V. FURTHER STUDIES AND EARLY RESEARCHES

The end of the war threw us all out of work. I can assure you that on the three pounds a week I was living on -- $750 a year -- I didn't have any money saved at all. So people went back to their homes, or they went back to their colleges, or whereever they were employed, and expected to be supported.

At that time the government was very conscious of two things. One was that it had to find something to do to employ its out-of-work military scientists, and the second was to try and catch up in the world with a conquered country like Germany by greatly expanding its science and technology. In other words, expanding research in these activities to teach the English people how to do science and engineering. Government sponsored research societies were set up, and one of these was the Photographic Research Association which became one of my sponsors, although they never paid me any money. Another was the Department of Science and Industrial Research. I got a grant under them by Professor Thorpe's recommendation which would permit me to do photographic research for two years. I put up a scheme for doing preliminary research in color photography. Professor Thorpe then went to my main professor, the man who had been head of teaching me for three years whilst I was getting my degree, and asked if he could find room for me. He gave me a room down on a basement floor at the Royal College, with windows in a recess from the pavement from the outside, a big ventilating fan, and you operated in there under electric light. Of course, florescent lights were unknown in those days. A little dark room was built for me, and there I set myself up.

Here another mistake was made, a mistake that many undisciplined, impractical inventors make and that is to try and make a trade or, more grandiously, a fortune out of their hobbies. So all my hopes were pinned on doing things in photography. I had the foolish idea that my education in science was finished and I could now go forth with my tremendous talents and become a famous scientist in another eighteen months. Again, it has taken me fifty years to find out that not only that cannot be done, but it didn't happen either.

My next step was to become a member of the Royal Photographic Society, which was glad to take in younger members. For me, it was a way to establish some standing in the profession. I was a humble member. They had a membership, associateship, and fellowship, and I was taken in as a member. I used to attend their meetings in Russel Square. I also described my experiments in the photographic

journals of the day. "The British Journal of Photography", the "Photographic Journal", and "The Amateur Photographer". So you can imagine me set up with a professional dark room, and a government research grant to explore possible means of doing color photography.

There was no real color photography at the time. There was a french process called autochrome - it would take far too long to go into how it worked - but it was done by the two brothers Lumiere in Paris. They were the great forerunners of color photography, and by 1911 or 1912 these primitive color photographs were available. I've actually got one or two of them up in the attic.

I wanted to find some way of doing color photography in which you had your three color separation components right in the emulsion, instead of having to go through the two steps of having colored grains coated on glass and then putting the emulsion on top of that. But the joke of it all was that I didn't have the faintest notion of how to proceed, I had no experience, no nothing. I was just an individual who was so sure of himself, that it never occurred to me that I needed to collaborate. All they had to do was put me in a room and genius would shortly reward them with a revolutionary process.

Well, by the second year they weren't quite sure whether they were going to renew, and when the time came for the third year I was just told that I had wasted two years of my time and their money, and had better find something else to do. I had turned up nothing at all. Oh, I published a paper in the Photographic Journal, which is what you did when you failed; you published a paper instead, and a great deal of that is done today.

However, at this time the rolls of the College had expanded rapidly, because the men who had not been able to go to College because of the war were all coming back to get a hurried education. So, I was offered a job as lecturer-demonstrator; that is to say, I would take charge of a class in a laboratory, and I would also give a minor course of lectures in inorganic chemistry.

The Royal College of Science as such was a very small operation. We had something like sixty chemistry students in our class. We were not part of London University, this was a technical college, and it had a number of branches. The two main branches were chemistry and physics. The Royal College of Science and University College were both affiliated with the University of London, so that the University of London would provide them with examinations and syllabuses, and agree to examine their students and grant bachelors and masters degrees afterwards. The doctoral degree

was very rare in those days, and was called a Doctor of Science and not a doctor of Philosophy. Very few people had got the necessary brains and time or anything else to get a true doctorate. Mees and Shepard were unique that they had in a very short time indeed got their DSc.

