

PANEL HEATED INSTALLATIONS (Cont'd)

<u>BUILDING</u>	<u>DEALT WITH BY:</u>	<u>NOTES</u>
Swan and Edgars, Regent Street, Piccadilly.	Frank.	A well-known store with, I think, mechanical ventilation but not air-conditioning, designed to work with panel heating. Work done during re-building of Regent Street.
Bourne and Hollingsworth, Oxford Street.	Ernest and Frank.	A similar job to Swan and Edgars.
Fortnum and Mason, Piccadilly.	Duncan.	A similar job to Swan and Edgars.
Goldsmiths and Silversmiths Company, Regent Street.	Self.	Showrooms and offices but little mechanical ventilation. Now called "Garrards, the Crown Jewellers". Work done during re-building of Regent Street.
Austin Reeds, Regent Street.*	Ernest.	Similar to Garrards.
Hope Bros. Regent Street.*	Self.	Similar to Garrards but the showrooms only were panel heated and the rest of the building was dealt with by radiators.
Home for the Blind, North London.	Self.	Panel heating chosen because the occupants could not damage themselves by hitting radiators.
Glyn Mills Bank.	Duncan.	In addition to ceiling panels floor panels were also used. Floor
Police Section Houses.	Nelson.	Several of these were dealt with in the Metropolitan area for Scotland Yard.
Bank of England.	Frank.	This job merits an enlarged note which follows later.

On the jobs marked * there were major difficulties which are described later.

I cannot recollect any panel jobs which were dealt with by Alf and Leslie, but there may have been some. At this time Leslie dealt mainly with ventilation jobs rather than heating. The installation at the Bank of England took several years to complete. The Consulting Engineer was Oscar Faber whose mainstay was Kell, but in my opinion

Rosser and Russell designed most of it with an overall guidance from Kell. Under Frank, several persons helped: e.g. Tibbles who must have dealt with hundreds of very good drawings; Ernest, Leslie on ventilation and T. C. Stevens, foreman on site who ensured good workmanship.

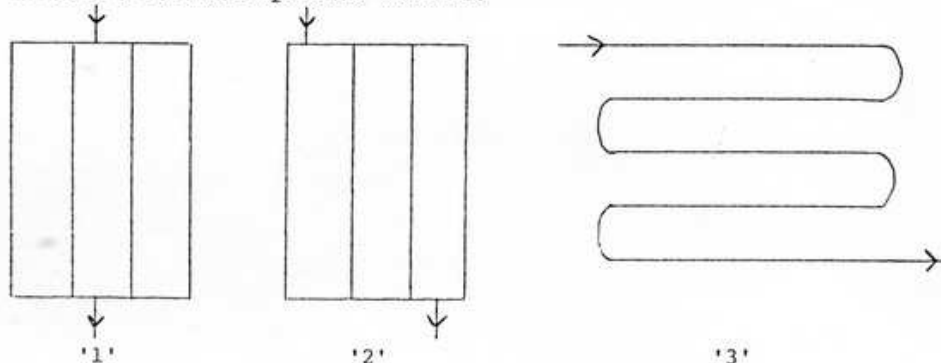
The wharf also took part and I remember mock-ups being made to determine the heat emission from copper panels, and the air flow from ceiling air inlet gratings. Actually, I took a 16mm cine film of these air flows which I gave to the firm a short time ago. These ceiling gratings were probably the forerunners of the later ceiling diffusers. Briefly the installation consisted of:

Panel heating with continuous copper coils.
Ventilation air ducting in copper.
Refrigeration plant for air-conditioning.
Waste heat recovery from diesel generating sets.
Oil fired boilers for use when waste heat was insufficient.
Domestic hot water and various subsidiary services.

Frank especially did a marvellous job and he deserved full credit. I remember that, on first starting up, alterations had to be made due to extreme condensation at the flue gas exit points, which was caused by the low water temperature required for panel heating. This was overcome by raising their operating water temperature and then by reducing this temperature by means of thermostatic mixing valves. The question likely to be asked is "Were there any difficulties encountered in panel heating and if so what were they?" My answer is "Yes, there were snags" some of which I list below and divide into "Minor" and Major" ones.

"Minor"

1. On the early installations a rate of airchange of once per hour was used for the heat loss calculations in the spaces to be warmed. This was due to the thought that with radiant heating a greater airchange was unnecessary when compared to other systems. In small rooms this was not the case, although it was not so noticeable in larger rooms, later installations were designed bearing this matter in mind. Fortunately, on the earlier installations there was ample reserve, and by raising the boiler temperature still well under that at which plaster could crack, this difficulty was overcome.
2. The original panels were made of steel tubes with grid formations as sketches 1 and 2 below, but later the continuous coil method was used. The tube was of $\frac{1}{2}$ " internal diameter, and could easily be bent in a hand operated machine:



With '1': The water tended partially to miss the outer tube.
With '2': The result was not much better.
With '3': The tendency was overcome and the panels cost less to make due to much less welding.

