geo W. Hughes had many pens which were known by particular names and I remember one called 'Platernal' which had a reservoir and was very well known in Greece. Indeed every Maker developed a large or small range of pens which came to be known throughout the world.

I remember in the case of my Father's Company we sold a pen called a 'Magnetic Electric pen number 520'. These pens were finished by barrel coppering the polished steel, following this they were magnetized and

in the 1930's the 'Hawkers' in the Bull Ring in Birmingham used to hang these pens in a chain and would stand on the edge of the pavement calling people's attention to their wares. In some cases they would float them in a glass of water to show that they would point to the North due to the magnetism.

DIFFERENT MARKETS FOR PENS

The outlets in 1930 fell into various classes. First of all there was the sale of the proprietary pens which I have briefly touched on above, which became known by their name, and many Buyers would not consider a substitute. These were sold in this Country through the Wholesale Stationers, such as W.H. Haydon of London and other well known firms who would in turn supply Banks and Offices, Insurance Companies etc., etc. The other outlets in England were the vast quantities of pens which were bought by the County Council Authorities, such as London County Council, The West Riding of Yorkshire, The Liverpool Corporation and many others, and annually these Authorities would invite Manufacturers to quote for their requirements which could represent anything from 10,000 to 20,000 gross of pens for each Authority.

H.M. Stationery Office also bought a great quantity of pens and they had in fact about 12 patterns for the use of Post Offices and other Government departments, and all these pens were marked S. Crown 0 with a code number and the initial of the Maker.

All the Railway Companies invited quotations for their annual requirements and bought pens with their special imprints. Another very considerable output was through Educational Wholesalers among them such firms as E. J. Arnold & Son of Leeds, A. Brown & Sons of Hull, The Educational Supply Association of London, Thomas Hope of Manchester, Philip and Tacey of London and Charles Thurnam of Carlisle. These firms had built up very large businesses to supply the Education Authorities with all manner of Education requirements such as paper, desks, maps, drawing instruments and naturally ink pots and pens. All these firms insisted on having pens marked with their own name and their contracts were very keenly sought after for they represented a very large output of pen nibs. I have mentioned earlier that the only firm that I can remember who did not supply these Educational Wholesalers, or indeed any of the Local Authorities, with pens imprinted with their own name, was Geo. W. Hughes, but what he did was to send a Traveler around the schools and sought an interview with the Head Teachers to persuade them that Hughes pens were the best quality available, and in many cases he was successful in getting the schools to ask the Wholesalers to buy these particular branded pens, and for many years he automatically got the orders because he was the only one who could sell pens with that particular imprint.

Naturally the sales in England were very small compared with the export orders, some of which completely eclipsed the quantities which were sold in this Country.

In my own particular case I remember well the order for the Dutch East Indies which then included among others the main islands of Borneo, Java and Sumatra and the annual requirements for one particular pen which was known as the Crown or Spring Back pen amounted to 365 thousand gross or 1,000 gross for every day of the year, and this was only a small quantity of the total number of patterns which were bought by the Dutch East Indies Authorities.

Most of this trade at that time was done through Holland, and Exporting Houses based in Amsterdam, Rotterdam and the Hague handled the sales to the Indies where they had their Offices. Here again the competition was enormously keen and for the big Government contract which perhaps amounted to 1/2 million gross of pens the price at one time was as low as threepence farthing per box of one gross of pens delivered CIF Batavia. This at a time when there was little automation and most of the operations of manufacture were being performed on hand presses.

Another market in that part of the World was Siam, now known as Thailand, and there was a particularly popular pattern known as the 'spear pointed' pen which sold in that Country.

There was the vast market of India and the most popular patterns in that Country at the peak of British exports were the Red Ink Pen, which was made of nickel silver, the famous Waverley type pen originated by Macniven and Cameron to which I have already referred, and the Hindoo pen made by the same

Company. In addition the demand for the yellow metal pen, similar in shape to Esterbrooks I famous 'Relief pen' was very popular in the Indian Market.

The demand in Egypt was very considerable and I well remember that we manufactured pens in my own business in the 30's for the Egyptian Government and all the nibs were marked in Arabic.

The South African Government with headquarters in Trafalgar Square placed a large order annually for school pens and I was delighted soon after the 1939-45 war to obtain this contract.

Another big buyer was the Sudan Government who bought not only great quantities of school pens but also the penholder sticks and metal holders to go with them.