Just to keep the chronology straight, let me repeat. At the end of the war I had an associate degree (ARCS) from the Royal College of Science and a bachelor of science (BSC) from the London University, granted by their examination process. I had two years of postgraduate work in chemistry, done at the Wembley Experimental Station. I was now back at college for another two years of personally supervised research in photography which led nowhere, and I had just been appointed what we would call lecturer or associate professor, who was known then as a demonstrator.

I never had any idea of getting a doctors degree. My job was to spend six or seven hours a day in the analytical laboratory; to wander from time to time from bench to bench to see how the men were doing with their chemical analyses, help them, make suggestions, grade their papers afterwards, supervise their examinations at the end of the year and generally administer the group. At the time I'm thinking of, there were about 63 students in that laboratory, of which 21 were under my care. Another 21 were under another demonstrator. The final 21 and the responsibility for the whole business were under a division head who was the head of analytical chemistry, a Doctor H.F. Harwood. Harwood was a first class man at his job. He was also a very famous analyst and his hobby and profession was analyzing rocks. Very few people knew what pure minerals really were. He, I think, did many of the analyses of common minerals that are accepted today.

In addition to this I had one lecture a week to give on inorganic chemistry. Now inorganic chemistry at that time meant that you had to learn the properties of the elements and the compounds. Just about this time Rutherford had suggested a constitution for the chemical atom. Niels Bohrs had followed Rutherford's idea much further and professors over on this side of the ocean, particularly, had begun to envisage and then describe or codify the electronic structure of the elements, how one differs from another. This was unknown at the time I was a student. But whilst I was lecturing to the class and simply repeating what I had learned before, in the leading journals descriptions of these newer ideas about chemistry began to appear. To my shame, I neglected to read these. Nobody ever suggested to me, let alone my head professor, that I should update my teaching in inorganic chemistry to the newer knowledge. I taught there for five years teaching the same guff every year and getting heartily sick of it and spending

the whole of the times that I didn't have to wander from bench to bench, doing photographic research, making crazy little inventions and writing for the photographic journals.

I also acquired a modest practice in photography which increased my income from the 300 pounds a year I was getting to about 750 pounds a year by the time I came to the USA. That was nearly as much money as my mother had supported our family and educated me on. So, in a sense, I was considered to be doing fairly well.

My photographic practice was not that of taking pictures, but of advising people who had problems in photography. Firms who were trying to use a particular process and couldn't make it work or anybody who wanted to know something. One man asked me if I would go to Dresden with him and inspect a new process for motion pictures that he was thinking of buying. He took me along and I was able to help him quite materially on that. I was also an adviser for my Uncles' firm of Norton and Gregory. As I look back now, I am quite sure that I was of no use to them whatsoever. I think Dr. Spencer who inherited my practice was probably much more valuable to them than I ever was. But, this is what I did for those five years.

Round about 1923, after a talk with Professor Harwood, I was beginning to get a little worried about my own future career, the PhD which was so popular in Germany -- German PhD's were coming over to England and taking many of the jobs in chemistry -- suddenly became a popular degree and the London University agreed to provide PhD's. The question was, ought I to have a PhD? I went to Professor Thorpe one day and I said, "I don't know whether I have missed something, but ought I to have a PhD? After all, everybody and his uncle seems to be getting into the act. Is it worth doing? He said, "I don't know whether it's worth doing, but if everybody and his uncle is getting into it, can you afford to be without?"

At that moment, somebody else suggested to me why not go in for an external degree? London University would take packaged researches done elsewhere and subject them to scrutiny of a board of examiners and if they thought that they were worthwhile, they would grant a degree. So, I got all my little publications together and bound them up. They were all different sizes; some were in full scat length on the typewriting paper, others were printed in journals, with very small sheets, which were the size that journals were in those days, particularly after World War I when the country was pretty impoverished. I bound the whole lot up and I think Douglas Spencer helped me quite a lot. I got them together, wrote a preamble and a summary and sent this in.