3. At first the distribution pipework was fixed in the basement and from there flow and return risers served the individual panels. Also, the pumps were fixed in the return main. With this arrangement air collected in the panels and special reversing connections had to be made on the pumps in order to push the air out. Later distribution pipework was revised with basement flow mains and roof top return mains in which case air travelled upwards to the return main from which it was automatically released.
4. I remember that on one small installation which I dealt with, the room temperatures could not be obtained and the job had to be scrapped. The plastering work had been done by a small local firm who did not keep to the instructions provided. The ceiling panels were in wood joist floors and the plaster did not adhere to the piping so that heat transmission was reduced.

On larger jobs the firm insisted that Plastering Limited should deal with such work.

As a result of this small job arrangements were made for Messrs. Plastering to visit smaller jobs to make sure that this work was being done correctly. I list this as a small defect as it was on one job only, and it was then possible to prevent it happening on other work. The small job to which I refer was a Benskins Public House near St. Albans called "Rats Castle": not a bad name under the circumstances. The tragedy to me was that I missed doing further work for Benskins who had a large re-building programme in hand.

"Major"

5. Some clients asked for panel heating after the floors had been fixed so that there was no opportunity to use steel panel coils cast in with the ceilings. Crittalls then decided to use "amalgam" piping which was flexible and could be fixed to the underside, reinforced and plastered over. Although this piping was supposed to be suitable for the work this was found to be not so, and water leaks occurred. Crittalls had installed such piping for Messrs. Harvey Nicholls and Woolworths premises. Rosser and Russell were caught up in this and their work at Austin Reeds by Ernest and at Hope Bros. showrooms by myself had to be re-done at the firm's cost.

A few much smaller jobs had also to be re-done and my recollection is of dealing with a large house at Pollards Park, Chalfont St. Giles. Although this was warmed mainly by radiators, the Billiard Room was panel heated, and radiators were then installed to take its place. With the exception of this major snag, panel heating was a success, especially where air-conditioning in its earlier form was installed in larger buildings and where both systems worked in conjunction and together.

Panel hot water heating was the forerunner of other low temperature radiant systems. Ideal Boilers and Radiators Limited put their "Rayrod" on the market, to compete, and several forms of electrical low temperature systems started to become available.

WORLD WAR II: 1939-1944

I consider that I must go into some details prior to and at the beginning of World War II, so far as Rosser and Russell are concerned. Alf had died in 1937 and Nelson had a serious illness in 1939. Donald Tweddle (my nephew), Ian Duff and Donald Naylor had entered the firm prior to the outbreak of war. Donald Tweddle and Ian Duff were members of the Honourable Artillery Company and Territorial Army respectively. The war clouds had started to arise and prior to the outbreak Duncan and I joined the Auxiliary Air Force in the Balloon Barrage Section because appeals had been made for part-time volunteers. If war was declared we both felt that the country might quickly be forced into submission by the German Air Force, and many other people thought likewise. After some preliminary training I was called upon to serve for a fortnight at Hackney. I did not return to the firm because war was then imminent. Duncan was in a somewhat similar position and we both ended up on full time service.

Both Donald Tweddle and Ian Duff were called up for war service as well as some of the younger staff. Donald, Ian and Cleghane returned from Dunkirk, but Donald was killed later in Burma. Later on Donald Naylor, who had helped with the Risley contract, was called up. Ernest continued with the firm but was killed in an air raid in 1941.

Rosser and Russell's position at the outbreak of war was therefore difficult, and they did not know what sort of war work would become available to them. Germany's bombing did not occur at the beginning and members of the Auxiliary Air Force were questioned about their technical knowledge and I told them about my heating and ventilating experience and electrical knowledge. Both Duncan and I were too old to train as pilots.

At that time my father's health was not good and I explained matters to him. His feeling was that I would be transferred to the Royal Air Force on the technical side. In many ways I wish that this had happened, but during this period the firm had applied for the release of Duncan and myself to deal with their war work. This release was granted on the basis of "indefinite business release" and we therefore both returned to the firm at Conduit Street as civilians but on war work.

As shown later the firm carried out many important contracts, and I have always been glad that most of mine were for the Royal Air Force.

