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ROSE POLYTECHNIC INSTITUTE, TERRE HAUTE, INDIANA

MOTHER USED TO MAKE THEM—You expect good things to eat from the modern gas range that combines beauty with convenience and economy in cooking.

Progress Means Change

Oxy-acetylene Welding Helps Stove Manufacturers and Others Overcome Initial Factory Costs of New Models

G. O. CARTER*

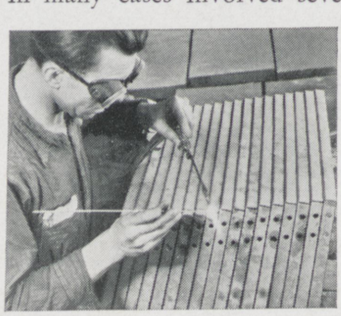
Once, there were no other means of fabricating metal products except through huge investments in patterns, dies and special tool equipment. Naturally, it was logical for the plant to resist Sales Department pressure for too frequent design changes. Capital investment had to be amortized first.

Now, it is no longer necessary to place this handicap on the sales organization and keep it fighting for sales counter to consumer demands.

Welding Lowers Cost of Stoves

Modern gas ranges, for example, are assembled from a considerable number of enameled sheet steel panels of different sizes. Former manufacturing methods required a set of dies for each panel. The total investment in dies for an ordinary stove in many cases involved several thousand dollars. With such a large investment factories were naturally reluctant to make any change involving the scrapping of dies until enough stoves of a particular model had been manufactured to absorb their cost.

Many large gas range manufacturers now use welding in the fabrication of stove panels and eliminate the necessity for dies. The sheet steel is cut to required size on standard shears; the corners punched out on standard machines; the edges turned up on standard brakes and—the corners are welded.



INVISIBLE JOINTS — Welded corners make a sturdier stove — eliminate chipping of enamel in assembly and in use.

Welding Is Modern

By adopting welding and cutting these manufacturers have largely eliminated factory resistance to consumer change. This flexible means of production easily permits improvement in current models, or redesign without serious breaks in plant operation, or increased capital investment.

The total cost of operation by the new method is not only lower but it is now possible to follow consumer demand quickly without the necessity of scrapping expensive equipment.

Used in Many Industries

The experience of the stove manufacturer is duplicated in many industries. Redesigning metal products and equipment for welded construction has resulted in increased strength, utility and permanence. It has been adopted for metal furniture, loud speakers, refrigerators, display signs, sheet metal desks, stainless steel barrels, hoes, truck bodies, and numerous other articles. Welding is applicable to the widest range of materials—steel and the ferrous alloys—aluminum, brass, bronze, and practically all other non-ferrous metals and alloys. Welding is ideal for applications where smooth, invisible joints are necessary for enameling.

Wealth of Experience

The application of oxy-acetylene welding and cutting to your production problems need not be deferred because it may seem difficult. Linde Development Engineers will work with you and offer valuable engineering assistance in product design—or redesign. The Linde organization can focus upon the problems of one user the combined experience of thousands and day-by-day discoveries of a large research staff. It may be able to help you. Consult the nearest Linde Sales Office —without obligation. Linde Sales Offices are located at Atlanta—Baltimore, Birmingham, Boston, Buffalo, Butte—Chicago, Cleveland—Dallas, Denver, Detroit—El Paso—Houston —Indianapolis—Kansas City—Los Angeles—Memphis, Milwaukee, Minneapolis—New Orleans, New York—Philadelphia, Phoenix, Pittsburgh, Portland, Ore. —St. Louis, Salt Lake City, San Francisco, Seattle, Spokane, and

JOINTLESS AND STAINLESS — Welding makes stainless steel barrels practical in more ways than one. It assures strong joints, resists corrosion, and does not affect the contents.

Tulsa. Everything for oxy-acetylene welding and cutting—Linde Oxygen, Prest-O-Lite Acetylene, Union Carbide and Oxweld Apparatus and Supplies—is available from Linde through producing plants and warehouse stocks in every industrial center.