After the Great War one of the most important Suppliers of pens to Algeria and Morocco was the firm of J.B. Mallat & Co. whose headquarters were in Paris, but who also had an office in Antwerp. This firm did not manufacture steel pens but placed large orders with British Manufacturers and the patterns selected tended to follow the French demand for very fine pointed pens. In this market there was one exception known as the Manifold or Carbon pen which was very strong and was used for making copies of letters and other documents.

I well remember soon after I entered the trade at the age of 17 travelling to Brussels and then to Antwerp to call on J.B. Mallat at a time when one travelled by Sabena Line which was one of the first airlines to allow smoking during a flight. In the case of my Father's Company our exports to Europe were not large but in the case of D. Leonardt & Co. with whom later I became associated, they enjoyed a wonderful trade in Countries such as Latvia, Lithuania and Estonia which are now Soviet Baltic republics. At one time Leonardts had their pens manufactured in Germany -an received a Royalty on the sales of exports to the Eastern European Countries.

The South American Continent was again an enormous market for pens and although it was those larger firms who had established their trade names which took the bulk of the trade, my own Company sold pens in most of the important markets in South America and I remember in the case of Columbia we once exported a consignment of pens to Bogota intended for use in schools. These pens were known as 'Falcon' pens and alas the packing cases in which they were sent had been made 2" too wide and because they could not be put into the panniers of mules to be taken up the mountains to the schools they were all returned to our factory for repacking; a harsh lesson for incompetence which cost a lot of money but it taught those responsible not to make the same mistake again.

It would be interesting to digress for a moment to comment upon the very exact systems which were adopted for the exportation of pens. As I have remarked in another chapter, the usual pack was 25 boxes each containing 1 gross wrapped in a parcel. In the case of D. Leonardt & Co. one of their Senior Clerks prepared what was known as the 'Bible' and if for example one wished to send 3,000 gross of pens No. 516 one referred to the 'Bible' which told you, you required one No. 37 case and specified the dimensions in inches and centimeters. Furthermore if you looked in the 'Bible' under the number 516 you were instantly told the weight of 3,000 gross pens so when it came to completing the export documents reference to 'The Bible' made it an automatic procedure to fill in the correct weights and measurements for the Shipping Companies.

Mistakes in those days were very few and far between!

In the years prior to the second World War it was not usual for any of the British Pen Manufacturers to have their own Selling Houses overseas and the usual practice was to appoint an Agent who worked on a commission basis and represented one's interests abroad, and in my own case we had many Agents and in later years when I became associated with D. Leonardt & Co. we had many more and it was the practice as far as possible to visit one's Agents at regular intervals in order to encourage them to promote sales.

CHAPTER 5

FIRST STAGE TOWARDS AUTOMATION

In the preceding chapters I have tried to give an accurate description of the various processes connected with the manufacture of a steel pen, together with the methods used for selling the pens. I shall now devote the final chapter of my book to explain the ways in which the old methods of manufacture have been improved, developed and combined, finally ending in complete automation.

In describing the advances which have been made I think one must constantly refer to the list of seventeen operations which are listed on page nine, for it was from these that automation developed.

I suppose that with certain exceptions it would be fair to say that the most important change in introducing automation was "that you held on to what you wanted, instead of throwing away what you wanted".

In the old days once a pen had been blanked out it had to be picked up, or oriented in some way before the next operation could be performed. This meant a hand operation which in the early days was very inexpensive. One of the firms with whom I was closely associated John Mitchell of Moland Street, Birmingham, tackled the problem by an intermediate stage and what they did was to blank the pens on a hand press into a magazine. The magazine when full was attached to another machine which revolved in a horizontal plain and each blank was discharged from the magazine by a 'knife' and fed into the guide on the piercing machine. It was carried round on a circular table and pierced and marked at two different stations, and finally discharged. This meant that hand piercing and stamp marking had been eliminated as far as hand operations were concerned and the pen was then ready for annealing and raising.

At about the same time rotary raising machines were devised and following the annealing process the pens were fed manually into vertical guides outside the tool area and were carried round between the raising die and punch and were raised in the vertical plane. When they had been raised they fell out of the guides freely. This method of course necessitated the single handling of each nib into the guide and the process of automation had not yet been completed.

OPERATIONS 1-6 BLANKING, PIERCING, ANNEALING, MARKING, EMBOSSING, RAISING

Probably the next step was the amalgamation of cutting, piercing, marking and raising in a Progression Tool. To achieve this, the pens were made from coil steel which had been sheared to the correct width. The first operation in the progression tooling was piercing, followed by marking, following which the outline of the pen was cut out and the only place at which it was still held in the strip was at the heel. Having freed the pen from the strip it could then be raised between a punch and die. The final step in the progression was to sever the heel from the strip.

