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OF ROSE POLYTECHNIC INSTITUTE

OCT. 1930

MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

GOAL!

FOURTH down! Seconds to play! Defending a slender one-point margin of victory, eleven husky bodies have valiantly repulsed three smashing attacks which have advanced the ball a scant foot to the fifteen-yard line. With success almost certainly within the defenders' grasp, the field goal specialist drops far back behind his stalwart line. A crashing impact — a blur of rushing bodies — and his nimble foot sends the ball spinning high between the goal posts for the winning points!

Shift this scene to a battle ground of modern business. The goal is an important contract . . . a substantial order for electrical equipment or appliances. Salesmanship, backed by a product of established quality, plays its important part; but a Westinghouse representative is more than a salesman. The background of specialized engineering knowledge that so often enables him to serve his customers as a consultant in electrification, is what supplies the necessary "punch" to win.

To many a younger college man with Westinghouse has come the opportunity to apply his talent toward the conclusion of a worthwhile transaction. The young men whose photographs appear on this page are but a few of many who, with college only a few years behind them, are finding success with an organization offering such a variety of opportunities in the world's electrical work.

• • •

Below are listed a few of the many important jobs handled by Westinghouse in recent years, wherein younger college men have played important parts:

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THE MARTYR

ROBERT M. CLARK, E. '32

The Economics of Coal Mine Mechanization

(Allen G. Stimson, Chairman R. P. I. Branch A. S. M. E.)

Reasons for Mechanization

The coal industry has been slow in applying high production methods. Most mines are operated very inefficiently and few can boast of the scientific management which has so accelerated American Industry. The development of materials handling equipment in manufacturing plants suggested similar methods for coal mining, and engineers began to recognize the opportunity for research and development in this previously dormant and backward industry. A tremendous influx of new ideas from other fields is responsible for the contemporary advances in mining methods.

The high wage rates demanded by the miner's unions as compared with the low wage rates of non-union miners, have given formidable impetus to the mechanization movement. Few companies would have been able to pay the high wages if certain mechanical devices had not been introduced. Still others have been forced to adopt complete mechanization in order to compete with mines operating under more favorable conditions.

The low prices of coal which have prevailed for the past decade have forced operators either to abandon those mines in the marginal group or to reduce production costs. Cost saving has in a great many mines been effected by the introduction of mechanical equipment. Under any conditions the necessity for cost reduction has been a great stimulus to the development of mining machinery.

Steady employment and a high output per dollar of investment may be secured through mechanization since the extreme seasonal fluctuation in tonnage requirements has made it desirable to devote the time during the months of minimum demand to entry driving and development work, so that at the period of large tonnage requirements operating labor can be transferred to mechanical devices capable of loading large tonnages in the rooms and entries previously prepared.

In some regions where housing facilities are inadequate the shortage of men has forced operators to install mechanical equipment in order to increase the output per man.

The increasing economic necessity for mining thinner seams has been an incentive to the progress of mechanical loading. In both the bituminous and anthracite fields very thin seams are now being mined with conveyors and scrapers. The use of rock handling machines for driving entries has aided this development.

Loading Devices

Five outstanding types of loading devices are in use today. In loading machines there are three elements: a gathering mechanism feeds the coal on to a conveyor which carries it to the loading boom. Conveyor loaders and pit car loaders are merely conveyors upon which the coal is shoveled by hand. Scrapers consist of a self-loading scoop which is drawn over the mine floor by power and up over an apron to the car. Power shovels are frequently used but are restricted to seams not less than six feet. The entry driver cuts the coal and loads it into cars without the use of explosives.

Factors Affecting Choice of Machines

Many considerations affect the choice of loading device to be used in a particular mine but the deciding factors in nearly every instance indicate a preference but do not fix a limit, since the types are used interchangeably. The system is a matter of local preference and is determined more by natural conditions than by any characteristics of the machines.

Mines with bad top have been worked with mechanical loaders, but because of the greater clearance required for their operation timbering is more difficult, and hence, development under these conditions has been retarded. Conveyors usually require less clear space between timbers than any other type, and are now being used under roof which has been reported prohibitive for car loading by hand.

In the past machines have been more widely adopted in the thicker seams, but loaders are now on the market which are designed to work in veins of four feet or less. Scrapers and conveyors are generally used in seams of less than four feet, but are also used in high coal.

Conveyors and pit car loaders when loaded with hand shoveling offer the same opportunity for cleaning coal at the face as did the old method of hand loading. Mechanical loading machines and scrapers undoubtedly increase the need for surface preparation, but it is also true that coal cleaning can be performed much more efficiently and with less labor on the surface than at the working face, and any increased costs due to surface cleaning are well offset by the economies effected underground.

Reorganization of Mining Methods

Standardized conditions and operations have never been realized in the coal industry and, because of natural conditions, probably never will be, but mining practices are improving. Where hand loading at the face is employed the output is contingent upon the whims of the workmen, who work when, as long, and as hard as they please. Men of all ages and qualifications labor in the mines, each at his particular place, digging, picking, shoveling, and cleaning the coal according to his own judgment or mood, drilling the holes by hand, and shooting the coal with his own powder, and receiving pay by the number of tons of coal he loads. Old men can work as little as they please without demerit yet earn enough money to exist. Extensive operations are necessary to secure volume production; intensive mining is impossible. No manufacturing plant could flourish with such uncertain production.

Mechanization is industrially modernizing coal production, relieving the miners of the drudgery of digging and hand loading yet subjecting them to greater discipline. The young efficient workman is needed to operate the new machines. There is no place for the old man or the inefficient workman. Coal production is changing from the piece rate method of hand loading to the day rate method of machine loading, and machine loading may eventually be operated on the piece rate basis if mining conditions become sufficiently standardized.

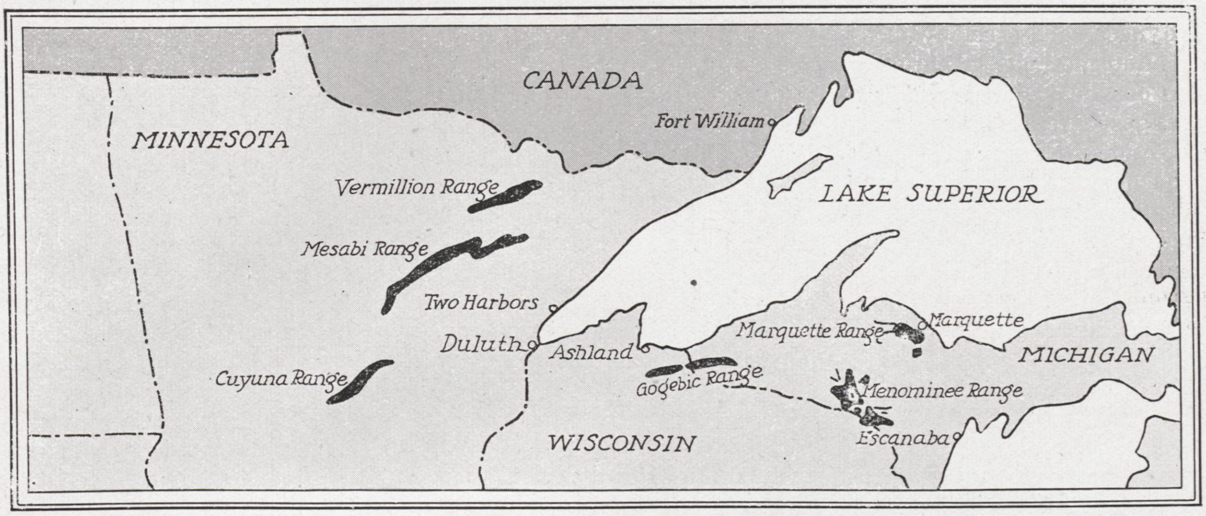
The principles of efficiency used by the industrials are now influencing mining methods. Mining conditions can never be completely homogeneous with men and machinery operating with the rhythm of a machine shop because coal veins are too irregular, but working conditions are becoming more nearly standardized through mechanization. With the manual system miners worked independently and inconsistently. By using machines the workings are concentrated so that supervision is more adequate, haulages are shorter, capital outlay in trackage is lessened, the entries and rooms are more uniform, working conditions can be improved at lower cost, and the efficiencies of large scale production begin to appear not only possible but very practicable. Standardized conditions make possible standardized operations. The entry drivers open up the working places; the cutting machines undercut the coal; the drilling machines prepare holes for the explosive; the loading machines load the shot coal into the cars; electric locomotives haul the coal to the shaft where it is hoisted to the tipple, mechanically sorted and graded and loaded on the cars ready for shipment to the consumer, all without having been touched by the human hand.

The standardization of mining conditions and operations has made possible standard schedules which insure the operator of adequate tonnage control, an impossibility with hand loading. The cutters, drilling machines, loaders, and locomotives operate on schedule making their rounds of the workings at a predetermined rate insuring synchronism and efficiency.

With the advent of mechanization and scientific management has come the desirability of operating the mine for more than one shift per day. Continuous operation has some distinct advantages, one of the most outstanding of which is greater return per dollar invested in mechanical equipment. This apparatus usually becomes obsolete before it wears out so that continuous use lowers the cost of investment without diminishing the life. Another advantage of double shift operation is the opportunity to equalize the total daily production of the different machine elements; for example, if during the day shift more places can be prepared than can be loaded out, the loaders can relieve the congestion for the following day by working a second shift while the cutters and drilling machines are idle, and thus increase production. The cycle of mining operations can be adjusted either by the introduction of additional equipment or by increasing the working time of the individual units, so that the total work of each element per day is perfectly coordinated with all other elements and the lowest operating cost consistent with safety of men and conservation of coal is maintained.

Mechanical loading has increased the tonnage, concentrated the workings, and thus made necessary more efficient haulage, and reduced the necessary capital for development work. This more intensive use of haulage has justified expenditure for better track arrangements, block signals, and trip dispatchers; and made possible better working conditions such as electric lighting, locomotives, and more adequate ventilation systems. Other economies are the reduction of the time necessary to bring the mine up to capacity production, and lower maintenance expense, both due to more concentrated workings. Larger mine cars can be used advantageously with mechanical loading because of the resultant increased operating time of the loading machines and the difficulty of hand-shoveling coal into very high cars. With scrapers and conveyors a trip of cars can be loaded at a central point, and thus simplify and in some cases eliminate gathering haulage.

Mechanization has reduced the cost of coal production, made possible better working conditions, lower maintenance expense, and provided more adequate tonnage control. The reduction of operating labor has increased unemployment of the miners but the demand for mining machinery has provided work for more engineers in the manufacturing plants.



The Iron Ore Industry of the Lake Superior Region

R. O. Cash, '23 and
T. H. Michell

The terms Lake Superior district and the iron ore industry have become more or less synonymous as each passing year of the last half century has seen an ever-increasing percentage of our nation's iron ore supply mined and shipped from this section. We now find portions of Michigan, Minnesota and Wisconsin almost exclusively identified with this vast industry, the development of which presents an interesting and romantic narrative.