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*Consulting Engineer, The Linde Air Products Company, Unit of Union Carbide and Carbon Corporation. —This being a Business-News Advertisement.

Surveying This Issue

AT last the railroads are awakening and are making a systematic attempt to gain back the passenger service which the busses and motor cars have taken from them. Mr. Burt describes their progress in the lead article.

THE mortar and pestle have long since departed and have been replaced by modern machinery. The present methods of milling are described by Mr. Sentman in his article, "Modern Milling."

THE three common methods of carrying on radio communication are described by Mr. Straw in his non-technical article, "Methods of Radio Communication."

THE use of groundwater as a drought relief is proposed by Mr. Hamilton in his article, "Groundwater and Drought Effects."

A. W. H.

THE ROSE TECHNIC

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THE STAFF

of the

ROSE TECHNIC

Extends To One and All

Its Wishes for

A Very Merry Christmas

and

A Most Prosperous New Year

THE ROSE TECHNIC

THE TECHNICAL JOURNAL OF THE ROSE POLYTECHNIC INSTITUTE

Volume XLIV DECEMBER, 1934 Number 4

Developments in Railroad Passenger Service

Gordon L. Burt, c.e., '35

ONLY a few weeks ago the Union Pacific's stream-lined, articulated, Diesel-electric streaked across the continent to establish a new transcontinental record, of 56 hours, 55 minutes. This run, which smashed the old record of 71 hrs., 27 min. set in 1906 by 14½ hours, together with the world-record-breaking dash of the regularly scheduled Milwaukee Road steam train between Chicago and Milwaukee in July have restored something of the romance which the railroad formerly possessed for the layman but which in recent years has been lost to newer types of transportation.

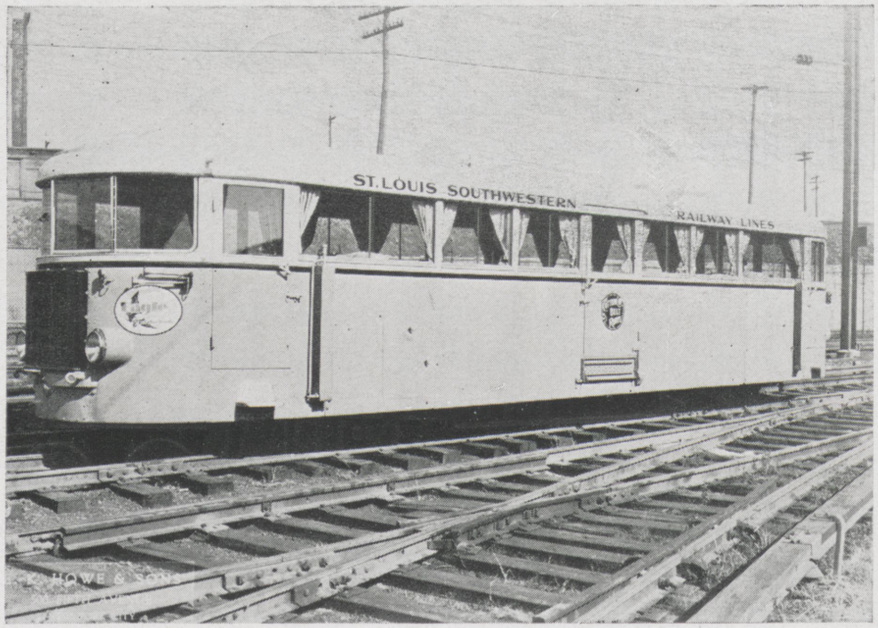
When our grandfathers were boys the railroads were triumphing over puffing river steamboats, slow-moving canal barges, and the overland stagecoach. Today the situation has changed greatly. The railroads, beset by ruinous competition on every side—from the private automobile, the bus, the truck, the government waterway, and even the Panama canal—have their backs to the wall. In the last few years the roads have awakened to this realization and now are very active in developing new equipment and services.