During this period, due to poor health, my father could not assist with the more active types of work, but he continued to attend the office and helped in other ways. As regards myself, on my return to the firm I have always felt grateful to Frank in obtaining an entry for the firm to the Air Ministry from which I then obtained a lot of work. In the carrying out of this work my thanks for help are due

to W. Porter and R. J. Lucas in the office and to several foremen: e.g. V. Bunn, E. Fuisse, T. R. Stevens and others who I do not now remember.

I am sorry not to be able to give any details about Frank's, Duncan's and Leslie's work other than the brief references. This is due to my not being directly involved in their work. I am able, however, to give better details of my own work which will give an indication of the types of installations which were dealt with. All contributed to Air Raid Precautions and Damage work.

Frank's and Leslie's Work:

This was mainly for the British Broadcasting Corporation and consisted of heating, domestic hot water, ventilation and transmitter valve cooling installations for many of their buildings. Such transmitting stations fed information not only to Great Britain but also to many countries abroad. The cooling of the larger transmitting valves was essential so as to dissipate the heat generated, and I think that on some installations this surplus heat was used to assist in the winter warming of the buildings.

Duncan's Work:

His main job was at the Ordnance Factory at Risley near Warrington and this was the largest war-time job done by the firm. He himself spent many months there, assisted by other office staff. For this reason he was not available in the office to deal with other work. Numerically, therefore, I was able to deal with more individual jobs than he could.

After Risley, however, I remember his dealing with a smaller Ordnance Factory at Ruddington near Nottingham, and another large job at Corsham. This latter installation was for the Ministry of Aircraft Production, with an underground boiler house as well as underground and overground buildings. He probably dealt with other works but I do not remember them, except for a factory installation for Messrs. Handley Page at Radlett. Rosser and Russell, therefore, dealt with this firm during both World Wars.

My Work:

I do not wish to give the impression that I dealt with a larger amount of ~~work~~^{work} than that done by other individuals, but numerically the installations would be more. It is fortunate, therefore, that I can give more detailed information on them, which I will now do. A lot of the work was out of the rut to me, interested me and made me feel that I contributed more than I would have done in the Royal Air Force.

1. R.A.F. STATION, WEST MALLING, KENT:

This was a fighter station, construction of which was commenced before the war. The buildings were, therefore, of solid type compared with the hutted type used later. It was bombed during the Battle of Britain, but the Germans did not fully concentrate on it, but rather attacked Biggin Hill etc., hoping to use West Malling later as one of their bases.

I remember visiting the site during the Battle and sheltering from bombs which hit some of the smaller buildings, and onto the external mains serving them. Our fighters hit back hard and the vapour trails in the sky showed that the Battle had really commenced.

The site was a dispersed one, served from a main boiler house and with external mains in trenches which carried low pressure hot water heating and domestic hot water supply to the various buildings.

My job was to instal the services in the buildings and also local steam boilers and pipework to deal with cooking apparatus. The main boilers and external mains had already been installed.

2. R.A.F. STATION, DOWNHAM MARKET, EAST ANGLIA:

This was a bomber station of war-time hutted construction and the original site was doubled as the war progressed. It was one of the first stations to have a fog dispersal system for the main runways, and many gallons of ignited petrol were used to get rid of the fog.

My work was to provide heating and hot water supply systems for the dispersed buildings, steam plant for cooking and small gas filtration systems in case of a poison gas attack. From here some of the 1,000 aircraft were flown for the night raids on Germany.

3. R.A.F. STATIONS, BURY ST. EDMUNDS and SEETHING, EAST ANGLIA:

Both of these stations were bomber ones and similar to Downham Market. Both were increased in size as the war progressed.

4. R.A.F. STATION, SNETTERTON HEATH, EAST ANGLIA:

This was a bomber station which started off on similar lines to Downham Market, but its original size must have increased by about sixfold. It was, therefore, the largest station which I dealt with. The Americans eventually took over this station and maintenance hangers were added and these were served from a main boiler house with an output of 7-10 million B.T.U's per hour, the heat input to the buildings being by means of hot water unit heaters. T. R. Stevens (foreman) will remember this job. I especially remember it because I had meals in the U.S.A. Officers' cafeteria consisting of ham and pineapple and other "goodies" which in those days ordinary civilians rarely received. After the war the runways were used as motor racing tracks.

5. R.A.F. STATIONS, LUDHAM and EARSHAM, EAST ANGLIA:

These were fighter stations of much smaller size than those for bombers, and were used to protect the bomber stations. They also increased in size and my work was on similar lines to that at the bomber stations.