The ore deposits of the Lake Superior district are divided into six ranges—the Vermillion, Mesabi and Cuyuna in northern Minnesota, and the Marquette, Menominee and Gogebic in the upper peninsula of Michigan. The Menominee and Gogebic ranges also extend a short distance into northern Wisconsin. The characteristics of the ore and its formations vary materially on each of these ranges, and this phase alone affords a subject of deep interest for geological study.

Iron ore was first discovered in 1845, under the roots of an old stump on the Marquette range. This range was so named in honor of Father James Marquette, a Jesuit priest who had established missions in this section during the latter part of the seventeenth century. Today along the road between the cities of Ishpeming and Negaunee, Michigan, you will find the historic spot marked by an appropriate monument. Here the first ore was taken from shallow open pits and in 1852 the first shipment, consisting of a few tons, was packed in barrels for delivery to one of the lower lake ports.

The country was undeveloped in these early days. It was necessary to transport the ore in wagons or sleds for fifteen miles through the woods to Marquette, Michigan; thence by boat to Sault Ste. Marie, where it was unloaded and hauled past the rapids that separate Lakes Superior and Michigan at this point. It was then loaded into boats and finally transported to those lower lake ports most accessible to the blast furnaces. Fortunately transportation facilities were rapidly improved. The construction of a canal at Sault Ste. Marie in 1855, followed by the building of a railroad between Ishpeming and Marquette in 1857, facilitated the early development of the industry.

The development of the Marquette range naturally led to further exploration in the Upper Peninsula and resulted in the discovery of iron ore on both the Menominee and Gogebic ranges. First shipments were made from the former in 1877 and from the latter in 1884. Since the majority of deposits in the Michigan ranges are covered to a great depth by overburden, most of the ore is removed by underground methods. However, there are some shallow deposits on both the Gogebic and Marquette ranges that are now the scene of open-pit operations.

Prior to 1884 all the iron ore shipped from the Lake Superior district had been mined in Michigan's three ranges, but in that year, with the initial shipment from Vermillion range, Michigan's prowess as an iron ore producer was first challenged. The finding of ore on this range was important, for it led eventually to the discovery of the large Mesabi range ore deposits in November, 1890. Minnesota soon gained supremacy as a producer of iron ore and its position has never since been disputed. The last range to be discovered was the Cuyuna, which derived its name from its discoverer, Cuyler Adams, and his faithful dog, Una, that had been his constant companion during his prospecting days. First shipments were made from this range in 1911. Development work followed and it now ranks with the other ranges as a steady producer of ore.

Ore deposits of the Vermillion

range lie deep beneath the surface and are necessarily removed by underground methods. A majority of those on the Cuyuna and Mesabi ranges are comparatively shallow, and are easily accessible for economical stripping and open-pit operation, although there are several ore bodies that are more advantageously mined by underground methods. Both systems are in current use.

The Mesabi range, by virtue of its large yearly production, its enormous reserves and magnificent civic improvements, is perhaps more popularly identified with the iron mining industry than any other. The name "Mesabi" originally came from the Ojibwa Indians and referred to a mythical giant, who, according to Indian legend, had his home in this long range of hills. The gigantic tonnage of ore, since found in its deposits, has proved that the original Indian name was an especially appropriate selection.

Since the discovery of ore on the Marquette range in 1845, including the shipments of 1928, records show that 1,398,478,044 tons of ore have been mined and shipped from the Lake Superior district. This enormous tonnage is divided among the various ranges approximately as follows: Mesabi, 816 millions; Gogebic, 174 millions; Marquette, 165 millions; Menominee, 163 millions; Vermillion, 55 millions; and Cuyuna, 27 millions. The 1928 shipments amounted to nearly fifty-five million tons, of which approximately thirty-five came from the Mesabi; seven from the Gogebic; five from the Menominee; four from the Marquette, and two each from the Cuyuna and Vermillion ranges. These figures will give the reader a basis upon which to determine the total production of the six ranges in this district at the present time.

The iron ore deposits of the Lake Superior district resulted from the disintegration of iron-bearing rocks and formations by erosion, folding, faulting, and other geological actions, which were then concentrated, by the circulation and filtering of underground waters, into small, enriched ore bodies, during the geological eras. Each range varies widely in geological formation and the ore bodies are correspondingly different, but for the most part the ores of this district are either a hard or soft hematite (Fe_2O_3) or magnetite (Fe_3O_4). Thus far production has been chiefly limited to hematite ores and will doubtless so continue as long as these deposits are available.

Exploration work, first carried on in shallow ore bodies by means of small shafts and test pits, soon gave way to diamond drilling as the search for ore extended to the deeper deposits. This work, in the deeper mines of Michigan, is largely executed by underground drifting, which operation is also supplemented by the use of diamond drills set up in underground locations. The churn drill has likewise been used in many of the Mesabi range properties, especially in surface and soft ores, where it has been found to give better results than the diamond drill.

The results of exploration work not only define the limit and depth of the deposit, but also furnish accurate samples of the ore encountered, so that after the drilling and drifting have been completed, an estimate of the tonnage and grade of ore the property contains can be accurately computed. Such data and preliminary estimates govern the plan of operation and development. Whether the ore shall be won by underground or stripping methods depends upon the calculated ultimate cost per ton of ore recovered.

If the overburden is not too deep and the ore body large enough to warrant the removal of such surface yardage so as to obtain ultimately an economical tonnage of merchantable ore, then the open-pit system of mining is employed. This method offers the advantage of a large and flexible production with comparatively few employes; and in periods of depression or inactivity it exacts relatively small maintenance charges. All surface material is first removed from the ore body by the use of power shovels, locomotives and dump cars; this waste material being transported to nearby ore-barren land. Then the ore is loaded direct into railroad cars by power shovels and hauled out of the pits with locomotives. It has become necessary, in later years, to crush and wash some of the open-pit ores before shipping them. In such cases the material is loaded into dump cars in the pits for transportation to the crushing or washing plants. After treatment, it is then loaded into railroad cars for shipment.

The development of this mining method has largely been a romance of mechanical progress. The first steam shovel, a small 35-ton model with half-yard dipper capacity, made its appearance on the Mesabi range in 1892, and other mechanical equipment such as locomotives and dump cars were likewise correspondingly small. Today, this early equipment has been supplanted, in some extreme instances, by 300-ton, full-revolving, caterpillar traction electric shovels with eight-cubic-yard dippers, and large-type locomotives weighing 125 tons on their drivers, as well as air-dumped cars of 30 cubic yards capacity. Some of the mines recently stripped have installed large electric locomotives as regular equipment, and the loading of ore from such properties is almost completely a mechanical process.

Thus, despite a constant increase of wage and supply costs, and with fewer working hours, the operator has been able to keep the cost per ton at a satisfactory figure by the use of modern labor and time-saving machinery. Industry in other sections has greatly profited by mechanical improvements developed in open-pit iron mines. A specific example is the modern steam or electric shovel, which has been developed and improved almost entirely as a result of its extensive use in these mines.

Iron ore that cannot be recovered economically by open-pit operations is mined by underground methods, of which there

(Continued on page 22)

With Rose at Camp Custer

By Harold Powell, m., '31

The military camp this year was held at Camp Custer, Battle Creek, Michigan from June 20 to July 31. The six weeks period was completely taken up with intensive training.

On the morning of June 20, between the hours of six-thirty and eight, many cadets, wearing their advanced course uniforms, could be seen walking about the reservation and returning the salutes of the enlisted men who, for the moment, had been fooled by the uniform. After nine o'clock, however, no more of this was seen. Instead, the cadets were wearing regulation garrison uniforms, religously saluting every officer in sight, and meekly saying "Sir" when spoken to. However, they soon became familiar with the customs.

The next thing on the program of the morning was the task of getting the tents fixed up. Bunks had to be arranged, clothing racks made and set up, mosquito bars in place, and various other tasks done.

About the sorriest spectacle of the day was that presented by two Rose cadets who, in search of tent equipment, happened to walk by the orderly tent just at the moment when Lieutenant Selee was looking for two capable K.P.'s and the Rose cadets were elected. To add to their ill-luck the potato-peeler was not yet in operation. That made things nice. All the K.P.'s had to do that day was to wash dishes for 120 men three times and, when not doing that, peel potatoes for the next four meals! The total potato-peeling time came to six hours, so, by the time the last dish was washed and the last potato peeled, the cadets were ready to call it a day. Blame them? After that, however, regular K.P. duty began and, with the potato-peeler working, it wasn't so bad.

The first week of camp was spent on rifle marksmanship. The course consisted of lectures, demonstration, practice, and shooting for record. All cadets shot for record and after everyone had finished it was found that Rose Poly had qualified seven men, two as sharpshooters and five as marksmen.

After that came pistol marksmanship. The cadets fired for record on July 7 and, despite the fact that many of them didn't get back in camp from their fourth of July leave until four that morning, several managed to qualify.

Then followed training in pontoon bridges, trestle bridges, use and theory of demolitions, equitation, close-order drill, combat principles, camp sanitation and hygiene, and, last of all, the overnight hike.

The cadets soon learned to jump out of bed and into their clothes at the first sound of bugle or whistle—but how those cadet first-sergeants and their whistles were abused! The first-sergeant drew more good-natured abuse from sleepy cadets than any six men could take, had it really been meant. About the most humorous thing to watch was the spectacle a cadet made who was trying to wrap his leggings after the formation whistle had blown. Many new words were coined during such attempts.

There were three times every day, however, when the sound of the whistle drew no abuse. That was when the whistle called to mess and it was eagerly awaited by all. The company would form and file into the mess hall where, at the command "Seats", there would commence a battle second to none. If any cadet had a weak heart or any compunction, he was due to go hungry, for a hundred and twenty college men can certainly make the food disappear! The spice to the meals was added by the mess-sergeant, a former Leavenworth mess-sergeant. Some of his famous remarks were: "Gimme your attention, youse guys. If I see any more butter going out of here on your plates youse ain'ta gonna get no more butter. How would'ja like that?" or "Youse oughta be fed rat-poison and jam sandwiches, yeh, jam two slices of bread together." All of this with his arms akimbo and hat tipped forward almost over his nose. But, although he was hard-boiled, the cadets soon caught on and would razz him, too.

Rivalry was had a plenty due to the fact that there was a troop of R.O.T.C. cavalry across the company street. The engineers have no more use for the cavalry than the cavalry has for them, so one can readily understand the situation. The engineers derived

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Theories of Gliding

James Hughes, m., ex. '32

It has always been the desire of mankind to fly. By watching such birds as the buzzard, the vulture, the seagull, and the albatross man was led to build the first glider. The albatross is a master at soaring and much of our scientific data is based upon the study of this bird.

A ratio of wing depth to wing span of 1:22 has been taken from it. It has been found that an oval shaped hull is best in that streamlining plays a major role in the building of a glider. The wind resistance must be a minimum order to have a low sinking velocity. If one will observe closely, he will note that the present day gliders are single winged. The wings vary in length from forty to sixty feet, and from four and one-half to six feet in width. If they were wider there would be numerous eddies formed over the back of the wing. By being made in this manner the stability of the glider is increased. It is able to stand the cross current of the air better.

Theoretically there are two kinds of gliding, "static" and "dynamic." However, upon close examination it is found that the two blend very much.