I didn't have to wait very long. I was told that the Photographic Research Association had been given these papers and

the head of the Photographic Research Association, Dr. Slater Price, had said that if I could satisfactorily pass a verbal exam, that the written material would be acceptable. So I went for the verbal exam and failed. Failed ingominiously.

They said I was putting this in for photography. I had done a lot of photographic research, but I hadn't learned a lot of photographic science. They said I had better go away and learn the photographic science. I was told that I should specialize in photography, in the chemistry of gelatin which, at that time, had been recognized as the parent material of whatever it was that conferred on the silver in the emulsion its sensitivity to light and made it rapid emulsion. One gelatin would, another would not. So, I learnt of the chemistry of gelatin.

When I returned for a reexamination, the secretary of the Photographic Research Association came down and met me in the hall. She said, "well, they are all upstairs waiting for you. When you go into the room, they will be sitting around the table. Don't ask them to stand up." I said, "Why"? She said, "they have all got books open on their knees wondering what to ask you. I don't think you're going to have any trouble." I went up there and I gave them such a spiel of what I learned that they told me before I had left I had passed. So I got my doctor's degree. But I am not really the material for a doctorate. I should never have got a doctor's degree, or if I had, I should never had used the title doctor, because I am typically a mister. I am an engineering chemist; not a scientific chemist. Only in later years have I recognized the need and done the work to acquire some smattering of real science for my researches. It is one of the things that I have lacked all my life not having gone through the mill to get the background necessary to become a first class scientist.

I did do a lot of very original research in photography, however. My contribution in those five years was to elucidate all the laws of washing photographic materials. When you put film in the developer, it comes out saturated with the developer. You've got to wash the developer out; put it in the fixing agent, wash the fixing agent out. If you didn't wash the developer out, the picture was stained. If you didn't wash the fixing agent out, the sulfur in the thiosulfate, which dissolved the silver out, would bleach the picture to a dirty yellow in a year or two's time, so it had to be washed out very thoroughly. The laws of washing were not understood. Even if the laws of washing were understood, nobody had obtained the proper time needed to wash one type of photograph versus another. I published five papers. One was written with Douglas Spencer. Two, which appeared in the Photographic Journal in the years 1921 and 24, are regarded as classic today. People still refer to them, even though I wrote them as a very young man.

I should say that while my early attempt at a color process was totally wasted, simultaneously with my going into academic life I began to do worthwhile things on the side. It was only the named research, funded by the government department that failed. From then on, everything came along fine, especially the work on washing.

I am always sorry to think the good old days of the photographic glass plate have gone by. The glass plate, with the emulsion on one side of it, gave you a picture that was permanently flat. You didn't have to put it between two pieces of glass as you do with film, or stretch it and put a suction pad on behind to keep it flat. Today we are always having problems with lack of flatness in film. But with the old glass plate you could post a picture on accurately and you could enlarge it accurately and reproduce it afterwards with no problem at all. Furthermore, you could also handle plates nicely. You developed them, fixed them, and washed them, facing upwards in a shallow dish, or later on in a trough with a number of serrations in which these could be dropped, and then you handled them by their edges and you could dry them very nicely. One of the ways that we used to dry them in England was to stand them up against a window pane at the medium half of the window where a little bit of draft coming up from the crack between the bottom half and the top would blow air onto the plate and the plate would be dry in anything from an hour on a warm summar day to 4, 5 or 6 hours, a very long waiting; it would always dry unevenly and was rather a nuisance. Well, the professionals used to make drying cabinets where they would stand their plates, but the circulating fan was always picking up dust. You could also quicken the drying of the plate by just standing the plate with its back to the window and pointing the fan at it. Then it would just blow all the dust from the carpet onto the plate surface. The plate would be dry in twenty minutes and they you would lightly dust off and hope that none had stuck.

