Chapter 1. The Man Redler

It is impossible to write any history of the REDLER Conveyor without first giving a brief insight of the man Arnold Redler, who against almost overwhelming odds fostered, persevered and developed his original idea and lived to see the day when the word REDLER was known throughout the world.

He left school at the age of fourteen, handicapped by being almost totally deaf and with an impediment in his speech, both the unfortunate result of being kicked on the head during a game of rugby at the age of ten.

Born at South Molton, Devon, on the 27th. May 1875, he came from generations of millers on his father's side, whilst his mother whose maiden name was Francis had amongst her forbears the inventor of the Francis water turbine unit which, at one time, harnessed most of the world's water supply.

Arnold Redler left school at the age of fourteen and entered his father's business of flour milling at Taunton where he received a thorough training in this field, and to which in the years to come he was to invent many improvements to existing equipment and the innovation of new.

He was a solitary man with no close intimate friends, his only relaxation from his work being the mammoth chamber organ which he played loud enough to hear himself, much to the discomfort of others.

Around the turn of the century Arnold and his elder brother Daniel broke away from the family business and set up on their own in Worcester under the name of Daniel Redler & Co. Ltd.

In 1909 they moved to larger premises in Sharpness, which was the furthermost inland port at which ocean going vessels could unload, and with remarkable foresight, the surrounding land to the Mill was also leased and was ultimately to become the site of his first engineering works.

With the advent of World War One, there was the inevitable shortage of manpower which was compensated by the use of female labour until the practice was stopped in 1919.

Arnold Redler had given much thought to the amount of time and labour devoted to the task of manually emptying storage bins and with the enforced shortage of labour he felt the time was right to try his ideas out.

With no practical knowledge of engineering he was able to approach the problem unbiased by text books or accepted principles, and the fact that Engineers with whom he had discussed his ideas were united in stating his proposals were not workable did not deter him.

Being forthright and dogmatic in his views such adverse criticism only spurred him to greater resolve and effort to prove himself correct.

Even so, little did he realise the effect his discovery was to have in the years to come, yet this remarkable man at the age of fifty was able to turn his back on flour milling and devote his energies full time to his engineering works.

The Idea

Until Arnold began his experiments in 1919 flour had been discharged from storage bins almost entirely by hand, a long process which was costly in both time and labour.

In general, discharge was made through holes in the floor each about one foot square, and depending on the time it had been standing in the bin flour would fall through until it stopped flowing by its natural angle of repose which meant that above each hole was a steep conical hole.

The material left standing around the holes was trimmed manually to fall through the holes until the bin was empty, which meant the first flour fed to the bin was also the last out.

Many attempts had been made in the past to mechanise this procedure but as none could be termed really satisfactory, all were ultimately abandoned.

His thoughts were widely different to these early experiments and having carefully studied each in turn, was convinced that he knew just why they would not do the job.

He laid down four main factors as being essential features:-

1. The Bin discharger must have a very low power consumption.
2. It must handle the flour gently and not cause damage or excessive dust.
3. Eradicate the need for sloping flanks as these reduced the amount of storage which could be provided over a given floor area.
4. Discharge the bin on the 'First in First out' principle so that new flour poured into the bin would not take precedence over the flour already in store.

For some years he had toyed with the idea of using endless chains running across the flat floor of the bin, but he had done nothing constructive about it until the shortage of labour forced him to do so.

Whilst his intense independence and distrust of any suggestion or idea that was not his own enabled him to seek the advice of qualified engineers and then completely disregard it, this fact undoubtedly served him in good stead with his initial idea and experiments.

Later however it became painfully obvious that when he had proved his ideas right his lack of engineering knowledge not only retarded the development but also its commercial exploitation.

It has been said his idea was no more than an inspired guess, and however truthful this may be, it does not detract from the man's ability or the determination with which he set about proving his principle.

These same basic principles still apply to the REDLER machine of today.

The Early Experiments

Application was made for Provisional Protection for the Bin Discharger was made on August 12th. 1919, and was granted Patent No. 159236.

To first test his idea he constructed a channel or trough out of thick timber, the overall dimensions being approximately twelve inches wide by twelve inches deep and eight feet long.

Along the bottom of this trough with their ends projecting at each end he placed several standard Ewart chains.

The trough was filled with sharps and a thick plank which just fitted inside the trough was placed on top and pressed down by a 15 ton jack operated against the underside of the ceiling beams.