Coordinator Eastman accurately characterizes the present day trend when in an address in Atlanta, Ga. on Nov. 6th, he said, "The new competition has brought the railroad inventor back to life. For many years railroad passenger service moved over the rails but otherwise stood still. Now a tidal wave of improvements seems to sweep on the scene."

What the permenant effects of this wave of developments will be is difficult to hazard. Yet by reviewing the advancement made during the recent months and by previewing the equipment to be built and placed in service during the next few months we shall be able to tell in which direction the tide is sweeping.

Union Pacific Gets Second High Speed Train

The record-breaking train of the U. P. is the second high-speed, light weight train built for this railroad. It is a six car articulated unit consisting of a power car, mail baggage car, three sleepers and a coach-buffet car. This is the first of the new trains to be equipped for overnight travel. (The first three-car train was described in the Nov. 1933 issue of the "Rose



Technic").

Aluminum alloy construction is used to reduce the weight of the 376 ft. train to 210 tons from the 700 ton dead weight of the equivalent conventional train. The passenger carrying capacity is 124.

Motive Power

A Winton 900-hp., 12 cylinder, two-cycle V-type Diesel-electric engine drives the new train, developing rated power at 750 r.p.m. This compares with the first train's power plant which developed 600-hp. at 1200 r.p.m. The electrical equipment consists of a G.E. generator, four tractive motors and controls. The generator is directly connected to the engine while the motors, rated at 300-hp. are mounted two on each truck of the power car and are geared to the wheels.

Other features include: four wheel trucks, articulated of course; new air brakes said to stop a train more quickly and smoothly than before; newly designed Pullman sleepers providing occupants of lower berths a door which insures complete privacy and a rigid stairway and dressing platform for the upper berth travelers; windows double glazed with safety glass; air conditioning throughout with Frigidaire units.

This train, when placed in passenger service between Chicago and the Pacific Coast is expected to cut one business day from the trip. Two more units have been ordered by this road, each of them is to be a nine car unit.

The Burlington's Zephyr

The Chicago, Burlington and Quincy's Zephyr, which has attained a top speed of 107 m.p.h. is powered by a new type 660-hp. 2 cycle, 8 cylinder oil burning Diesel engine. It is similar to the U. P.'s first train, having three articulated coaches, but it is constructed of stainless steel shot welded. Its weight is 100 tons, little more than the weight of a single sleeping car of conventional weight.

On Nov. 11th the Zephyr was placed in service on the run between Lincoln, Nebraska and Kansas City, Missouri, covering the 250 mile distance twice daily in five and one-half hours at an average rate of 46 m.p.h. This is the first high speed streamlined train to be placed on a regular run. C. B. & Q. officials are watching for signs of the public reaction to the new service. A better idea of the maintenance and operating costs of the new unit will be had when the train has been in daily operation for several months. Some time ago it was announced that two additional trains similar to the Zephyr had been ordered for delivery late in February.

Milwaukee Road Tries Fast Steam Trains

Railroad men are by no means satisfied that the Diesel-electric is the best power unit for the new service. In July, a standard steam locomotive hauled one of the Milwaukee Road's passenger trains, (a five-car 736 ton load) from Mayfair, Illinois to Lake, Wisconsin, a distance of 69.9 miles at an average speed of 91.1 m.p.h. It set a worlds record for sustained speed and demonstrated again that high speed steam transportation is feasible.

The road expects delivery early in March of two fast, streamlined steam locomotives from the American Locomotive Company. For these $90,000 power plants, 52 light weight, semi-stream lined passenger coaches have been built.