It occurred to me then that I was putting a lot of electricity into this electric fan and only a tiny little bit of that fan blast was doing any work at all drying the plate. Why not, thought I, fasten the plates to the fan blades and then all the time air would be passing over the plates. But, of course, that was entirely impracticable. What I did was to produce a rocking rack, in which the rows of wet plates were stood on a horizontal bar and they leant against another horizontal bar just at the top, with the space in between being unobscured. These two bars were held together to form a rectangle. The rectangle was hung on two wires, one at each end from the fulcrum and a tiny little electromagnet was placed at the top so that this whole contraption became like the hammer in an electric bell for the period of about two seconds and very tiny

current from a battery would keep this thing swinging backwards and forwards and I could dry my plates in a warm room in half an hour absolutely uniformly and had done it with an expenditure of energy which was a fraction, perhaps a hundredth of what an electric motor would have required to do the same thing. There I find the beginning, coming from a financially humble backround, of the idea of trying to do all kinds of simple tasks and physical operations by the simplest means and with the least possible expenditure of energy. That concept and that train has stood me in good stead all my life and has been one of the compelling factors, conditioning factors of all the gainful living, all the money that I have made since then. I didn't patent this. There was obviously no possible market for such a contraption.

My next foray was concerned with the washing of plates, particularly the washing of papers. The photographic plates would be put into a large tray. Water would be poured into the tray. We did not have in those days the huge metal and porcelain sinks which are common in dark rooms today. You did not leave all your photograhic trays in the bottom of the sink with a tap dripping and pouring over the top of them - a scandalous waste of water -- and anyway, that doesn't really wash the prints. The water goes into the tray and the prints all stick together, so you have to stand there lifing the prints one at a time and getting new water between them and transfer them from one tray to another. Even today, no really good print washing device has been constructed except when the photograhic paper is on a long, continuous roll and can be processed by machinery dipping them into a tank and out again and so the surface is kept free and doesn't touch another piece of paper on the way. I solved this problem to a certain extent by putting the dish on the edge of the bench propped up very slightly at the far end and then allowed water from the tap or from the tube coming from the tap to fall in the corner where the lip was and as it fell into the lip, it would shoot horizontally around the corner and start some motion of the prints in the tray and at the same time, the used water would flow out at the corner where it would come from. A great deal of that came under the lip, got on the table and some on the floor and was a thorough nuisance.

How, thought I, can one devise some means obviating this? Well, I would go from obviating to the obvious. The obvious to me was that one should have a syphon hanging in the tray and as the tray filled up, the syphon would syphon it out. Well that would be fine if you could prevent air getting into the syphon, for otherwise you'd have to start the syphon again and you would be standing there operating it anyway. How could you make this automatic? Well, I tried a number of ways in which the incoming water would produce the vacuum for starting the syphon. My first way was a very laborious

one. It was difficult to make and I won't describe it here. But the second one was a real flash of insight. The incoming water would pass right through the body of the syphon at the top bend to a little squirt nozzle. On the other side of the bend there would be what is known as a venturi tube which would receive this squirt and the venturi tube was then bent down to form a second nozzle pointing horizontally into the tray. As the water passed from the jet to the venturi, it entrapped air. It was a suction pump, a conventional jet suction pump. It was always creating a vacuum inside the syphon. All you had to do was to prime the syphon, that is to put some water in the bottom bend, turn on tap, and wait, and the water would shoot into the empty tray, and just as it was perfectly obvious it was going to overflow all over the place the syphon would start and magically it would empty out and maintain a constant level in the tray with all the prints running round and so forth.

Well I used to exhibit this as a novelty as much as anything else; and then it occurred to me that if it was any use to me, it might be a gadget useful to other people. I took out a British patent, and thank Heavens, also, an American one in the United States. I had one in Canada too. I didn't know what I was going to do with these things. I just had the inventor's compelling idea that this should be patented, in the sense that he now owned this and owned all he rest of the world with it. I sold this to Kodak. It became the Kodak Automatic Tray Syphon. Kodak automatic tray syphons are still sold today. You wash the prints beautifully with this -- better than anything I have ever seen used today. But people don't do that today. They have these great big photographic sinks which you put everything down in the wet sink instead of having it on a table or something overflowing into the sink. The syphon enables you to use the smallest sink -- the kitchen sink; anything like that. Put a table up by the kitchen sink; put your big trays on that and the tray syphon overlapping into the sink. They work quite spectacularly.