The principle of static soaring is very simple. It merely consists of gliding on a rising current of air. Suppose a strong wind that is blowing across a level stretch of ground strikes a hill, the air currents will be deflected upward. In order to use this breeze for gliding purposes it must strike a certain kind of hill. If the hill is conical in shape it can clearly be seen that the wind would go around the sides of the hill instead of a greater part being directed upward. A long mountain range is much better, while with a hill that is horseshoe shaped with the heel of the shoe pointing toward the wind, it is found that the vertical component of the wind's velocity is greatly increased. Such is the case at the Wasserkuppe in Germany. Let us take an example to illustrate the power of a rising air current upon a plane. Let a wind be blowing with a velocity of 32 feet per second up a 1:4 slope. It would have a lifting component of 8 feet per second. Say the plane is flying at a speed of 60 feet per second and has a gliding angle of 1:8. It has a natural descent of seven and one-half feet per second, and under the present conditions would be carried up at a rate of one-half foot per second and still have a velocity of 28 feet per second against the wind. This would soon carry the pilot away from his source of power and he would have to find another rising current of air. That is why gliding pilots have to go meandering around between mountain ranges if they wish to stay in the air.

A grain field or a forest would create a rising air current if it were not for the cooler atmosphere about it. Going a step farther different kinds of soil cause different air currents. Sandy soil is heated much more quickly than clay soil. These thermal variations are very numerous in the tropics as is shown by the whirlwinds and typhoons. Every cumulus cloud is the top of a rising air current. This is a tool that gliders use to much advantage.

The best conditions for static soaring are to be found some distance off the windward crest. The altitude of the useful air currents may go to twice the height of the mountain range. There are two points of maximum velocity. One directly in front of the crest on the windward side, the other quite a bit above the crest on the leeward side.

Soaring flight or dynamic flight is sometimes called sailing flight. The sailing vessel depends upon two mediums to be propelled. What then is the second medium to be made use of in gliding? Air currents are not always in the same direction as I have shown. It is from this source that dynamic flying has been made useful. Let us consider an idealized form of wind variation. If the speed of the wind fluctuates between twenty and sixty miles per hour and let the acceleration period of the gust be four feet per second, there would be ten seconds between the two extremes. Suppose we have been gliding in a twenty mile wind and its velocity is increased, if we don't react with the glider we will gain speed quickly. However it isn't speed that is desired but elevation. Before the gust has reached a climax it is best to try to find another current of air because in the lull you will be taken to the original level.

If the average acceleration is the same or more in proportion to gravity than the ratio of drag to lift, then a 100 per cent soaring effect will be produced. We have our ordinary gliders and others that are called sailplanes. The latter must be used if you wish to do any soaring at all because of their lightness as compared to actual lift for every square foot of wing surface. To make the ideal sailplane it is necessary to combine a low sinking velocity, with speed, and a low gliding figure. By a low gliding figure we mean the ratio of altitude to total distance flown. By a low sinking velocity we mean the natural vertical descent of the machine per second. Say for instance you covered a distance of seven miles from an altitude of 2,000 feet. The gliding figure there would be 1 to 18.48. Speed is necessary because you must go quickly from one air current to another. Its sinking velocity, speed, and gliding figure are determined by its weight, wing curvature, and wing surface. So far these things have not been combined as well as they might be.

The structure of most gliders is of wood. Very thin ply wood is used varying from three thirty-seconds to one thirty-second of an inch for three ply material. The beams and trusses are joined by

(Continued on page 17)

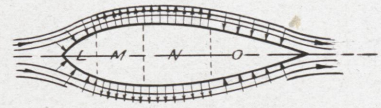
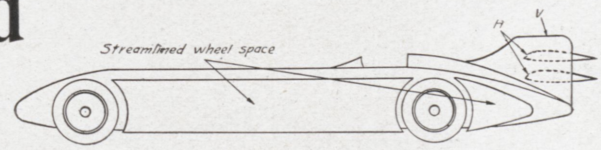


Fig a
Lines of flow for stream line body

Streamline for Speed



Sketch b
Streamlining on high speed race car

Albert L. Ahlers, m., '32

The feat of building racing cars to attain speeds over 200 miles per hour is the culmination of some of the most interesting aerodynamic and mechanical investigations ever carried out.

The month of March found the Daytona Beach, Florida, literally swarming with enthusiastic and hopeful race drivers trying to set new speed records in their class. Among these was Kaye Don, a British speed king, who has been challenging the record of 207 miles per hour, set by Major Segrave last year. Back of these flying wonders as they sweep over Daytona Beach, lay many months of technical investigations and costly laboratory experiments which are finally transformed into the streamlined monster that roars down the beach at speeds well over 300 feet per second.

In this article the research in aerodynamics which has led to the modern developments in race car streamlining will be discussed.

At the present time most results of successful streamlining are calculated by elaborated testing of models in the wind tunnel which necessitates much aerodynamical mathematics. The motion of fluids (or in this case air) is so complex that no complete mathematical theory has as yet been evolved for it. In hydrodynamics the mathematicians have stipulated a perfect fluid possessing no viscosity. In such a fluid all bodies may move without encountering resistance. Although the conception of a perfect fluid may seem of no practical importance, yet hydrodynamic theory serves as a guide in designs of streamlining.

A stream line body may be defined as one which has a gradual change of curvature along any section (see figure a), and which when moved through the air makes little disturbance or turbulent wake. Such a body moving in a viscid fluid would experience mostly frictionless resistance. In all calculations in this work it is assumed that the same resistance will be brought into action whether a body is moving through a fluid or a fluid is streaming past the body, providing the relative motion is the same. It is practically the same proposition as in the designing the outlines of cams where the roller moves about the cam, the cam remaining stationary.

In the case of a streamlined body it may be shown that the pressures vary upon the surface in both positive and negative directions resulting in a zero energy on the body. Bernouilli's theorem of fluid motion is used to compute the energy of the air flow around the body. The air in its vicinity is divided into a large number of imaginary tubes of flow (see figure a). Well ahead of the body where the stream flow is as yet undisturbed, the energy of the air will be that due to the static pressure P of the stream and the kinetic energy V of the undisturbed velocity. In simpler terms this would be the actual pressure of the air and its kinetic energy with respect to an observer at a fixed point. In a perfect fluid this will remain a constant K along any tube of flow and is equal to

$$\frac{P}{D} + \frac{V}{2g} = K$$

where D equals density of the air and g the gravity. For illustration, the body may be divided into portions L, M, N, and O. For the portion L, the tubes of flow widen out, the velocity and kinetic energy diminish and the pressure on the body becomes greater than that of the static pressure P. This would be action of negative forces. For the portion M the tubes crowd together, the velocity increases and the body is under the action of a positive pressure less than P. The flow on the next two portions N and O acts the same as before, resulting in a balance or no work done upon the body.

Of course the above is only theory and inaccurate for practical work but it leads to investigations in actual demonstrations. For example, take a car designed in the shape of a projectile. According to Newton using Bernouilli's theorem, the energy on the body would be equal to zero, but experiments prove this erroneous. Traveling at 200 miles per hour, it is found that there would be a pressure of 1000 pounds downward upon the forward end and even a greater upward pressure upon the rear of the car resulting in all the air pressure load being carried upon the front axle and wheels. Here the car is in danger of lifting its rear wheels from the ground.

A well designed streamlined car is the Sunbeam, by Louis Coatalem in the shape of one half that of the projectile with a long upward curve to the underbody in the rear as shown in sketch b. Moving at the same rate of speed, 200 miles per hour, there is a downward pressure of 750 pounds and an upward pressure of 350 pounds at the forward end, leaving a resultant downward pressure of 400 pounds. At the rear of the car a downward pull of 600 pounds to an upward suctional pull of 800 pounds leaving a 200

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Research and Progress

Conducted by Lee C. Kelsey

Telescope Mirror

Work is being rapidly carried forward on the 69 inch mirror for the telescope that will be acquired by the science department at Ohio Wesleyan University. This mirror is the largest American made telescope mirror.

The disk, 71 inches in diameter and 12½ inches thick was poured at the United States Bureau of Standards in 1929. The glass reached the mold at 2500 degrees Fahrenheit and was then permitted to cool to 1100 degrees the first week. The mould was in an insulated pit beneath the floor so that air currents would not reach any part of it and perhaps cause it to crack. It was held at this temperature four days and then cooled 4½ degrees each day until the temperature of 860 degrees was reached, then it was held at this constant temperature for 45 days for annealing after which it was allowed to cool gradually to outside temperature. This last cooling lasted for 130 days. It was only then that the covering was removed to ascertain whether the disk was broken and worthless or perfect.

This was the first large telescope disk ever cast and its successful completion rightly put a feather in the cap of the Bureau of Standards. Optical tests for strains and symmetry of annealing indicated that the disk was optically as well as physically a success and thus constituted the beginning of a sort of declaration of American independence. At the present time the mirror is about 20 per cent completed.

The disk, now reduced to about $9\frac{5}{16}$ inches thick has been ground to a concave (approximately spherical) curve having a depth of .95 inch, and less than one thousandth of an inch will be removed in all subsequent operations. It is in the grinding of this last thousandth of an inch that is found most of the real trouble in making a telescope mirror.

Even a thousandth of an inch is an extremely rough and course measurement in this work and a millionth of an inch is much closer to Mr. J. W. Fecker's (the maker of this mirror) final criterion of perfection. The degree of accuracy required by the purchaser in this case was one tenth of a wave length of yellow light, of about a 500,000th of an inch. In such a great task it is the practice to work within a specified tolerance, such as this, but Mr. Fecker carries the refinement to a still higher degree of accuracy. This final "figuring" usually requires endless hours of the most skilled retouching, all performed underground at a constant temperature.

Corrosion of Underground Structures

The corrosion of underground iron structures is a subject of considerable importance to all construction engineers. Corrosion causes the American people the loss of a small fortune every year. Much of this waste can be readily accounted for but there are chemical reactions of the earth that have not as yet been successfully combatted. Besides the chemical action there are other causes such as "self-corrosion", "stray current corrosion", etc.

Self Corrosion

Decomposition arising from electric currents which originate in the metal itself is a reaction of this nature. Galvanic action is such a reaction. Strictly speaking, galvanic action is the current developed when two unlike conductors of electricity come into contact with each other in the presence of an electrolyte. This action may arise when two sections of pipe composed of unlike metals are joined together. The action may also arise from the presence of foreign matter within the structure of the iron itself.

Electrolytic Corrosion

This term is used to denote decomposition arising from the passage through the pipe or iron structure of an electric current, which has its origin in, and enters the iron from, some external source. Such a reaction is traced to faulty insulation, stray current and leakage from electric railways, and ground power lines.

The variables effecting the corrosion of metal underground may be listed as follows:

(1) The current density at the surface of the metal. The amount of corrosion that occurs is largely a question of the quantity of electricity that is being discharged from a given surface.

(2) The presence of dissolved gases, such as oxygen, carbon dioxide and hydrogen sulphide, which affects both the rate of corrosion and the nature of the end products.

(3) The mechanical and chemical properties of the soil that surround the structure.

(4) The moisture content of the soil. Corrosion is almost nil in dry soils and almost complete in water saturated soils. It is also practically nil when the water content of the soil is less than 20 per cent, although corrosion varies with the type of soil.