6. R.A.F. NORTHERN STATIONS:

Leeds office dealt with several of these, the first being at Bottesford about which I helped Denis Hayes by preparing the

priced schedules and showing him how to deal with this type of work.

7. SPECIAL WORK FOR THE R.A.F.:

This was for C.N.T. buildings (Celestial Navigational Trainer). I dealt with some 7-8 of these situated at Wing in Buckinghamshire, Harwell in Berkshire (now Atomic Energy Establishment) and at another station whose name I cannot now remember but I think it was at Abingdon.

Whilst at Wing I met an aircraftsman pal from the Balloon Barrage, who had been transferred to the R.A.F. and commissioned, and who by then held a high position. I told him that I was dealing with C.N.T. buildings and his reply was "Good, get on with it because it is the very thing we need".

As the war progressed, night bombing of Germany at higher altitudes developed and a higher degree of technical training for coming pilots became necessary. Previous to this the older "link trainers" only had been used.

The C.N.T. buildings gave night navigational training in clear air and under temperature conditions which could be varied. They were dispersed on the sites, not only to give instructions to many, but also if one was bombed, others on that site could still be used.

Each building was not very large, octagonal in shape, about 50' across and 40' high, with a domed ceiling, the walls and ceiling being heavily insulated. At ground level there was a mock-up bomber cockpit, with aircraft controls etc., for the trainee pilot. Films of the night sky were them projected in darkness onto the domed ceiling. The question will be "How did Rosser and Russell enter into this?". The answer is as follows.

An attached building contained the heating, cooling and air filtration plant which consisted of:

- a) Electrically operated air heater batteries with step control, thermostatically controlled.
- b) Air filter, fan and air delivery and recirculation ducting to the main building.
- c) Refrigeration plant and controls.

Basically, therefore, each plant could provide either warm or cold conditions for the trainee, whichever was needed for any particular example. The buildings were sealed ones so that the plants also provided air for ventilation and breathing purposes. I do not remember the amount of temperature drop obtained inside the buildings, but it must have been considerable and possibly approached that experienced in the upper atmosphere.

The size of the refrigeration plants seemed to me to be large for dealing with comparatively small buildings. This type of work attracted me. It was so much more interesting than ordinary heating and ventilating work.

8. R.A.F. WORK FOR THE DIRECTORATE OF COMPRESSED GASES:

Again this work attracted me because it was more out of the usual. Previously most of the work for the R.A.F. had come under Air Ministry Works and Buildings 1A priority, but towards the end of the war I suddenly found myself drawn into work of the highest priority and on the secret list. The sites were hidden away in woods etc., so as to be invisible to enemy aircraft. Correspondence between the Ministry and the firm had to be delivered by hand and marked as referring to "FUR COAT", "TOP HAT" etc. sites. These sites were small ones stretching from Norfolk to the South Coast and in number were something like six to nine. Each site dealt with one or other of the following:

- a) Compressed air for many uses.
- b) Compressed oxygen for high flying.
- c) Compressed nitrogen for the sealing of aircraft petrol tanks, to make them less susceptible to bullets and so as to lessen fire risk.
- d) Compressed hydrogen for the Balloon Barrage across the Channel for the invasion. Here the balloons were operated from ships in order to counteract dive bombing by the enemy.

I have never really understood the high priority and screening given to this work. My guess, however, is that somebody suddenly realised that if one or other of the few main factories (e.g. British Oxygen Limited) was to be bombed, the result could have been very serious.

As a result I was called upon at short notice to provide and fix gas receivers and pipework for a site without knowing what was likely to be needed, and to fix compressors provided by the Ministry. V. Bunn helped me to get through several of the difficult jobs and he was held in high esteem by the Ministry.

The handling of compressed oxygen was tricky because any presence of grease could cause an explosion. All pipelines etc., had, therefore, to be treated with a solvent which I think was trichlorethylene. No plans were provided because little time was available, and the work was done "hand to mouth".

9. WHITE WALTHAM AIRFIELD, BERKSHIRE, FOR THE MINISTRY OF AIRCRAFT PRODUCTION:

This was an airfield for Air Transport Auxiliary and received aircraft from the United States. The work did not have a high priority. I think this was because such aircraft, when received, were quickly sent off to the R.A.F. airfields. It did, however, have a large hanger for aircraft which could not be sent off quickly. I installed the heating which used steam and unit heaters, and a boiler dealing with about 7,000 lbs. of steam per hour. Otherwise the installation calls for no special comment.

10. GENERAL AIRCRAFT LIMITED, FELTHAM, MIDDLESEX FOR THE MINISTRY OF AIRCRAFT PRODUCTION:

I dealt with the heating of a portion only of this factory,