The fact that he could draw the chains through the sharps despite this heavy pressure convinced him not only that his idea was on the right lines, but the power required to operate such a bin discharger would be very low.

Enthusiastically he constructed a bin seven feet wide, eight feet long, and eight feet in depth, with a division plate down the centre, and placed it in position on the second floor of the mill.

At each end of the bin he cut a hole in the floor the full width of the bin to enable the flour as discharged to fall through to the first floor, with the second floor acting as the bottom of the bin.

To form a driving end he fitted a shaft with multiple sprockets, and a telegraph pole sawn down the centre acted as a trailer with the chains running over the curved side.

The level of the sprockets and the telegraph pole was arranged so that the chains would just kiss the floor of the bin and were joined up beneath the floor to form endless chains, spaced out to cover the entire width of the bin.

At the driving end of the bin he cut an aperture in the wall the full width of the bin and four inches deep, and at the other end an aperture just deep enough to pass the chains over the telegraph pole.

A small power unit was attached and the chains set in motion to ensure they would run smoothly over the sprockets and the pole, prior to the bin being filled to half its depth with flour.

When the chains were set in motion again the flour passed through the aperture at such a rate that the first floor was flooded to a depth of several feet before the drive chain could be thrown off.

The chain speed of seventy feet a minute was obviously too fast, and this was reduced by half, but it was some time before he could overcome the difficulty of the flour spreading over the sprockets.

Reducing the number of chains on the floor of the bin, he found the chains which were left running discharged the flour and then left little tunnels as the mass arched or bridged over them, and remained stationary.

He next tried with attachments fixed to the links to cut away the sides of the tunnels, which they did effectively enough, but the attachments fouled each other when the chains wandered.

This convinced him that he was right in his first method of chains in close proximity so that at least seventy five per cent of the floor area was covered by moving chains.

The test revealed a major problem in the basic design, for when feeding new material into the bin on top of any material which was lying at its natural angle of repose, the new material had the tendency to run down the sides of the pile and through the 4" aperture completely defeating his object of first in first out.

The answer to this major problem came to him, as many of his ideas did, during a sleepless night and typically he reached for his sketch pad which was always close to his bed, and made a rough freehand sketch of his suggested solution there and then.

Returning to the mill he constructed a timber bin of similar dimensions to the first test bin and still using the second floor as the bin bottom, but this time he inserted a false floor to carry the top chain which sloped down towards the trailing end at an angle of 1" in 12".

At intervals in the false floor he cut apertures the full width of the bin, each 3" wide and at roughly 1'-7" centres, so that the flour could fall through on to the second floor, which this time would carry the return chain, and discharge into the holes which were again cut in this floor.

Ewart chains of 1½" and 2" pitch were used and spaced at about the same centres thus retaining his theory that 75% of the bin floor must be covered by the moving chains.

The test was so successful that he felt it merited the construction of an even larger bin, but this time of all steel construction.

He took his sketches to a firm of draughtsmen in London and asked them to draw up a design from which it could be manufactured, this they did, but departed from his sketches on the grounds that if drawn to his suggestion, the false floor would not carry the weight of the flour.

Undetered he drew out his own design and asked a firm of Constructional Engineers to quote for the manufacture, and in due course they accepted his order, only to revert to him and ask for it to be cancelled as his design was not in conformity with accepted practise.

Again his belief in his principles stood firm and he took his drawings to another firm and asked if they would manufacture the unit if he supervised the job and accepted the entire responsibility himself, and this proved to be the only means by which he could have the bin manufactured.

At last the bin was set to work and he made several important discoveries regarding the behaviour of flour in storage bins.

In the first instance the flour bridged from a 1½" diameter hawser which passed through the bin across the two foot wide gap to the end plate, and was so solid that the boiler room poker had to be used to break it down.

The second discovery was more serious, for when several of the haulage chains parted and some twenty tons of flour stood stationary in the bin, it suddenly avalanced and exerted such pressure on the bin walls that they burst open and the flour swept some sixty feet along the mill floor bending a 3" sprinkler joint at right angles and causing such a commotion that several men ran out of the building convinced that it was on the point of collapse.

All his experiments so far had been conducted with standard Ewart and Grey chains, so it was now obvious that chains designed specially for his purpose would be necessary.

Here again he encountered trouble with manufacturers who refused to accept his suggested design on the grounds that it could not possibly do the work expected of it.

It was necessary for him to use the same method by which he had the bins constructed before he could persuade anyone to accept his order. These chains, whilst they were successful enough to show that he was on the right lines, were not the final answer.