(5) The depth of the buried metal. This is mainly a function of the moisture of the soil. Cor-

rosion increases with depth because the concentration of moisture increases with depth.

(6) The formation of high resistance films on the surface of the metal. The extent to which the chemical reactions are reversible depends upon the freedom of access of such substances as oxygen, carbon dioxide, etc. which may result in secondary reactions giving rise to insoluble precipitates of the corroded metal.

(7) The limitation of flow due to polarization.

(8) Pitting of the surface of the metal, which tends to either increase or decrease the rate of decomposition.

(9) Changes in polarity of underground pipe. The polarity may change in periods of from a few seconds to a couple of hours due to the shifting of the load.

(10) The temperature of the soil. It has a pronounced affect by changing the conductivity of the earth and influencing the rate of transference of electric current.

(11) A decrease in corrosion occurs with an increase in the frequency of reversal of current. There is a limiting frequency above which practically no corrosion occurs. (12 to 60 cycles per second.)

Reduction of Corrosion

The rate and extent of corrosion can be controlled to some extent by paying close attention to one or all of the following things.

First, limiting the voltage drop in negative return lines.

Second, by the use of protective coatings on all underground metal structures. These coatings may be paint, fiber or fabric, but to be effective the coating must always be continuous without break or flaw.

Third, by the selection and use of materials that are more resistant to electrolytic action.

Do You Know That

Some new uses of vacuum tubes

In reforestation

Tubes measure the amount of sunlight reaching the ground as an index of how closely to replant.

In lumbering

The rate of drying timber is now measured by a thermionic device.

In electric signs

In classifying sign-lamp colours, photo-electric cells give dependable fatigueless inspection.

In paper manufacture

For calipering the thickness and moisture of paper during manufacture, the principle of the squealing of the radio ocilator is used.

In industry processes

Electronic tubes not only make possible new processes in industry; they also produce economies in old processes.

Out of the 22,624 motion picture theaters in the United States 12,448 are sound equipped.

There are approximately 1,000,000 home receiving radio sets in the United States today.

There has been a vacuum tube developed that will indicate minute currents down to 63 to be used for measurements as small as (10^{-17}) amperes.

Electrons travelling 125,000 miles per second

Bleach linseed and prilla oils crystal clear.

Change color of common salt, potassium chloride, etc.

Break down the surface structure of sheet glue.

Cause milk and butter to become rancid.

Kill living cells, small insects, fruit flies, etc.

Within ten seconds caused leaf of rubber plant to exude white latex.

Produce fluorescence in diamonds held in electron stream.

Mobile Helium Refilteration Plant

In a few years when air travel has become as commonplace as railroad travel is today, motor trucks that carry about mobile re-filteration plants may be as familiar to travelers as the workman who taps the axles while the train is standing in the station. This trailer full of motors and compressors will draw up along side the dirigible and will start to work, drawing out the helium gas from the baloonet, removing the air that has mixed with it, and returning it to the ship with its full lifting power restored.

The mobile helium re-purification plant was built for the Goodyear-Zeppelin Corporation by the Helium plant at Louisville, Kentucky. The entire plant with a capacity of 1500 cubic feet an hour is mounted on a pneumatic tired trailer body and can traverse any terrain which a truck can negotiate.

The plant consists essentially of two compressors one handling air, the other helium. The air compressor supplies air at high pressure to an expansion column, which serves to liquify a portion of the air, forming a cooling bath at a temperature of 170 degrees Centigrade. The second compressor forces helium at 2000 pounds pressure through copper coils immersed in liquid air, with consequent removal of impurities by liquefaction. The helium passes through nearly a half mile of copper tubing, and is finally discharged at a purity of 98 to 99 per cent to any desired point and at any pressure up to 2000 pounds

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Published Monthly by the Students of Rose Polytechnic Institute

The Rose TECHNIC

A Magazine Pertaining to Engineering and Allied Sciences

Member of Engineering College Magazines Associated

The Martyr

The traditional custom of paddling freshmen for reasons defined as "general principles" should no longer be tolerated because of the pernicious consequences. Six motives are responsible for the practice. The impelling motive is the **thrill** derived by the persons inflicting the punishment. Any man who must derive his pleasure through the suffering of others is undoubtedly a cowardly weakling and is not fit to live in this civilized world. Paddling provides an excellent opportunity for sophomores, who are **too cowardly to fight,** to chastise the freshmen for the satisfaction of personal grudges. That paddling can increase the respect of the freshmen for upperclassmen is impossible. If a sophomore can not command the respect of the freshmen by his personality and achievements instead of by administering punishment, he deserves no respect and should not be enrolled in the Institute. The psychological benefits derived by the suffering freshmen are nil, else the faculty would have made provisions in the curriculum for their frequent chastisement. Paddling injures and weakens the character of the freshmen. Theirs is the most important class in the school for it is the training they then receive that determines the quality of the governing influence that they will later exert over the student body. The principles of democracy provide every citizen with certain inalienable rights which he is justified in defending. The promiscuous paddling of Freshmen is contrary to these principles. If a man is taught to endure unmerited punishment inflicted by self-appointed powers, his self-respect is broken and in the future he will not defend his legitimate rights. This same unresisted, forcible restriction of personal liberty has made possible the contemporary racketeering and gangland control of the Government, yet in the Institute our Freshmen are forced to submit to unlawful violation of their personal rights.

Disciplinary punishment is justifiable but indiscriminate paddling is worse than no discipline. Because Freshmen are new they have much enthusiasm. Why should the Sophomores dampen their spirit and turn their friendship into resentment and hatred? Promiscuous paddling destroys the character and integrity of the students by intimidating them and eliminating the initiative, so essential to fine leadership. A technical training is no longer the prime requisite of a successful engineering career because engineering graduates are so numerous that they are cheap and commonplace. Industry needs leaders and executives more than technicians. Paddling retards the development of the personal characteristics peculiar to industrial leadership and is an obstacle to the cultivation of the loyalty and fellowship which constitute school spirit. Many students say that Rose lacks school spirit but yet they tolerate the punishment of freshmen and instill in them a hatred for the school traditions which seem to necessitate their persecution. It is no wonder that the Old Rose Spirit has died.

In many schools the hazing of freshmen has been abolished by action of the faculty and this will be done at Rose if restraint is not soon exercised by the students. Last year the student council passed a law prohibiting any paddling unless authorized by the "Kangaroo" court. On September 25th, the sophomore class defied this rule by staging a "general principles wood session." This defiance was an insult to the student government and must not be tolerated. The **ignorant and cowardly** sophomores who organized this paddling session have brought dishonor on the good name of the sophomore class and will undoubtedly have to answer to the Student Council for their actions. The student council will enforce the present laws and will punish offenders. This action of the council is necessary because if it is not taken the faculty may take the matter in hand.

Among the indirect evils of paddling the Freshmen is the resultant unfavorable publicity. The citizens of Terre Haute have contributed large sums of money to

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On the Campus

Robert T. Mees, m. '31

Prof. Peddle

One of the first things noticed by the student body upon their return to Rose this fall was the absence of Prof. Peddle.

While enjoying a vacation in Colorado last summer Prof. Peddle suffered a stroke. At first it was thought to be quite serious, but he quickly began to recover and was soon brought home. We are happy to say that he is in fairly good health at the present time and will be with us again soon. In fact, we expect him back by the Christmas holidays.

When word was received of Prof. Peddle's illness, the question arose as to who should take his place as acting president. In our opinion there was only one choice, and we were pleased to see that the Board of Managers confirmed it. Dr. White was the man chosen for the office.

To all of the upperclassmen he is well known and needs no introduction. But to the freshmen perhaps he is not so familiar. Dr. White has been with us for a number of years and has contributed a great deal to the growth of the school. He is among the leaders in the field of chemistry and has had offers of higher positions elsewhere. Twice before this, Dr. White has acted as president of the Institute and given general satisfaction. He, therefore, assumes the duties of the office with the confidence born of experience and can count upon the hearty cooperation of both the Faculty and the student body.

The students at Rose may indeed consider themselves lucky to have as acting President a man so well known and with such a reputation. We wish him every success.

The new year at Rose has brought with it several noteworthy changes. The senior class, of course, graduated but the Freshmen have more than made up in numbers for those who left the Institute in June. Official figures state that there are one hundred and twenty-five students in the Freshman class, the largest class to enter Rose.

New Members of the Faculty

It may be noted, too, that four new instructors have been added to the Faculty. Mr. Kenneth Gantz is teaching sophomore English. Mr. Gantz was graduated from the Indiana State Teachers College in 1929 with the degree of Bachelor of Arts.

To the Electrical Engineering department, a Rose graduate has returned. Mr. Herman A. Moench, now instructor in electrical engineering and physics, received his B.S. degree from Rose in 1929. Since his graduation, Mr. Moench has been with the Bell Telephone Laboratories in New York City where he was employed as a member of the technical staff of the Toll Systems Development Department.

Mr. Robert D. Quinn, the new instructor in mathematics and physics, received his A.B. degree from Indiana University in 1929 and his A.M. degree from the same institution the following year.

Mr. E. W. Mann received his B. of Ch.E. degree from Ohio State University in 1918. He has served as Chemist for the Grasselli Co. and the American Steel and Wire Co. at Cleveland, and was later chemical engineer for the American Zinc Oxide Co. at Columbus, Ohio. Mr. Mann comes to Rose as instructor in chemistry.

To all the new students and members of the Faculty we extend a hearty welcome, and may you come to regard old Rose with the same affection as the rest of us.

Prof. A. W. Childs, who has been abroad for the past twelve months, has returned to resume his activities at the Institute and we are glad to have him with us again.

Professors McCormick and Wischmeyer attended the summer meeting of the Society for the Promotion of Engineering Education. Prof. McCormick's division of the Society convened at Yale University and Prof. Wischmeyer attended at Montreal, Canada.

Prof. Bloxsome spent the past summer in graduate work at the University of Chicago.

Sophomore-Freshmen Encounters

On a cool, crisp, starry night in September 1930, before classes were begun, but after everyone had made known his intentions, there occurred that annual Frosh-Soph tieup.

From the beginning it looked like a very unequal combat. The Sophomores were outnumbered two to one, but they nervously crouched within the mammoth well lighted bull pen, on the Rose Poly campus, waiting for the Freshies to make their appearance. Eight o'clock brought the battle cry from over the hills, and it was echoed down into the gulley, where thousands of spectators had gathered to witness the action, fun, and entertainment. The valiant sophomores edged closer to the entrance, ready to meet the attack, which truly was to spell their doom.

On came the rhinies shouting their blood curdling cries. As they approached the ring in the dark, they broke into a run, one small fellow arriving first, who threw himself with outstretched arms at the mercy of the sophs.

At last they were all in the ring, and what a hoodlum and mixture of garrulous noises! Here and there came the shout, "thirty-four", which is the appeal which the freshmen send for aid. It took several minutes before the dust cleared, and then could be seen

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Joseph D. Harper, '91, Sales Manager, Oil Engine Department of the Fairbanks, Morse & Co., Chicago, Illinois died during the past summer. Mr. Harper was outstanding among the earlier graduates of our school who demonstrated the value of the training he received at Rose.