It will be appreciated that in order to achieve this progression very accurate feeding was required and there were various ways of controlling the length of the feed. In some cases where extreme accuracy was unnecessary it was sufficient to rely on a roll feed or a gripper feed which pushed the steel through the press tool at controlled intervals and set distances. However if absolute accuracy is sought the normal method is to use what are called 'pilots' whereby the press feed feeds the strip as near as possible to its required distance and then releases it. The pilots then come down and take control of it so that it is exactly located when the punches do their work.

Having achieved this type of progression it then became necessary to use annealed steel in such a state that it could be raised and follow the correct form, whereas, as I have explained in an earlier chapter, the original method was to blank and pierce out of hard rolled steel, which tended to produce a cleaner bank and pierce hole. This therefore was one of the things one lost when trying to cut out labour and achieve more economical production.

OPERATIONS 7 AND 8: HARDENING AND TEMPERING

As explained in an earlier chapter, following raising the next operation was heat treatment, i.e. hardening and tempering. The present method, which offers a great advance on the old system, is that the pens are

hardened in what is known as a Shaker Hearth. This is an electric furnace and the pens pass through on a heat resistant chromium hearth for a regulated time, and the progress of the pens is controlled by a cam which jerks them forward in much the same way as a passenger in a motor car is jerked forward when the car stops suddenly. At the end of the tunnel the pens, at a temperature of 850°C are discharged into a basket in a tempering bath which contains a solution of sodium nitrate/sodium nitrite at a temperature of approximately 360°C. One of the great advantages of this method of hardening is that it incorporates an endothermic gas plant whereby a screen of lighted gas prevents the atmosphere from entering the furnace and the result of this is that when the pens are discharged into the tempering salts they are scale free. They are allowed to soak in the tempering basket for approximately 20 minutes to half an hour and are then taken out by means of an electric hoist and quenched in water. Nowadays in the case of many carbon steel springs completely automatic hardening and tempering furnaces are used which not only heat the components up to the correct temperature but automatically discharge them from the tempering and water quench tank when they have gone through the full process.

The Reader will remember that one of the things that enabled the Hardener to judge the correct heat was looking for a colour of cherry red by eye but nowadays a Shaker Hearth furnace is fitted with an automatic pyrometer setting which ensures that temperatures are correct and it is not difficult to produce a hardened and tempered article automatically in the range of Rockwell C 40/44. By reason of the fact that the pens have no scale, but merely a blue discolouration the subsequent polishing operations have been made very much easier.

OPERATION 9: SCOURING

Following tempering the cleaning and de-burring operation is carried out, but the equipment is the same as for operation thirteen, polishing, (see page 45) a vibratory bowl taking the place of the old scouring barrels.

OPERATION 10: GRINDING

We next come to the question of grinding which has been described in an earlier chapter. I know of only one machine which was devised for grinding the pens and that again was in the Company with which I was very closely associated, John Mitchell who devised a semi automatic machine which would straight grind and cross grind. The pens were fed one by one into guides which were mounted on a circular carrying bar which carried them round the machine and passed them under grinding wheels which either cross ground or straight ground according to the demand of the Customer.

However this still remained an expensive operation and the practice grew of using a marking punch to give the appearance of grinding across the point. This was a method which enabled the Manufacturers to introduce it into the early stages of automation and as the coil passed through the power press which cut, pierced and marked the blanks, it could at the same time provide an imprint, or what in fact was imitation grinding, giving almost the same appearance of grinding on a carborundum wheel, but of course lacking the qualities of hand grinding for two reasons: One, this imprint was put on before the hardening and tempering of the pen; and Two, not having the effect of making the pens slightly thinner it did not add to the flexibility. It was what I suppose people today would call a cheap imitation in the interests of economy, but it was accepted and therefore sold.

OPERATION 11: SLITTING

Following grinding came the operation of slitting the pens which again I have described in an earlier chapter showing the method which was originally used. Some Readers may ask why it was not possible to put the slitting into an automatic progression tool and bring the pens off the power press ready for heat treatment. It was possible to make pens which were made from brass or nickel silver in this way and the method which was used was for the slit to be put in the blank held in the strip before raising, and -when the pen was raised the slit was closed by the pressure of the raising punch so when the pen came off the press it was in fact finished. This was not possible in the case of a carbon steel pen which had to be hardened and tempered because if the pens were slit before heat treatment the effect of hardening was to spread the points open, thus making them valueless. Therefore it was accepted, even by the largest Pen Manufacturers, that

slitting had to be done after heat treatment and by some means of semi automation. There may have been methods with which I am not familiar but one of the most successful which I have used myself and which was used very successfully by the well known firm Macniven and Cameron was to provide the motive force by electricity while retaining the method of slitting as used on hand presses as described in an earlier chapter.