The cars are of all-welded steel construction, have no roof and side projections to offer resistance to air flow and are 65% as heavy as conventional coaches. Yet they have conventional dimentions and fittings so that they may be interchanged with standard equipment if this should be desired. In addition 25 streamlined baggage cars are being constructed, some to carry facilities for dining car service, and two cars with beaver tails, have been ordered. The latter will be placed at the rear of the trains.

Extensive work has been carried out throughout the summer and fall on the roadbed between Chicago and the Twin Cities. It is planned to place the new trains in operation in the spring on the line between these points and cut the present running time by one-third.

The Burlington is to place their two new Diesel-electrics on the Twin City-Chicago run also. In fact, it is said that this road made the first move in preparation for the swift six and one-half hour run. The Zephyr made the run of 431 miles in six hours four minutes, including six stops of one minute standing time each, in a test run made late in July.

The North Western is preparing for this competition by converting

several steam locomotives into oil burners and increasing their speed. Passenger cars are also being remodeled and new truck are carry the equipment at the higher speeds.

B. & O. Tests Both Steam and Diesel-Electric

A little more than a year ago the Baltimore and Ohio began plans for two six-car, fully air-conditioned and streamlined trains, one of aluminum alloy and the other of a new alloy steel. The trains, newly completed, weight less than half that of conventional equipment units. One is to be powered by a Diesel locomotive of two separate units of 1800 h.p. each with central control. The other train will be drawn by a steam locomotive, rebuilt and equipped with a water-tube boiler generating 350 pounds of steam pressure and scientifically streamlined. It is designed for a speed of 100 miles an hour. Within a year much data should be available in the relative merits of the two types of power units.

Pennsylvania Electric

Along with the Diesel-electric and steam locomotive the electric locomotive is being designed to decrease head-on resistance and to increase speed. The Pennsylvania, one of the most progressive roads, ordered in November, 57 more electric locomotives at a cost of almost fifteen million dollars for high speed passenger service between New York, Philadelphia, Baltimore, and Washington, D. C. The units are to be operated by 1100 volt, 25 cycle, single phase current and will supplement an order for 28 placed in July. The new service is scheduled for inauguration early in 1935

In addition to the complete units ordered the equipment of many conventional trains with standard equipment is being modernized. Last summer several trains were air-conditioned throughout. Many others were cooled by blowers while standing in stations. For the 1935 season, a program calling for the air conditioning of 2500 passenger cars has been prepared by the western and southern roads. Every through train of importance which is operated in western territory will be air conditioned throughout.

Comparison of Types

This brief review incomplete as it must be, is yet indicative of the earnest effort of the railroads to provide service which will please the traveling public. In analysing the new equipment speed, economy and comfort might well be the salient points to consider. These appeal to the people in varying degrees according to their means. Just a little will be said about the comparisons of the several types on this basis.

Speed

Speed can be offered by the electric, the steam and the Diesel-electric. Instances in which the latter two have proved this have been cited above. The new electrics will establish themselves soon, it is expected. However, the limitations on speed are not in the power unit. Daniel Willard, president of the Baltimore and Ohio said recently, "The question is not how fast the train can go—it is: how fast can they go with due regard for human comfort and safety. In my mind there is not the least question that the roads will continue to increase passenger speed. . . They will increase it little by little with due regard for safety and comfort, not by such leaps and bounds as many people may anticipate."