My next objective was to get these things made. I had made this entirely out of glass. There was a little glass company in England, I believe called Duracell, and I got them to make me half a dozen and I went around to one of the most prominent photographic vendors, named Houghton's. Houghton's I think was at the corner of High Holborn and Tottenham Court Road or somewhere near there. They had a magnificent window display and I asked them if they would sell these. They said they didn't think I would have any market. I suggested that they put a demonstration in the window, which they did. They had a photographic tray on the little table, and the glass syphon showed beautifully how it worked on its insides. The water flowed from that into a bucket and every half hour some wretched little man had to carry the bucket out and empty it.

The effect was astounding. Passersby stopped. Queues formed. More people stopped to see what the queue was or waited to get by. I don't think I sold more than two of these in three or four days, but the Police made them take it out of the window because it was impeding traffic. I didn't make very much money out of this in England, but when I came to America, quite a substantial income came to this for about fifteen years, until the patent expired. Out of all my private patents, I have only had two that ever made any money; one at the beginning of my professional career and the other at the very end, which is a high vacuum pump oil, the polyphenol ethers.

The next stage also was a flash of insight. This is where the dyed in the wool gadgeteer begins to appear. Physical chemistry was burgeoning at this time. Electro chemistry was part of physical chemistry. People were measuring all kinds of properties of water and solutions by determining their electrical conductivity or the hydrogen potential, or something else. The conductivity cell was well known. Instead of having to use a galvinometer, you could use the newly developed vacuum tube, the telephone receiver and an ordinary electric buzzer to produce a musical tone which could be put through the conductivity cell. Then you could either wear the earphone or the still newer primitive loud speaker could be attached and you could judge the conductivity of your liquid by the loudness of the sound that came out of the speaker. This was then modified to have a double conductivity cell which employed the great invention of Professor Wheatstone for measuring electrical resistances, and has since become known as the Wheatstone bridge. You then balanced the conductivity that you wish to measure against one of known conductivity and the two were considered equal when the noise stopped completely. It was the nul method. Well what would be simpler than to put one conductivity cell on the incoming tap water which was reasonably pure water, one hoped, and the other one on the outflowing water. If the water picked up any photographic hypo or developer during his residence in the tray, this thing would make a noise. By gosh, it did make a veritable howl, and became known as the "hypo-howl". News of this was very rapidly noised abroad.

The first sound was heard publicly at an evening meeting of the Royal Photographic Society where I demonstrated this. The impact on my professional audience was immense. The invention of color photography could not have produced a greater degree of amusement and admiration as this thing was shown to the room. Furthermore, I would call for volunteers to take a photographic print out of their pocket and I would tell them whether it was properly washed. I would have a photographic print that was properly washed in my pocket, would place it in the water and show that nothing happened

at all. But they could take their less thoroughly washed one, because nobody had examined the theory of washing photographs at that time, and place this in the tray and after a minute or two the faintest hum could be heard which would then slowly fade away and I would take this out and say "your picture is now properly washed. I think if you will pin it up here, it will be dry enough for you to take home." Again, there was a crushing effect.

The chairman of the meeting was a very fine cultured gentlemen. I think he was an import from Germany in the days when people did not change nationalities very much. His name was Olaf Block. Olaf Block was chief scientist of the then very prominent Ilford Photographic Company. Olaf Block was a very fine scientist and industrial chemist, an artist, a musician, and a very genial fellow, but I don't think he ever washed his hands. He was entering into the fun of this thoroughly and was trying to get the greatest reaction from the audience on my behalf by calling for more volunteers for this that and the rest. Finally there was a kind of silence when this part of the meeting wanted winding up. He said, "Well, Hickman, tell us how sensitive is this? One of those last prints you did was a very tiny hum. What other things can we do to see how sensitive this is?" I said, "I think if you were to spit in there, it would probably do something, but it would also depend on whether you had eaten salt with your last meal and it's not a very nice thing to do." So he said, "well, what would happen if I put my fingers in?" I said "if your fingers are clean, you will get nothing out at all." "Well," he said, "I'm going to try it." Here was a photographer who was known to have the grubbiest nails and the most appallingly stained fingers. He plunged his hands into this and it went "wooooooooww!!" with an awful howl. It brought the house down. Olaf and I took a little time to repair our rapport, but we did eventually. You can see how easily I got loved by my superiors! When I arrived in Rochester to join Kodak, they had made a hypo howl in the laboratory and it was this and the photographic tray which ushered me into the Company. I was never held in higher esteem than I was for the first weeks.