David Morwood, '30, died during the past summer from a heart attack. We wish to express our deepest sympathy to the members of Mr. Morwood's family.

The Rose Tech Clubs

Last year disappointment seemed to crown our efforts to secure reports of the activities of the Rose Tech Clubs. This school year promises better results. We expect every Rose Tech Club to send in a small report each month.

On May 27 the Schenectady Rose Tech Club had a luncheon meeting in the General Electric Works restaurant. Mr. G. H. Pfeif gave a short talk on his visit to Rose. R. S. Sage, '07, was elected president; and H. S. Carmack, '28, secretary-treasurer. Following the election of new officers there was a general discussion concerning the advantages and disadvantages of various companies in the matter of selecting Engineering Graduates.

The following were present: E. G. Waters, '88; W. J. Davis, Jr., '92; H. E. McDermott, '93; G. H. Pfeif, '05; R. S. Sage, '07; O. G. Whitecotton, '07; H. J. Madison, '10; C. W. Falls, '18; O. E. Conover, '22; M. L. Witty, '26; E. W. Cunningham, '27; H. S. Carmack, '28; Wayne Kehoe, '28.

The New York Rose Tech Club has bright prospects. There are about forty Alumni in the vicinity who can attend meetings at various times. We shall expect to hear good reports about The N. Y. Rose Tech Club.

Last spring during the American Foundrymen's Convention and exhibition of foundry products in Cleveland it was brought to our minds that Rose has some very well known foundrymen among her Alumni. H. A. Schwartz, '01, recipient of the 1930 Penton Gold Medal, is a very distinguished foundryman as was shown by the article published in the last February issue of The Technic. John Bolton, '18, with The Lukenheimer Co. of Cincinnati, Ohio is another distinguished foundryman. He is general chairman of the non-ferrous division of The American Foundrymen's Association, a member of the committee on Metallography, and a member of the Advisory Committee on the Liquid Shrinkage Investigation now being carried on at the Bureau of Standards.

To All Rose Alumni

The opening of Rose Polytechnic Institute this fall has brought back the students from all parts of the country. Most of them have had the good fortune to be employed by Alumni of Rose when other sources of employment failed. For this fine spirit of cooperation the Alumni Editor takes great pleasure in thanking the Alumni. It was a splendid manifestation of their loyalty to Old Rose. In a great many cases this summer employment materially helps the men on towards graduation.

'03

Brent C. Jacob was here at Rose during the opening day. He was accompanied by his family, Mrs. Jacob and their two children. It seemed to be with a great deal of just pride that Mr. Jacob entered his only son in the school that he entered thirty-one years ago.

'06

A. W. Worthington has been elected as General Manager of Pittsburgh Limestone Company, G. W. Johnson Limestone Co., Keystone Limestone Co., St. Clair Limestone Co., Mahoning Limestone Co., and The Columbus Stone Co. These companies are subsidiaries to the United States Steel Corporation. They operate mines and quarries to produce flux for the U. S. Steel Corporation's furnaces in the Pittsburgh, Youngstown, and New Castle districts.

'11

Charles F. Werst visited the school during the summer. He was accompanied by Mrs. Werst and their two children. This is the second time Mr. Werst has been back since his graduation. At his first visit he found no one to greet him. Fortunately, there

'11

were people at the school this time who were glad to see him. We hope he will come again soon and we shall surely try to be on hand.

'13

Earl E. Hughes has been appointed Advertising Manager and Sales Promotion Manager for the entire organization of The Curtiss-Wright Corporation and subsidiaries. The past business career of Mr. Hughes has given him a broad business outlook and a keen insight into economic relations of sales and advertising practice under varied conditions. Aside from his degree in Electrical Engineering, he has a degree from the Harvard School of Business. During the war he saw two years of service in the A.E.F. in the Infantry and Ordinance Department. Mr. Hughes has had a very wide experience in business with Westinghouse Electrical & Manufacturing Co. in Engineering work and sales promotion. His experience has been obtained through service as Treasurer and Sales Manager of the Chesapeake Electrical Co., Baltimore, Md., as vice-president of Sales and Advertising of the Vacuette Sales Corporation, and as Promotion Manager of the Hoover Investment Corporation. For the past two years Mr. Hughes has been with the Wright Aeronautical Corporation organizing for them a logical program of sales, statistics, and a campaign of advertising and sales promotion.

'19

Owen G. Floyd has taken a position with the Gulf States Utilities Co., Beaumont, Texas. Formerly Mr. Floyd was with The Terre Haute, Indianapolis and Eastern Traction Co. as Power Engineer located at Terre Haute, Ind.

'21

Richard C. Voges has gone to the Planters Cotton Oil Co. in Dallas, Texas as Director of Laboratories. He formerly was Chief Chemist and Results Engineer of the Landa Industries Inc., New Braufels, Texas.

'22

Leroy A. Wilson was visiting the school shortly after its opening and was most pleased with the general appearance of everything. Mr. Wilson is an Engineer with American Telephone & Telegraph Co., New York, N. Y.

'23

James E. Albright is the Loudspeaker and Magnetic Pick-Up Engineer with the R.C.A.-Victor, Camden, N. J. Mr. Albright was initiated into Tau Beta Pi by the Indiana Beta Chapter at Rose during commencement week last June.

'25

Orville M. Dunning was married to Miss Florence Ann Griffin during the past summer. We wish this couple success and happiness.

Everett C. Gosnell has been transferred to the Seaboard Experimental Division of the Koppers Research Corporation at Kearny, N. J. He was formerly at Jersey City, N. J. with the same company.

'28

J. Leonard Montgomery was here with us a short while during the opening day of school. He is still with the R.C.A.-Victor Co. at Camden, N. J. and is apparently quite satisfied with his work.

Paul Scofield, ex '28, is with the Carrier Engineering Corporation of Los Angeles, Calif.

'29

Herman A. Moench has been called back to his Alma Mater as an instructor in the Electrical Engineering Department. He has been on the technical staff of the Bell Laboratories in New York, N. Y. since he was graduated.

Carl W. Scharf, Asst. in Rubber Research, with the Bell Laboratories Inc., New York, N. Y., has been out attending conventions in behalf of his company, and also taking a short vacation. He paid the school a visit, and seemed to enjoy being back. We were certainly glad to see him.

'30

Morris T. Shattuck was married this summer to Miss Louise Poor of Clinton, Ind. The couple are in Wilmington, N. J. where Morris is in the research department of the DuPont Ammonia Corporation.

Gilbert Shew has taken a position as instructor at the University of Florida. He intends to study there for the Master's Degree.

Gliding

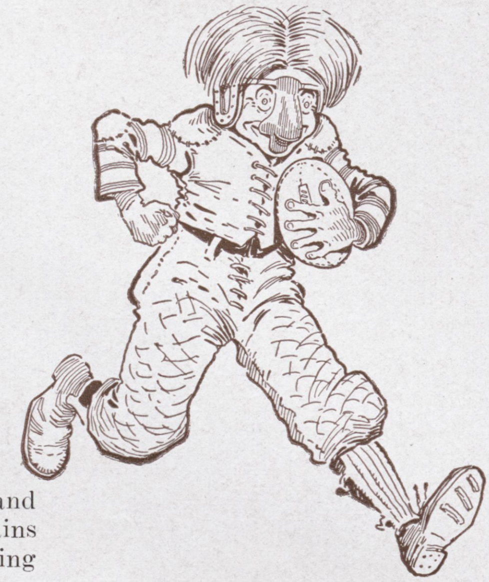
(Continued from page 10)

plywood gusset plates in the most intricate and elaborate manner. The joints are glued with waterproof casein glue. All nails are avoided as they add much to the weight and deterioration value. The weight of the wings are as small as 5 oz. per square foot of wing surface. The weight of a glider may vary from 90 to 250 pounds.

Glider clubs have been formed at most of the leading universities. The University of Michigan glider club has a veteran that has made over 6,000 flights with little trouble. The interest that is being shown all over the nation makes me desire to see a glider club formed at Rose.

Athletics

Don T. Spangenburg



Football Prospects

The prospects for a winning football team at Rose are brighter this year than for several years past. Coach Brown has a veteran line and one back from last year's team. Besides this there are several local High School stars who are looking good. Reed, former Garfield end is being used at fullback and is getting along famously. Hutchins, ex-Wiley Captain, is also doing well as relief man for Ogan center.

Plans are already under way for a large time Oct. 11, the Homecoming game, and all the alumni are urged to return. The Valparaiso team will be played on the Rose field in what promises to be a good game.

The following games remain to be played:

Oct. 4 Earlham at Richmond.

Oct. 11 Valparaiso at Rose Field (HOMECOMING).

Oct. 17 Hanover at Hanover (Night).

Oct. 25 Indiana Central at Rose Field.

Nov. 1 Oakland City at Rose.

Nov. 7 Evansville at Evansville (Night).

Nov. 15 Open.

Nov. 21 Ind. State at Memorial Stadium (Night).

Track

Ten men earned letters in track at Rose last Spring as a successful season was completed. The larger percentage of meets was won and some valuable material remains for next year. Those earning Letters were: Weddle, Spence, Dean, Loving, Witt, Stanley, Smith, Dicks, Allen and Baker.

Rose 14 -- Franklin 6

Rose Poly opened the college football year with a 14 to 6 victory over the Franklin Grizzlies. The first score of both teams was the result of breaks, but the second Rose score came after six first downs in a row. As the final gun fired Rose had again marched to the Franklin 20 yard line.

Throughout the entire game the punting of Kruzan was the feature. Time and again he sent the ball down the field and out of bounds on the five and six yard line.

In the first quarter Rose completed a long pass and was within scoring distance, only to fumble on the goal line. Franklin recovered, but Hylton blocked the punt and fell on the agate—Toneti's kick was perfect.

The second quarter Rose devoted to conservative football and did a lot of kicking.

Franklin's touchdown was the result of a long pass which the officials ruled had been interfered with over the goal line. Their try for point failed.

As the fourth quarter opened, Rose launched a drive for the goal line that could not be stopped. Six first downs came in a row and then Hill carried the ball over. Again Tonetti added the point. This long drive was made possible by Hill, Smith, and Creedon, who plunged the line for six and seven yards at a clip.

Reed, Rose fullback, received an injured foot in the second quarter and was relieved by Smith. The injury will probably keep Reed out of the thickest for the next week.

Franklin played good football throughout and fought hard, Surface and Downey being the best in the backfield.

The Rose line worked as a unit and deserves a lot of credit for stopping the powerful thrusts made by the Franklin backs, while the Rose backs also looked good throughout. As a whole the victory was well earned and Rose is looking forward to a successful season.

Lineup and summary:

Rose Poly		Franklin
Gillett	L.E.	Gray
Pratt	L.T.	Carl
Bruce	L.G.	McIntire
Ogan	C.	Nelson
Tonetti	R.G.	Ward
Kruzan	R.T.	Dick
Hylton	R.E.	Ellington
Simpcoe	Q.B.	Surface
Hill	L.H.	Downey
Hauer	R.H.	Wooden
Reed	F.B.	Ragsdale

Touchdowns—(Rose) Hill, Hylton. (Franklin) Downey. Extra point Tonetti (2).