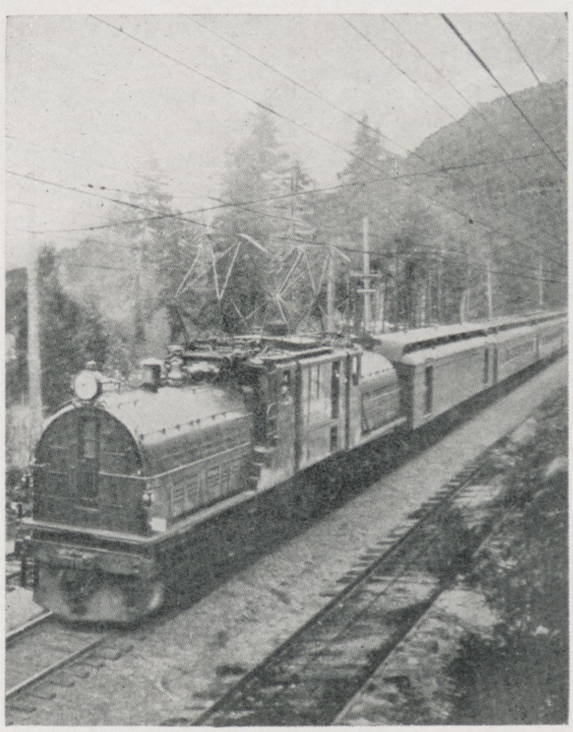
Mr. Eastman, the federal coordinator suggested about two weeks ago that more PWA funds be used to eliminate grade crossings. When the Zephyr made its thousand mile record run in May more than 2500 crossing flagmen were used. Accidents at high speed are dangerous and high speed trains are more difficult for the motorist to avoid. With the elimination of grade crossings, better roadbed and other mechanical improvements such as braking and signaling, faster schedules may be had with various power units.

Comfort

New developments in the construction of trucks and interior design as applied to the new units to gether with the dustless, optimum-temperature, air conditioning have combined to make the new transportation facilities more comfortable than, (dare we say it) any other mode of travel.

As to economy. It is still too early to determine the type of service which is most economical. Light weight streamlined coaches bring economy in operation but at increased first cost.

It will be the type of rail transportation which best satisfies the criteria, speed, comfort and economy, which will succeed present day equipment. However no over night changes will occur. Innovations will be made only if and when they satisfy a public demand. The events of 1935 should indicate the public reaction to one of the greatest progressive changes in railroading and should disclose the value of the new trains in actual service.



Modern Milling

Warren S. Sentman, m., '36

IT is a long step from the old mortar and pestle to the modern methods of milling grains. An individual seldom realizes when he eats his corn flakes just what processes were used to convert the corn into the crisp tasty form in which he finds it; nor does the housewife often stop to ponder over the past history of the flour that she is using in baking her cakes.

Let us trace briefly some of the changes in the milling of grains that have taken place in the past. The first mills were of the rudest and simplest design possible, merely being two stones, a large flat piece upon which the grain was placed and a smaller piece which was worked back and forth upon the larger stone. Later on some one concieved the idea of using animals to furnish power. The outgrowth of this idea was the stone wheel, pulled by an animal, moving in a circle upon a large flat stone. The meal obtained by this method was of a poor quality. As civilization advanced, new and better methods of grinding grains were discovered. One such method was the use of buhr stones. Grooves were cut in the faces of two circular stones which revolved together, coarse grooves near the center, and finer grooves near the edge. The grain was fed in at the center and as it worked itself outward, due to the rotation of the buhr stones, it became thoroughly ground. The meal obtained from this method was called whole ground meal because it contained all the parts of the grain intermixed. The next important improvement was the innovation of cast iron rolls in place of the buhr stones. Two cast iron rolls were set horizontal side by side and the grain was fed in from above, the kernels being broken due to the enormous force between the rolls. To gain a finer product the grains were subjected to more grinding. The more obvious advantages of the cast iron rolls were that they speeded up production and they enable the miller to keep a closer control over his products.

In addition to improvements in the grinding proper, numerous changes were made in other pieces of machinery. Sifters were improved, dryers and purifiers were redesigned, reels were made more efficient, aspirators were introduced, packing equipment was modernized, and new machinery was invented.

Since the different types of milling are somewhat similar, we will consider only the methods used in a modern corn mill producing meal, grits, oil, and corn flakes.