Slitting cutters were mounted in a die set and these die sets were put on a bench underneath a revolving shaft which was driven by an electric motor. Cams were mounted on the shaft which as they revolved depressed the top of the die set and moved the top slitting cutter down in a vertical direction. The speed could easily be regulated by means of pulleys or a variable speed motor so that the top die set could be depressed at the rate of one stroke a second or two strokes a second according to the speed which suited the operator. By this means the operators no longer had to activate the fly of the hand press because the tool was constantly going up and down in front of them and the skill lay in getting the synchronization of timing correct; in other words if the top slitting cutter was moving up and down at one a second, the girls had to locate the point of the pen in the guides as soon as the top cutter was free from the bottom cutter and hold the pens in position until the top cutter came down and put in the slit. When this method was first introduced it took a long time for the operators to get accustomed to the correct timing, and to start off what normally happened was that they missed one stroke of the press altogether and fed every other one, but with practice as always great skill followed and whereas to start off they were slitting probably one pen every two seconds, they finished up by being able to slit two pens in a second. It was unfortunate in many ways that this development came almost at the time when the demand for steel pens was fading for had it been used in the earlier days the result would have been a great improvement in productivity. Indeed it is true to say that many methods which were thought up and put into practice during the 160 years since the steel pen trade began are now no longer used for the simple reason that there is no great demand for pen nibs but these inventions were not lost and many of them have been applied to other small metal objects such as pocket clips which still sell in great quantities.

Whilst I am on the subject of slitting it is worth remarking that the advent of carbide tipped slitting cutters was another great help to slitting toolmakers for these retained their cutting edge for much longer.

There are six other operations, numbers 12 to 17 inclusive and as far as these are concerned it will suffice to restrict myself to a short paragraph on each because there have been no major changes as far as automation is concerned, principally due to the fact that the demand did not justify it.

OPERATION 12: POINT FORMING

In view of the limited number of pens sold with formed points the method of hand press point forming has not to my knowledge been changed.

OPERATIONS 9 AND 13: SCOURING AND POLISHING

There have been changes in the method of polishing. To some extent this was due to the fact that the Welsh granite is no longer available and the tendency nowadays is to use a large variety of grades in ceramic chippings. These chippings are placed in open circular vibratory polishing machines which can easily be discharged when the polishing operation is finished by the use of a magnetized moving tray, and removes the extreme physical effort of taking "shaking cans," as used in the early days, out of the frames, picking them up and emptying them by hand. This new type of polishing is now widely used for other small metal articles, but by the time they came on the market need for them in respect of pen nibs had disappeared.

OPERATION 14: COLOURING, AND 15: LACQUERING

As far as I am concerned although it is possible to colour pens by immersing them in a chemical we still use the old fashioned colouring barrel which has been described in an earlier chapter and similarly use the same method for lacquering.

OPERATION 16: LOOKING OVER

In many cases pens are still examined physically before being dispatched but the usual method of quality control inspection today is to look at a specific number of articles out of a specific batch. The number required is laid down by the British Standards Specification and if out of the number selected less than the given quantity of waste is found, the whole batch is

passed. If however above the given quantity is found to be scrap a further sample is looked at, and if this too does not pass the test then the whole batch is thrown away or all the articles are examined individually.

OPERATION 17: BOXING

This has not materially changed since the methods I have described in an earlier chapter, for the decrease in demand has made it unnecessary to devise ways of boxing more speedily. I have no doubt that had the demand of long ago still existed electronic weighing and boxing machines would have been devised which would virtually have eliminated female labour.

This concludes my account of the changes which took place between the years 1930 and 1980 and as the reader will see this account deals principally with the technical side of carbon steel pen making, with a short account of the method of selling and with some reference to the different markets of the world, together with some supporting photographs and literature.

Maybe one day I shall be prompted to write another book dealing not with the technical side of this old trade, but more with the social aspects and conditions of work of those with whom I have worked nearly an my life, coupled with my own experiences in the pre-war years at T. Hessin & Co. and afterwards with the establishment of the Highley Pen Co., the merger with D. Leonardt & Co. and the establishment of Mehra Leonardt Pens (Pvt) Ltd in partnership with my friends Amarnath and Ramnath Mehra of B.N. Mehra & Co. of Bombay, India.

Who knows?

A.A.S.C.

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Finally, I dedicate this little volume to my Wife who has made it possible by her encouragement, helpful editing, and constructive criticism.

A.A.S.C.
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