Substitutions—(Rose) Hutchins, Creedon, Smith.

Officials—Referee, Dietrich; umpire, McCoy; headlinesman, Bogue.

Fraternity Notes

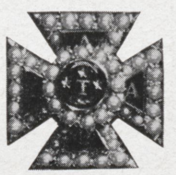
Alpha Chi Sigma

Once more the members and pledges of ΑΧΣ have gathered to say hello and to renew activities. An organization meeting was held on the evening of Sept. 25 at the home of Brother Johnson. Mrs. Johnson "came thru" very ably with entertainment of the gastronomic variety. House and financial regulations were discussed.

Brother Johnson, our delegate to Conclave at University of Minnesota this summer gave a report of his experiences. Many eminent chemists as well as student delegates were in attendance. During the five weeks of school following the Conclave Johnson stayed at the ΑΧΣ house on the university campus.

H. E. Wiedemann, Rose '03, former counsellor of district in which Iota is situated, was elected to the office of national head of Professional Chapters at Conclave.

Alpha Tau Omega



The opening of school finds Gamma Gamma back on the job with full force. Gamma Gamma lost eight men by graduation last June and although their absence will be keenly felt, the chapter has many capable men to take their places.

At the close of school last semester, Brothers Stanley and Witt were awarded sweaters for their excellent track work. These men contributed a large part of points to Rose's winning scores. Honorable mention must also go to Brothers Fitch and Wells, who although not receiving awards, remain loyal to the team all during the season.

In the recent class elections Gamma Gamma received more than her share of the offices. Brother Gillett, well known athlete, was chosen to lead the Sophomores during the coming year. Brother Witt, honor student, was given the highest award by being elected president of the Senior class.

Another Tau Brother, Clark was elected to the presidency of the Camera Club.

These men will do all in their power to perform the duties imposed upon them and will make Rose and Gamma Gamma proud of them.

The chapter will be well represented on the football team this season. Seven letter men, Brothers Bruce, Pratt, Gillett, Lowther, and Adams, and Pledge Brothers Kruzan, and Creedon are battling for positions on the varsity. We wish the men as well as the team, success during the coming season. Brother Stanley, yell leader supreme, is preparing for a strenuous vocal season.

Brothers Ferris and Crawford have returned to school after several years' absence.

Gamma Gamma is well pleased with the opening of school, the class elections, and the football men and predicts a great year for the chapter.

Tau Beta Pi

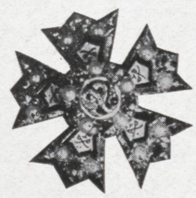
Indiana Beta of Tau Beta Pi held its final meeting of the spring term on May 23rd at the YWCA, which was a farewell banquet to the graduation class. Judge Jeffries of the juvenile court was invited as guest speaker and gave a very interesting talk on the problems encountered in the enforcement of juvenile criminal regulations.

After the banquet all the seniors made farewell speeches to the chapter, in which the general note was a sincere appreciation of their membership in Tau Beta Pi and an expression of hope that they might be able to keep in touch with the chapter after they had graduated.

The members lost by graduation are Milo Dean, Eldridge Allen, Donald Henderson, George Kessler, Royer Blair, Kenneth Alexander, Carl Ehrenhardt, Joseph Sperotto, Morris Shattuck, Murrel Lofland, Howard Wills, Ernest Johnson, and Jacob Shainblatt.

The student members returning this term are Herndon Witt, John Weddle, Allen Stimson, Charles White, and Clarence Hoff, with Benedict Wassel as pledge member. While this is a small number, it will soon be augmented by the pledging of members from the senior class, so the membership will be brought up to the full quota.

Sigma Nu



At the opening of school, Beta Upsilon of Sigma Nu found itself with a larger chapter than at the close of school last June, due to the returning of five brothers after a year's absence. With these men back, eager to carry on, prospects are bright for another successful year.

The brothers and pledge brothers upon whom the fortunes of the chapter will depend this year are: Robert Roach, James C. Weddle, Albert Ogan, John Richardson, Ernest Hurst, Hillard Gehres, Marvin Wilson, Lee C. Kelsey, Owen Howson, Myron Clark, Robert Finfrock, Bert Menden, Wilton Brown, Frank P. Butler, Joseph Hunter, Kenneth Wade, Frank Byrne, Floyd Hill, William Klingler, Frank Howard, Frank DeWitt, Byron McNabb, Howard White, Harold Amacher, George Maurer, Glenn Clark, Merrill Bradfield, Mack Decker, Forest Simpcoe, Art Reinking, Wayne Starke, Theron Detrick, Jack Faust, Carl Sexson, Lester Dowen, Carl Dowen and Homer Fisher.

Several members of the chapter are out for football, some on the varsity and others on the scrub, and all are doing well. They are Captain Ogan, Simpcoe, Hill, Finfrock and Bradfield. With the majority of last year's team back and with a wealth of material in the freshman class, prospects are very promising for another successful year.

The social year for the chapter was closed last June with a successful Senior farewell dance at the house. It was a sport dance, golf being the chosen sport with programs and decorations to carry out this idea. Music was by Hal Robert's Serenaders from DePauw.

The chapter was pleased to hear that Brother Jack Derry joined the ranks of the benedicts during the summer. He was married to Miss Catherine Stroup of New Philadelphia, Ohio on July 7, 1930.

A number of our alumni have been back for a visit to the school and chapter during the past two weeks and many of them have promised to be back for homecoming, October 11th. The brothers who have visited the chapter are: Valentine Mitch, Robert Dowen, Claude Sweeney, Arthur Reinking, William Houston, Robert Wade, Ralph Bailey, Galen Clark, John Mendenhall, John Cooley, John Moorhead and Brent Jacob, Sr.

Theta Kappa Nu

The opening of the school year found practically all of the brothers of Theta Nu back in school and eager to get started more and carry on for the school and Theta Nu.

Those who answered the first roll call are as follows:

Seniors: Mick Kehoe, Harold Powell, Stan Davis, Frank Sabla, Dick Johnson, Joe Earl, Charles White, and Andy Spence;

Juniors: Harry Netzhammer, Don Greenfield, Wayne Dickerson, Henry Pfizenmayer, Paul Froeb, Al Ahlers, Bud Potter, Bill Shofner, Bill Haynes, Chet Stock, Wayne Plimmer and Charles McGillivray;

Sophomores: Jim Guymon, Russ Powell, Bill Lindeman, Ted Bauer, Ernie Leitzman, Harold Barrett, Jim Cantwell, and Howard Alvey.

Mick Kehoe attended the national convention in June as the delegate of Indiana Gamma and gave a very interesting account of his stay in Richmond, Virginia, and of the various side trips to points of interest made while there. Probably the most interesting of the side trips was the one made to Washington, D. C., where the delegation was received by President Hoover.

The chapter was honored and pleased to have as its guest recently brother Lee Wilson, national president of the fraternity. Lee stayed several days and seemed as glad to get back as he was welcome. On Monday night, September 29, a banquet was held at the chapter house in honor of Brother Wilson. Immediately following the banquet formal initiation was held for several pledges.

Indiana Gamma takes the greatest of pleasure in announcing the initiation of these pledges into the fraternity: Ted Bauer, James Cantwell, William Lindeman, Charles McGillivray, and Harold Barrett.

Several graduates were back recently, among whom were: Fred Andrews, Francis Tapy, Walter Davidson, Lee Berry, Harold York, and Jim Procter.

Theta Xi

Theta Xi is looking forward to an even more prosperous year than last. Our seniors who graduated are greatly missed but we realize that it is for the best and they go with our best wishes. Brothers Schaack, Hauer, Moench, Kemp, and Pledge Bro. Hylton are out for football. If Rose ever had a football team, it will certainly be this year. Let's boost the team. Then in advanced military are Bros. Barrett, Ray, Laatz, Schaack, Ogden, Hauer and Weinbrecht.

Brother Hubert Schwartz and Pledge Bro. Lautenschlager entered the ranks of the Benedicts over the summer. We wish them the best of success in their new venture.

Brothers Ogden and Blake spent some time in the hospital this summer. We understand that the scenery around a hospital is "quite sweet" to use Bro. Blake's own words and Bro. Ogden offers his experiences to substantiate the statement. There is no need to say that they had plenty of visitors who agree heartily.

The brothers are already making plans for the annual hard times dance. This function is always one of great hilarity and nonsense and this one promises to be even better than those of former years.

The Martyr

(Continued from page 14)

the endowment of the Institute and they send their sons here for education yet the Sophomores are allowed to mistreat these same students. The townspeople hear little of the good that Rose is doing but they do hear a great deal about the barbarous and vulgar practices which the **undesirable element** in the sophomore class has indulged in.

Students of Rose should have more dignity. Any dumb brute can beat an unresisting subordinate into submission, so what credit can the sophomores derive from inflicting punishment? Such actions are indicative of the **brutal cowardliness** that characterize the men who organize the paddling sessions. These practices should be beneath the dignity of any student of the Institute.

The Iron Ore Industry of the Lake Superior District

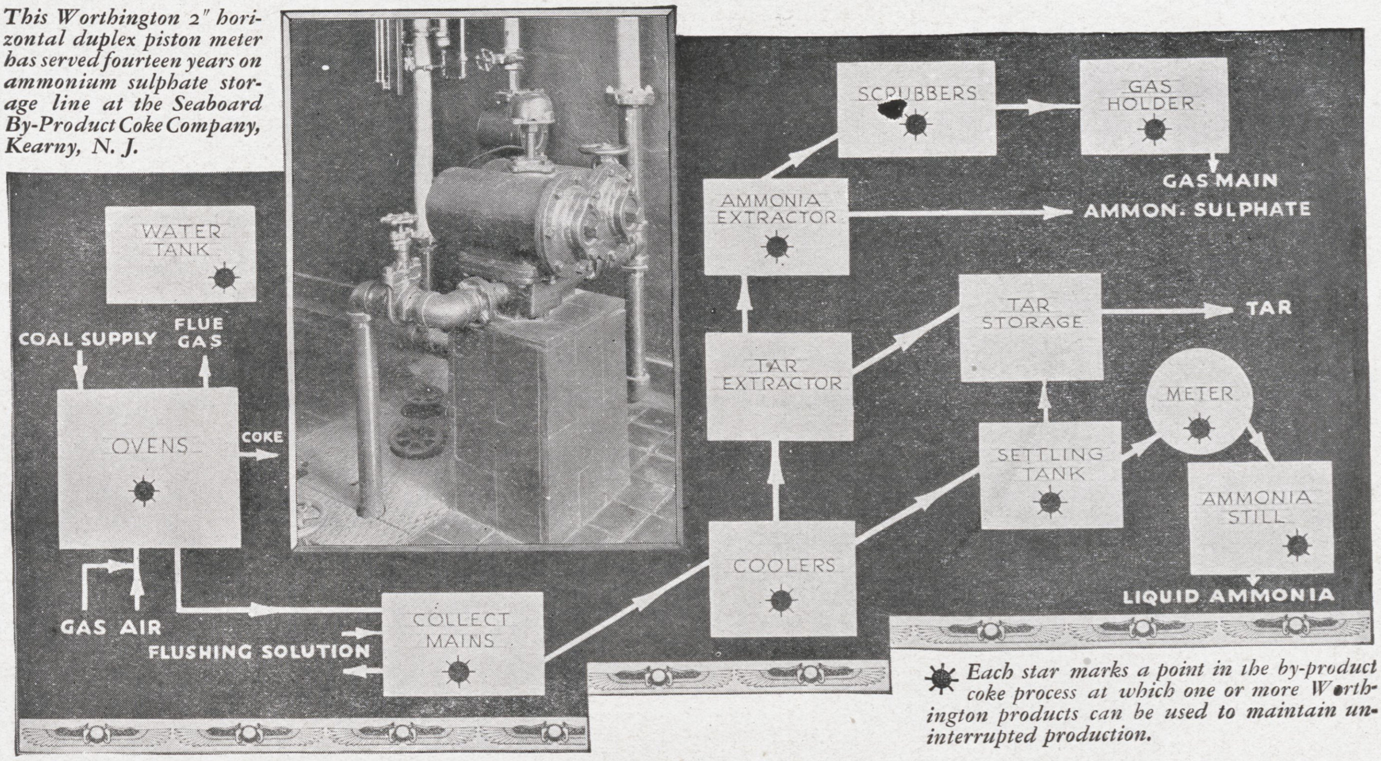
(Continued from page 8)