I had another gadget of a very amusing nature which I demonstrated from time to time. It had no possible commercial future, but being as I say, an inventerante patentee, I had to patent this too. This gadget was given the rather vulgar name of the papundulator. There was a need to have a means for rocking the photographic dish. You might say all you need to do is to put a little screw with an eccentric on it, and have this turn slowly to rock the dish backwards and forwards. But this is exactly what you must not do. The skilled photographer, when he is developing something in a dish, gives it a random motion.

I was playing with water syphons at this time and my various hydrolic skills and plumbing was a form of playing with water toys that I could not stop doing. Imagine that we have a rubber tube conveying water from the tap, lying down horizontally on the bench. Now I stand an upside down, U shaped glass tube, so that the bend stands two feet up in the air, with one free end hanging over a sink. I will attach the rubber tubing from the top to the end that is on the bench. Now let's suppose I put a little pressure gauge on a spur just where the glass bends before going up. We turn the tap on slowly and as the water climbs up in the bend, the needle of the pressure gauge goes up and up as the greater weight of water in the tube. Now it goes over the top and starts to run down the other side and so long as it forms a complete column and just doesn't run down one wall of the tubing, by the time it gets right to the bottom of the part hanging over the sink, and is running into the sink, the gauge will actually register a negative pressure. I have gone from a positive pressure where the water climbs up, to a negative pressure as it comes down the other side. Now suppose that we do purposely what happened to me accidentally: the gauge comes off, and immediately air rushes in and the water column is broken and the water now comes out of the place where the gauge was and goes all over the table. Suppose now, instead of the gauge, I take another tube and fasten on where the gauge was and allow that to poke up in the air slightly higher than the vent tube. The water enters from the tap, runs up the vent syphon then it runs up the little auxiliary tube on the side. When it gets up to the top, it syphons over and the pressure on the side tube begins to run down and at the moment the syphon tube is empty, air gets in and breaks the syphon. So I have an intermittent syphon which has an intermittent pressure cycle, up, down, up, down. I had a little tiny bladder which had been used for collecting gases in the laboratory. I put another tube on in the same place as when the pressure tube was, I put the bladder on there and what did I see? As this water went up and down here, this bladder blew itself up and then sank down and blew itself up and sank down again. It almost looks as though it's alive. The next thing to do was to put this under one edge of a photographic dish, and here was a beautiful dish rocker. But it had one thing wrong with it. Unless you were altering the speed of the tap, it was always running at the same rate. So, I built two of these with two little bladders and arranged the water stream in one to be slower than the water stream in the other. The dish rested on a third point, a little spike, and these two bladders, and would rock in the most crazy manner all over the place and would do a magnificent job. I took the papundulator up to the Royal Photographic Society and this produced howls of laughter but nobody was impressed as they had been with the tray syphon. I really mention it more as an example of my life long need to play with

water, and because it is mentioned in the piece by Douglas Spencer, which follows.

I'm afraid that the dire consequences--expulsion from college--of earlier pranks didn't stop me from perpetrating others as a graduate student and demonstrator. I remember once going from my basement laboratory down the hall to a room where various bottles and glassware were stored. This room was under a lecture theater which had tiers of seats for the audience, descending towards the stage. The bottle store room therefore had a stepped ceiling, right down to the floor at the back. It also happened that for ventilation or other purposes there were gaps in the risers between tiers which were supposed to have grates or screens over them. However, some of these were missing. On this particular day, there was a lecture going on, and I peeked through to see what was happening. I saw a most beautiful female leg sticking down before my eyes. So I grabbed it and started to pull and kept pulling. Shrieks of horror interrupted the lecturer. Then I let go, collected my bottles and returned to my experiments.