The corn, upon being brought to the mill, is first elevated to the top of the plant where it is weighed and cleaned. In the cleaning process the light dusty materials, tramp iron, and foreign matter above the size of the kernels are removed. From the cleaner the corn is spouted to the steamer. The steamer is a large, iron, jacketed cylinder from ten to fifteen feet long and ten to twelve inches in diameter. The grain is forced through from one end to the other by means of a screw conveyor. Near the front end a steady stream of water is run upon the corn as it moves along, so that every part of it becomes thoroughly dampened. Live steam is admitted to the jacket surrounding the cylinder, and due to the heat and moisture, the hull or outer skin of the corn is loosened. From the steamer the corn goes to the tempering tanks, which are large tanks in which the corn remains for a period of time in order to soak up the correct amount of moisture before passing on to the degerminators.

This continous operation of steaming is an improvement over the old method in which the corn was left in a heated tank while it was being thoroughly saturated with water. In the old method the operation was intermittent and lengthy, whereas the present tempering process is continous and readily controlled.

It is at the degerminators that the grain receives its first grinding. A degerminator is a casting in the shape of the frustum of a cone about 10 inches in diameter at the small end, 18 inches in diameter at the large end, and approxamately 24 inches long, which revolves horizontally inside another frustum of a cone. The revolving part of the machine has its surface studded with little spherically shaped humps. The top of the shell within which it revolves is covered in a like manner, while the bottom part is made up of cast screens. The corn is fed in at the small end and works back to the large end. In doing so the loosened hulls and the germ are removed and the grain is split into two parts. The germs from the kernels pass through the screens, while the hulls and split kernels come out the rear end of the machine.

Upon leaving the degerminators, the product is conveyed to the dryers and coolers, where the moisture is dried out by steam heat and the product is cooled by air. At this point its moisture content is between 10% and 15%. From the dryers and coolers the product is elevated to the grading reels where the bulk of it, called "hominy feed," is removed and the balance distributed to the various reduction systems in the mill.

After leaving the grading reels the different grades are aspirated,

that is, cleaned by air, to take out the light fluffy materials. From the aspirators the product passes to the first break rolls where it is ground between small, corrugated iron rolls. The product of the first break rolls is then graded in a reel made of 16 mesh wire; the coarser parts passing off to an aspirator and down to the second break rolls, and the lighter material going to the meal reels and third break rolls. The product from the second break rolls goes to the sifters where it is graded by passing it through screens or sieves of varying degrees of finess. The product of the third break rolls also passes to a sifter where it is graded. It might be well to state here that as the number of the roll break increase the size of the corrugations on the faces becomes smaller. Where the first break rolls may be as coarse as 4 corrugations per inch of circumference, the third break rolls may have 16 or 20 corrugations per inch of circumference. Obviously the finer the corrugations the finer the resultant product of the rolls.

After leaving the sifters, the products are aspirated and then conveyed to the packing department. The method of packing depends upon the use to which the product is going to be placed. For table use the goods are packed in attractive cartoons by automatic packaging equipment; if for bulk sale, the products are packed in sacks.

Modern corn milling, however, is not as simple as the above description would imply, but it is essentially a continous grinding, grading, and cleaning process.

The names given to the products are determined by their nature and size. Thus grits are called 12's, 14's, 16's, or 22's according to the mesh screen or sieve through which they will pass. Meal is the clean, sound, ground part of the corn that passes through a No. 48 XXX bolting cloth, that is, a bolting cloth with 46 meshes per linear inch. Corn flour is the finest product of the mill.

In a modern corn mill all parts of the grain are used. The germ, after being removed from the kernels, is dried and sent to the oil expellor where the oil is removed. From this oil, soap and cooking oils are derived. After the oil is removed from the germ, the residue, which is called oil cake, is mixed with the hull and bran and ground into a fine mixture in an attrition mill. The resultant product is called hominy feed.

An attrition mill is composed of two vertical iron discs, which are placed face to face and rotated in opposite directions. The faces that work together are composed of removable grinding plates. The product is fed into the center, and as it works its way outward, it becomes thoroughly ground and pulverized.