are many different systems in use, since each ore body offers its own particular mining problems and difficulties. Perhaps the most common method employed is that of top-slicing, in which a shaft is sunk just outside of and to the bottom of the ore body. At the bottom of the shaft a main haulage drift or level is driven and developed. Raises are then put up from this main level to the top of the ore body, and from them subdrifts and levels are driven and developed at vertical intervals of from twelve to fourteen feet. The ore in the top sublevel is mined first, being removed in horizontal slices after the subdrifts have been driven to the property line or ore limits. Then the surface is caved, after which the next lower sublevel is mined and so on until the main level is reached. Such ore, mined in slices, is trammed through the subdrifts and dumped into a nearby raise. It is collected at the bottom by cars and motors on the main level and is then transported to a shaft pocket and hoisted in skips to the surface. During the summer months the ore is loaded direct into railroad cars. In winter, when navigation is closed, it is stockpiled to be reloaded into railroad cars with the opening of the shipping season.

The increased cost of labor and supplies has likewise made it necessary to turn to mechanical and labor-saving equipment in underground mines. In drifting work where mucking was formerly done by hand, mechanical loaders or scrapers are now used; modern high-speed drills are in action where formerly the slow, laborious hand-augers were employed; and in the slices and sublevels where ore was previously hand mucked into small cars which were hand trammed and dumped into raises, electric-double-drum scrapers now convey the ore direct from the blasted pile into the raise. Such advancement is

(Continued on page 28)

This Worthington 2" horizontal duplex piston meter has served fourteen years on ammonium sulphate storage line at the Seaboard By-Product Coke Company, Kearny, N. J.



Each star marks a point in the by-product coke process at which one or more Worthington products can be used to maintain uninterrupted production.

They bought *today's* performance *. . . fourteen years ago*

IN 1916, the Seaboard By-Product Coke Company installed this Worthington horizontal duplex piston meter for measuring the passage of ammonium sulphate from settling tank to still.

Today, the meter is still in service, playing an important part in safeguarding production efficiencies. It measures 37½ tons of liquid per day.

This service record is a typical one . . . for Worthington's seventy years of experience in building meters is reflected, in each unit produced, in the ability to function accurately year after year with a minimum of maintenance.

The importance of measuring the fluids involved in industrial processes is sometimes overlooked. A check-up of your liquid handling problems by a Worthington engineer may show you a means of cutting costs.

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Campus News

(Continued from page 15)

several groups of men fighting from above and below. Strong cord was supplied, legs and arms were bound, not once or twice, but to stay tied. The stronger and more daring men kept struggling, but the weaker ones soon gave up.

Soon from this boiling pot of humanity, the contest narrowed down, and success seemed to join the side of the freshies, and one by one the vanquished but resisting sophomores were piled around the center of the pen. Within fifteen minutes the colors of the freshies were floating over the tumult. In less than half an hour the victims were carried and dragged to waiting trucks, where they enjoyed their first and last free ride at the expense of the freshmen.

Another battle had gone down in the annals of Rose history, making it one up for the beginners.

Deming Hall Filled

In order to make a more attractive home for out of town students, the rooms and main hall were redecorated during the vacation period.

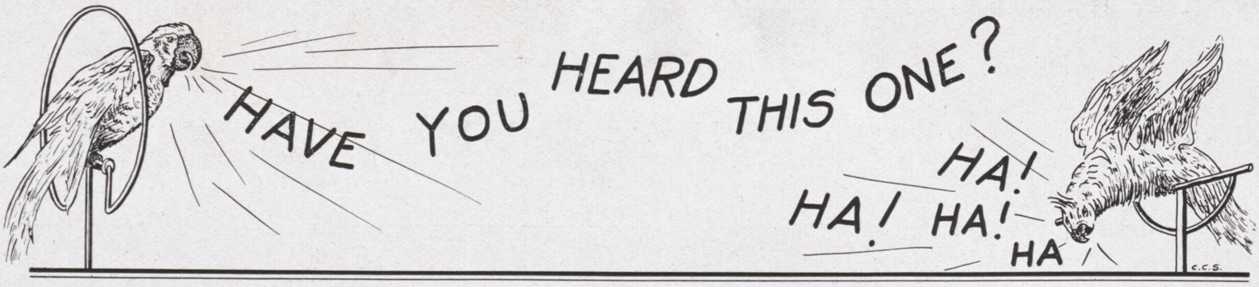
Our men's dormitory, located on the campus, is filled to capacity. The twenty double rooms and twelve single rooms accommodate fifty-two men.

A checkup of the membership in the hall reveals the fact that there are thirty-three freshmen and eighteen upperclassmen.

Mr. Bloxsome, of the English department, is the faculty representative in the dormitory.

A most congenial crowd, such as only colleges can afford, promises to make life and activity in and about the dormitory exceptionally attractive this year.

Tuesday evening, September 23rd., the Deming Hall Association was organized. The following officers were elected to serve during the first semester of the school year: L. Herndon Witt, Jr., Pres., Max Eyerman, Sec. Treas.



Frosh: What is the best way to get a Co-ed on the phone?
Senior: Lift up the hook and receiver.

That old adage——"He who hesitates is lost", should read, "He who hesitates has his tail-light knocked out."

Paw, what is a bicuspid?
A bicuspid, my boy, is a double barreled spittoon.

Engineering Definition. Slip Stick.——An excuse for approximating answer.

Fair motorist: Really, I didn't mean to hit you.
Irate victim: What have you got that bumper on your car for if you aren't aiming to hit someone?

What would a nation be without women?
A stagnation, I guess.

Fair passenger to sailor: Where is the Captain?
Sailor: He is forward, Miss.
Fair One: Well, that's all right; this is a pleasure trip, anyway.

"I'm poisoned", murmured John, falling into a stupor (someone was always leaving the lid off the stupor).

A young M. E. ordered a carload of material from a Chicago jobber. The jobber wired him:
"Cannot ship your order until last consignment is paid for."
The M. E. wired back:
"Unable to wait that long, cancel the order."

A college education seldom hurts a man if he's willing to learn a little something after he graduates.

Ch. E. (to weeping wife): "What are your tears to me, only droplets of a dilute solution of sodium chloride."

Visitor: "What a charming baby! And how it does resemble your husband!"
Hostess: "Gracious you alarm me. We adopted this baby."

Papa: Now that you are through college you should marry some nice girl.
Son: And never use my college experience? Why, father!

She's so dumb she thinks a hangover is a Jewish holiday.

Padre: You'll ruin your stomach, my good man, drinking that stuff.
Old Soak: 'Sall right, 'Sall right. It won't show with my coat on.

What did the boss say when you told him it was triplets?
He promoted me to the head of my department.
What department are you in?
Production.

The ladies that just passed were Mrs. John Brown and her niece. Her niece is rather good looking.
Don't say 'knees is', say 'knees are'.

I could dance on like this forever.
Don't say that; you're bound to improve.

When you throw a match in the air does it light?
No.
Then Newton must be wrong.

What are you doing? Fishing?
No, drowning worms.

From whence them motley freckles?
From eating rusty raisins.

Do you know what happens to little boys who draw pictures on people's sidewalks?
Yes, they go to college and take architecture.

Your boys are graduating from college rather late. What kept them back so long? Are they delicate?
No. Athletes.

Any ice today?
No thanks, we broke our shaker.

A him to a her flea. Marry me or I'll go to the dogs.

A Jew and an Irishman were on board a ship bound for Ireland.
Irishman (catching sight of his native land). Hurrah for Ireland!
Jew (riled). Hurrah, Hell!
Irishman: 'Hat's right, every man for his own country.

Prof: Can you tell me when the revival of learning took place?
Stude: Just before the finals.

Freshie: Who is Doc White?
Soph: Good Lord. Don't you—
Freshie: Oh.

Don't worry if your job is small
And your rewards are few;
Remember that the mighty oak
Was once a nut like you.

E. E.: What makes you think that my head is made of cork?
C. E.: It always seems to be at the neck of a bottle.

With Rose at Camp Custer

(Continued from page 9)

a great deal of amusement from the fact that every night one of the cavalry cadets would be called for by his chauffeur and taken out. One evening the cadet was on K.P. duty and washing dishes when the chauffeur arrived. The cadet promptly put the chauffeur to washing dishes and sat down to take it easy. Everything went well until the mess-sergeant happened to glance that way. Then the chauffeur was chased and the cadet put to work scouring pots and pans.

The cadets spent their evenings in various ways. Some would go to Eagle Lake (on the reservation) to swim, some to Gull Lake or Goguac Lake to dance or swim, some to the Hostess House to write letters or read, some would visit newly found friends, and some would go to bed. Every Friday night a dance was held, at the Hostess House, for the cadets and every one of them was a success, due mainly to the efforts of the hostess.

To furnish further entertainment a baseball team was made up and games played against other camp teams; indoor baseball was played; shows and lectures held in the camp theatre; and a boxing tournament held, in which much undreamed of talent was discovered.

A week before the end of camp the Rose Poly cadets, who had been considering the question all summer, met and decided to join the national engineering military fraternity, Tau Nu Tau, which was to replace the "Cadet Officers Club" at Rose Poly. They were initiated by the members of the Illinois chapter at an impressive sunrise ceremony held at Eagle Lake.

To close the camp schedule, an over-night hike was taken by the company. Although the destination was only two miles from camp, the cadets marched twelve long miles before they reached Eagle Lake, where they encamped for the night in pup-tents.

On the last night a formal dance was held at the Battle Creek Country Club in honor of the new members of Tau Nu Tau. The dance was attended by all members of the R.O.T.C. and was a pronounced success.

Then, after grabbing a few hours sleep, the cadets turned in their equipment and after voting the camp a huge success and the summer well spent, the cadets departed for their various homes, where they could enjoy a night's sleep and not have to worry about hearing a whistle in their ears before the sun was up.

The awards made at camp to Rose men are as follows:

Herndon Witt—Best all-around performance at camp.