Another example of my playing with water was my development of a silent toilet using syphon devices similar to those of the papundulator. It had no moving parts, except for the button you pushed to flush it, which would send in a bubble of air and trip the syphon. As the tank refilled after flushing it would automatically reset the syphon for the next flush. I made one of these entirely of glass, including the tank and set it up in the laboratory where it could be demonstrated on propitious occasions. Again, I took out a patent, but never managed to sell it commercially despite its advantage of quietness.

My good friend, Douglas Spencer, was five years my junior and just finished college the first year I started teaching. The second year, he became a young demonstrator like myself and he was very interested in what I was doing, because as usual, even back in those days, I had started to put on a show in the laboratory. Everybody wanted to see what I was doing, just as they do with my present laboratory, where all the bubbles in the glassware are hanging around. I invited Spencer to join me and I can remember Professor Baker who was the head of the Chemistry Department really quite disgusted. He would say, "Spencer, don't let yourself be beguiled by Hickman and photography. You've got the makings of a really good chemist." Baker was probably quite right. I don't think I was a very good influence on him at all. But the interesting thing is that Spencer never went on with chemistry. He not only inherited my photographic practice and all my teachings, but he became both Director of Research and General Manager of Kodak, Ltd. in London, in the course of time. He got there through both his chemical

acumen as a researcher and his business acumen. After leaving the Royal College, he entered a firm that had devised a means, not a practical means for amateur photography, but a specialist means for expensive advertising, of taking color photographs and producing them on paper, making color prints. Spencer's firm turned out some magnificent color prints. Spencer was doing very well there, but this firm didn't make enough money to keep going and eventually he married and he had to do something to increase his income. I had been telling the Kodak people here that we were in trouble in England, we really hadn't gotten competent people to run the British branch. I said, "You should get Spencer. You should get Spencer". Eventually, they got Spencer. Spencer rose to be head man there. But Spencer himself was a very erratic individual, over frank and like myself, he left Kodak in a state of high dudgeon. Why, I don't know. He hadn't invented any photographic processes for somebody else to become acquisitive of as in my case. But anyway, as things go, I would say it was a very successful career.

Anyway, Spencer helped me considerably with my research on washing. The hypo howl was very important in this, as it allowed us to make accurate measurements of washing times in our experiments, while the syphon and papundulator allowed us to get very clean prints. I won the Williamson Award from the Royal Photographic Society in 1924 for my work on this, and Spencer won it the next year on my recommendation, for his further contributions to this research. We had a wonderful collaboration, and a jolly good time as well. He was unofficial cartoonist for the school, and poked fun at everybody in his drawings. Some flavor of our adventures, slightly distorted for effect, are given in the reminiscence by Spencer printed in the Photographic Journal in 1967, which follows:

> Let me dispose of Spencer first. The first camera I owned that actually worked was a VPK and I used to make contact prints on Gaslight paper. It was the smallest available format for I had no pictorial pretensions. My choice of subject matter was mainly determined by what happened to be in front of the lens at the moment I released the shutter. In a large number of instances this proved to be my middle finger.
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> I got tired of explaining that what looked like fly specks on my contact print were Highland cattle in their native setting so, when I heard that you could buy large sheets of war surplus Bromide paper at a fraction of the cost of Velox, I bought some, and a second hand portable daylight enlarger. I had no instruction sheet for either but hopefully loaded the device with a

negative at the narrow end and bromide paper at the other, took it out of my cellar darkroom and pointed it at the sky.