Perhaps the most common corn product is that of corn flakes. Corn flakes are made from polished grits that will pass through a No. 4 screen. The grits are first cooked in batches of 1200 to 1800 pounds in revolving cylindrical steam cookers. During the cooking process, salt, malt, sugar, and syrup are added. The grits are then dried and conveyed to tempering bins which have a sufficiently large capacity to keep at least eight hours ahead of the demands of the rolls. The tempered product then passes to the flaking rolls where the grits are flaked to the desired thinness by rolls which weigh approximately 2000 pounds apiece. From the flaking rolls the flakes pass through the toasting ovens, then to the grading table, and finally to the packing department.

In addition to the above mentioned goods, numerous other products are made from corn, such as starches, sugars, syrups, and solvents.

Methods of Radio Communications

John A. Straw, e.e., '35

THE methods of radio communication, in accordance with the type of transmission, are radiotelegraphy and radiotelephony. In the former a telegraph code of dots and dashes is used, while in the latter actual speech is employed.

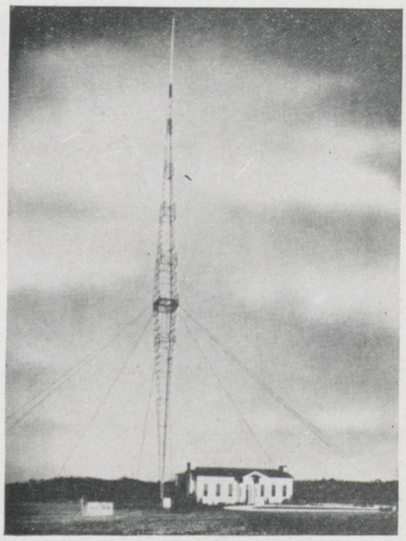
There is another division which might also be made, based on the ease or facility of communication. Under this division there are three methods: (1) ordinary two-way communication, (2) break-in, and (3) duplex. These three methods and all that is said about them below apply to both radiotelegraphy and radiotelephony.

In the ordinary two-way communication only one of the two communicating stations using such a method has its transmitter on at any one time. That is, when the operator of one station has his transmitter on, he has his receiver turned off, while at the other station the conditions are reversed. When the first operator wishes to hear from the second, he "signs off," using a prearranged signal. The second operator then talks to the first, and the process is continued throughout the entire communication. This is the method used by most amateur radio operators because it is cheaper than the other two methods. Any type of transmitter or receiver may be used, and they may be located in the same room.

The break-in method is a faster and more satisfactory form of communication, but it differs very

little from the first method. The manner of communication is identical, with the following exceptions. When one operator wishes to listen to the other, he merely says "break." (In radiotelegraphy the word "break" is abbreviated bk). The second operator immediately comes back to the first without any interruption of any kind. However, in the ordinary two-way system the identity of both stations is given each time one of the operators "signs off" or "comes on", thereby causing an interruption which is not present in the break-in system. Break-in is used by some amateur radio operators and by companies in connection with airplane routes. The only requirement for this method over the previous one is the ability of the receiver to remain very near the frequency of the station with which contact has been made. This requirement must be met so that no tuning will be necessary after the contact has been made, since there is no time for such tuning if the method is to work properly. Most receivers will meet this requirement very nicely, so that this method is a very practical one.

The duplex method is quite different. It is the most satisfactory of all, but the requirements for such a method are also much more severe. When two stations are operating with the duplex method, both the transmitter and the receiver at both stations are on continuously. The receiver at one station is tuned to the frequency of the transmitter at the other station and vice versa. In using this method, one operator may interrupt the other at any time so that the communication can be handled just as though the two operators were actually together. The requirements which must be met in order to communicate in this manner are as follows. First, the transmitter and receiver at each station must generally be separated by a distance of at least one-half mile. If this is not done, the operator will not be able to hear anyone except himself in his own receiver, because of proximity to his own transmitter. Secondly, the two stations must operate on different frequencies, otherwise the receiver at each station, being tuned to the frequency of its own station. As a result each station would "drown out" the other one. In the third place, a highly selective receiver must be used at both stations. The receiver at each station must be so selective that its response to the signal to be received is greater than its response to the signal sent out. The receiver, to be sure, is tuned to the frequency of the signal to be received and not to that of the outgoing signal. Nevertheless, only a good receiver will respond more to the desired signal than to that which is undesired, because of the greater comparative strength of the outgoing signal over that of the incoming signal.