Ellis and Roach—Boxing awards.

Rifle awards—Wassell, Mathews, Ellis, Loving, Ray, and Wilson.

Pistol awards—Wassell, Powell, Ellis, Loving, Mathews, and Wilson.

The Iron Ore Industry of the Lake Superior District

(Continued from page 22)

only logical, for underground costs must relatively keep pace with those of open-pit operations.

Since the ore varies in natural iron and other mineral values, depending upon the composition, it is sampled and analyzed before shipment. Each operator is allotted a number of pockets in the ore docks, into which ores of similar analysis or desired grade are dumped and stored until tonnage sufficient for a cargo has accumulated. Then it is loaded into a boat and transported to a lower lake port.

Railway and lake transportation equipment has developed hand in hand with that used in the mines. Wooden cars of thirty tons capacity once served to haul ore from the mines to the docks, but they have given way to all-steel cars of fifty and seventy-five tons capacity at the present time. Huge modern locomotives can now pull, in most instances, a sufficient tonnage of ore from mine to dock in one train load to completely fill an ore boat of average size.

Large fleets of boats, maintained by various steel companies and independent interests, are kept busy throughout the shipping season transporting ore from the Lake Superior docks to those lower lake ports located most advantageously to the blast furnaces. Some idea of the magnitude of this lake carrier industry alone may be gained from the fact that approximately 350 vessels with a total trip capacity of almost three millions of tons of ore will be in operation during the present season. Lake Superior has long been noted, among vessel men and shippers, for its severe storms and dangerous channels. Navigation is especially treacherous in the early spring and late fall months because of bad weather and ice conditions. Often, at these times, large fleets of ore boats are caught in the ice and delayed for days.

Within recent years, blast fur-

(Continued on page 30)

Streamline for Speed

(Continued from page 11)

pound force as resultant. With the 400 pounds in front and 200 pounds in rear good stability is obtained. To better this stability for steering, the 1930 Sunbeam had installed two adjustable horizonal stabilizers H and also two fixed vertical fins V. The resistance or pressure on the rear of the car becomes a minimum when the horizontal stabilizer is in line with the air flow. As the angle changes so does the resistance, thus a controllable amount of pressure is at hand to keep the speeding car on an even keel.

Calculations on same car show head on air resistance at different speeds. These, at 180 miles per hour are equal to 740 pounds; at 190 miles per hour, 830 pounds; at 200 miles per hour, 920 pounds; and at 210 miles per hour the wind resistance is 1,020 pounds. It is also well to notice that at the highest speed it required one half the total horse power just to overcome the air pressure.

The total resistance upon the car is proportioned upon every part; body, chassis, wheels, tires and even the driver's forehead protruding but a few inches above the cowl. Each part alone calls for separate testing and streamlining. Behind the driver's head there is a long streamlined design. Wheels are carefully streamlined to minimize air resistance caused by their rotation. In the 1930 Sunbeam the space between the front and rear wheels is occupied by a rectangular box streamlining the front wheel into the rear and being continued beyond this in a pointed tail.

As shown above streamlining is only about 50 per cent efficient according to the amount of horse power it requires to overcome the air resistance. Later developments will tend to increase this; and in doing so, the displaced air will be made to pass over, rather than under and around the machine. The turbulent wake will be reduced by new tail designs. It is this principle of design that accounts for the striking and very radical streamlining as seen in the high speed cars of today.

Research and Progress

(Continued from page 13)

per square inch. The loss in re-purification is approximately 1 per cent.

The mobile helium plant was designed by R. R. Bottoms, director of research, and E. G. Luening, executive of the Girdler Corporation, which operates the Helium Company. These men are also responsible for the development of the special fuel gas used by the Graf Zeppelin on its first return trip to Friedrichshafen from the United States.

Large Transmitting Tubes

Since the first days of radio broadcast the engineer has from time to time improved the means of transmission in various ways but perhaps his chief difficulty was in the transmission tubes. They were not powerful or large enough, and when made more powerful, the difficulty arose in the proper cooling of the grids. Westinghouse has developed a new tube known as the A W 220 which is 72 inches in height, has a diameter of eight inches and weighs 60 pounds. Their research engineer, Mr. I. E. Mourmomtseff, has succeeded in producing a tube of mechanical strength and sturdiness through a double end construction. This new tube requires approximately five tons of water through the cooling jacket each hour to keep the temperature down sufficiently.

The success of the new station of the Westinghouse Electric and Mfg. Company will depend largely upon the success of this tube.

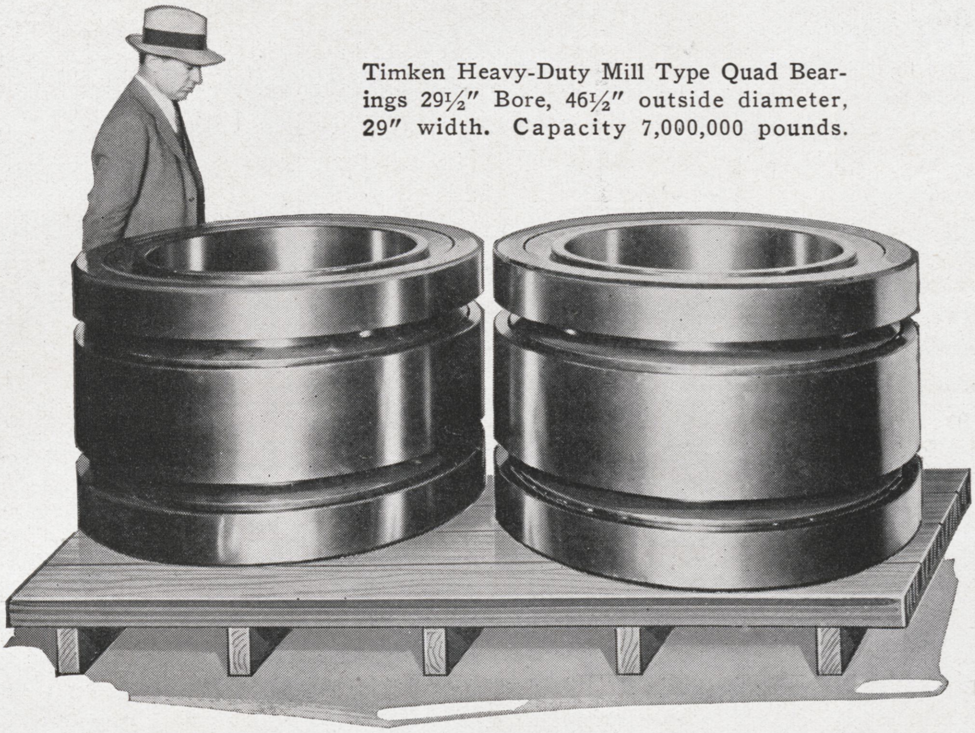
The Iron Ore Industry of the Lake Superior District

(Continued from page 28)

naces and steel mills have been constructed at Duluth, Minnesota, mainly for the manufacture of wire and nail products. Thus within a radius of seventy miles from the city of Duluth, one can see the raw iron ore taken from the earth, converted into pig iron, steel and various finished products.

Living and working conditions have long been recognized as vital to the progress of the industry, and they have steadily improved. Each employe's health and welfare while at work is guarded by the most rigid enforcement of modern measures of safety and sanitation, while company dwellings, and in some instances company schools and hospitals, are well maintained for the use of employes and their families.

—From DuPont Magazine.



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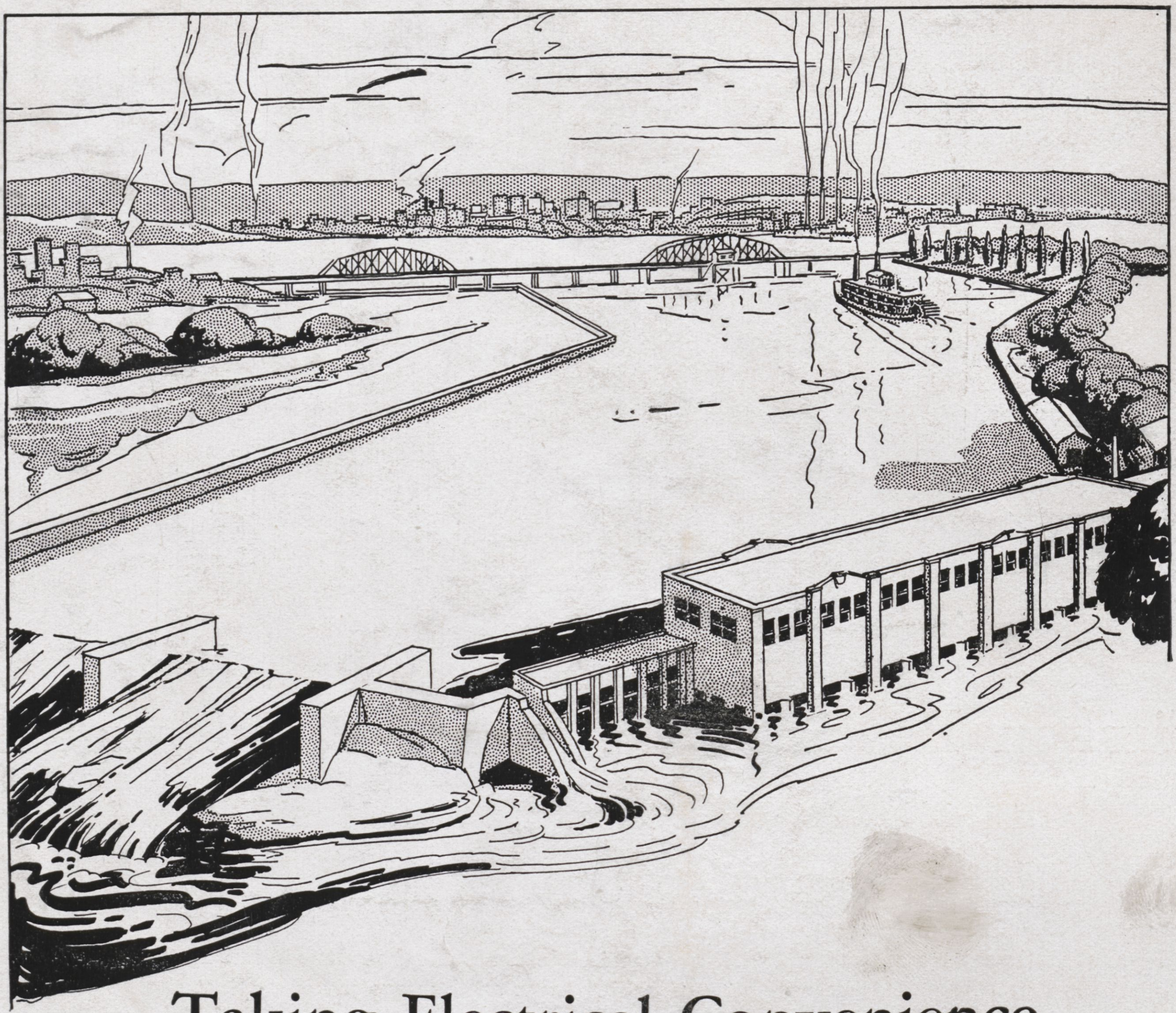

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