Every time I developed the paper the result proved to be a negative print, so I sought advice. On the College notice board there was an announcement that a Mr. Hichman, a Member of the RPS, was shortly giving a lecture entitled "Lightning methods of Photography" so I went to see him. He gave one look at my negative prints and exclaimed "Solarization". I thought this was some form of oath because he didn't explain the word but asked me if I was interested in photography. When I said "Yes", he suggested I help him with a demonstration he'd announced he was giving at his lecture -- namely, to photograph the Chairman and project the results on the screen within one minute. The trouble was, single-handed, he couldn't do it within the time limit he'd committed himself to.

We spent that evening in an atmosphere of hot processing solutions, formaldehyde and methylated spirit but the best we could achieve jointly was one minute fifteen seconds and immediately we put the slide in the Carbon Arc Projection Lantern the image flowed unrecognizably down the slide.

We faced the next slide with glass so that the gelatin couldn't run if it melted but the result was horrible--the image merely squashed out in all directions. When we packed up for the night Hickman said "Well, drying the slide and projecting it is your responsibility. Go away and think about it." So I did. I went to Prof. Ingold, who was going to take the chair at the lecture, and asked him if he'd mind wearing his mortar-board and gown for the coming portrait. He was a good sport and agreed and, on the night when the time arrived the flash powder went off, the lecture hall filled with the usual cloud of white smoke, a large seconds timer facing the audience was started and the hall plunged into darkness except for a red lamp illuminating Hickman's dishes and the clock face. After 50 seconds Hickman announced smugly that his part was done and handed me the roughly blotted slide, still dripping with meths and formalin. I

placed it on a hot water bottle and galloped in the dark up the tiers of seats towards the lantern, deliberately stumbling to my knees in the process which gained me a little sympathy but not enough time. I waved the slide over the nearly red hot top of the projector while I fumbled with what seemed to be a jammed slide carrier. Eventually the slide shot home and a pen and ink sketch of a donkey wearing a mortar-board and gown appeared on the screen. I shouted an apology "Wrong slide". There was further difficulty in getting it out of the lantern and replacing it with the now dry enough slide when an excellent picture of the Chairman appeared on the screen.

Everyone had forgotten the clock and was obviously sorry that Hickman had chosen such a clumsy assistant. But Hickman wasn't. He invited me to join him in some photograhic research, saying "You're just the sort of crook I need".

Hickman was designed for the engineering profession but the profession didn't think much of the design at that time. Nor did his professor because an internal combustion engine Hickman had invented which, instead of petrol as fuel, was fed with small strips of cordite automatically chopped from a supply reel, blew its cylinder head through the partition separating Hickman's laboratory from the professor's. So, learning from a friend in Ilford that they'd just condemned 100 dozen boxed quarter plates because of age, fog, he begged them and began his work on washing photographic products.

Unfortunately, someone had seen the plates delivered and next morning fifty of the boxes were missing from the cupboard. Hickman spent the next few days fixing pulleys, cords and electrical contacts to the inside of the cupboard door. If anyone unaware of this opened the door it operated a hidden camera's shutter, fired flash powder, broke a glass cylinder full of liquid sulphur dioxide filling the room with choking gas and set off an alarm bell in the porter's lodge. We never got a photograph of the

thief but Hickman and I accidently photographed ourselves and rendered the room uninhabitable on two or three occasions.

My part in the washing research was to accumulate data for the curves Hickman was sure represented the rate of removal of hypo under different conditions. It involved hours of manual dish rocking of which I was eventually relieved by his next invention -- a dish support resting on two rubber bladders which were blown up and emptied in out of phase sequence by a combination of water pressure and a syphon emptying system. The success of this device fascinated Hickman and shortly afterwards he turned up with a pair of his mother's corsets in the inside front of which he'd sewn a circle of similarly operated rubber bladders. He was sure it would cure constipation in anyone he could persuade to wear the corsets because of the peristaltic action the bladders would stimulate as each in turn was blown up and emptied. I assured him I didn't suffer from constipation so he persuaded a sallow faced research student to put it on. When the water tap was turned on the poor bloke leapt about like a speared fish screaming "Turn it off" and then was violently sick. Hickman had got the peristaltic action going all right -- but the wrong way.