His attempts to have further chains made caused so many difficulties that he attempted to find a solution by using a sliding grid method instead of chains, the grid opening and closing over a false bottom. It is recorded that he spent almost seven hundred pounds on this experiment until he ran into difficulties which appeared to be beyond his knowledge at the time.

Advice was sought from his Patent Agents and they opted for the original chain discharger in preference to the grid design, so Arnold Redler returned to his experiments with this unit.

It was at this stage that he found further possibilities in the use of his chains beyond the initial intention of bin discharging.

Normally when loading the bin with flour the top was raked over to spread the load evenly over the false floor, but on this occasion it was left standing in a pile with the angle of repose sloping towards the back of the bin.

After the chains had been running for some time they became exposed at the back end, and climbing into the bin via the inspection door he was amazed to see the entire load was moving forward as one mass.

Measuring the depth he found that chains only 3/8" deep were actually conveying a load depth of six feet.

Further experiments with chains in narrow troughs he discovered material could be contained in depth and conveyed at any angle up to the angle of repose, and with attachments to the chains to sweep the side of the casing he could convey at even steeper angles until the material fell over the sides of the trough.

To counteract this he covered the tops of the troughs, and also inserted a division plate to segrate the lower conveying leg from the top return chain.

After this it was a short step to lifting the material vertically, and the REDLER method of conveying and elevating was born.

First

Development of the REDLER En Masse system

In an article published in the Trade Journal "Milling" in December 1921, the author refers to several ingenious devices which Arnold Redler had incorporated in his mill at Sharpness, but made only scant reference to the Bin Discharger and conveyor.

Plainly the author did not realise that he was witnessing history in the making, and the fore runner of a method that was to be later described in the press as being the greatest advance made in the mechanical handling of materials

Perhaps this is understandable when it is realised that in the early days few people were prepared to accept Arnold Redler's principles until he exhibited his machines at the Wembley Exhibition in 1924.

No one had thought of harnessing the friction between material particles to promote its movement, until Arnold Redler hit on the idea.

"Angle of Repose" and "Structure Strength" were common terms, but so far everybody had attempted to discharge a bin vertically, and when he claimed that the easiest method was to empty it horizontally the sceptics calculated by the then accepted methods that at least 50 HP. would be needed.

Arnold Redler then proved his bin would operate successfully with only half of one horsepower being used.

He also proved that the friction of material on material was greater than on steel plate, and by moving the outer layer, the entire mass could be moved forward, upward, sideways and even around corners.

Between 1919 and 1924 the amount of time and money he devoted to his handling system was undoubtedly instrumental, but not entirely responsible for his mill going into voluntary liquidation, and he was thus able to devote himself entirely to his new career.

Here was a man with plenty of determination and faith in his ideas, but with limited experience, no plant, no machinery, and above all no capital. Yet, at the age of fifty he turned his back on his life's work as a Flour Miller, and started to manufacture machines.

He booked space at the British Empire Exhibition at Wembley for the full duration of the Exhibition which actually ran on into 1925.

Several orders matured from this exhibition, but one of the major contributions to his immediate future was the agreement with Buhler Bros of Uzwil in Switzerland for his bin dischargers and conveyors to be manufactured on the Continent.

This proved to be profitable to both parties, but as far as Arnold Redler was concerned the royalty payments financed his operations for some years until professional engineers were engaged and began to introduce more orthodox methods of production.

In 1928 the Works at Sharpness were extended, by which time the ever growing list of materials he was called upon to handle necessitated additional chains, including the "Side pull" which would take materials in a horizontal circuit.

1930 saw the machines exhibited at the British Industries Fair in Castle Bromwich, and also at the Toronto Exhibition in Canada.

At the latter Exhibition the REDLER machines on view included the Standard, Tubular, Uniflow, Side-pull, Duo, Two-Way, Flexible, Inmeasuring and Outmeasuring conveyors as well as Bulk Abstractors and Bin Dischargers.

In 1932 an agreement was made for Stephens-Adamson Manufacturing Company of Illinois to manufacture Coal handling plants using REDLER machines, and this was later extended for the Company to become the major American manufacturers and distributors of all REDLER equipment.

Licences to manufacture certain types of REDLER equipment were also granted to Fraser & Chalmers Ltd, Henry Simon Ltd, Lodge Cotterell Ltd, and the Birtley Iron Co. Ltd., with components supplied by Redler Equipment.