A modern broadcasting station a feat of electrical engineering.

The trend in radio communication has been a gradual one toward the use of the break-in and duplex methods. In spite of the requirements for the use of these methods, their convenience and ease of operation, together with their time saving advantage, more than compensate for the effort and expense associated with their use. For this reason it is probable that the present trend will continue at a faster rate, especially in the direction of the duplex method of communication.

Groundwater and Drought Effects

E. A. Hamilton, c.e., '35

OVER these middle west states there are tens of thousands of wells from which a very large amount of groundwater is discharged annually. This year in Minnesota, Wisconsin, the Dakotas, and Kansas wells failed by the thousands, and as a consequence farmers were compelled to drive their cattle long distances to find unfailing water supplies. This year's drought, geological experts tell us, has never been equalled in the white man's history of the new world. So there appears before us this vital question, "Is it possible that our groundwater supply may fail us?" We today are taxing it as it has never been taxed before. We are using increasingly large amounts of water each year and the majority of it is ground water. Every farm has its well. Many cities have ground water supplies. Meanwhile our population is increasing, and with it the allowance of water per capita per day as well. Can the ground water supply meet the demand?

The whole of the central United

States may be divided into nine zones, based on the ground formations which affect ground water as to amount, condition, and availability. In regions one and two (see figure one) the principal water bearing formations are sandstone and limestone of paleozoic origin. In three (Indiana, Illinois, and Ohio) these formations are overlain with glacial drift containing water bearing sand and gravel. In four (northern Wisconsin and Minnesota) this glacial formation overlies granite and other formations of a crystalline character containing comparatively little water. In five (North Dakota, South Dakota, and parts of Iowa and Nebraska) there are cretaceous formations and water bearing Dakota sandstone beneath the glacial drift. In eight the glacial drift overlies tertiary and cretaceous foundations containing more water bearing sandstone. In nine and seven cretaceous rocks are covered by tertiary and pleistocene formations containing beds of water bearing sandstone, sand, and gravel. In six the principal water bearing formation is the Dakota sandstone.

The great underground reservoirs of most of the north-central regions have not been seriously depleted by this summer's drought, and wells driven deeply enough to tap these reservoirs have not gone dry. The areas in which the effects of the drought have been felt most are those in which these water bearing formations are either lacking or are filled with salty water, or are too thin or impervious to be tapped. There has been some shortage even in those regions having excellent ground water, but only where there have been shallow wells or wells tapping water pockets instead of the ground water stratum itself. These underground reservoirs very much resemble their artificial counterparts on the surface, and between precipitation periods help to supply the surface flow of water. In places where the ground water table is close to the surface, vegetation absorbs most of the moisture. In the arid western regions very seldom does any water at all reach the surface because the entire flow is absorbed by vegetation.

During a drought there is practically no increase in groundwater supply. The requirements of individual wells and of municipal supply go on as before with the result that the draw-down increases, ground water levels decline, the discharge from the under ground stores declines, and stream flow lessens. If the formations are thick beds of sand and gravel or of cavernous limestone, the streams may, and probably will, continue to flow throughout the drought. If the formations possess little storage capacity and have a clayey topsoil, the vegetation will probably consume the entire discharge and may lower the ground water table to a considerable extent. During the past eight to ten months these conditions have prevailed here in the midwest, and unless there is a great deal of precipitation during the coming winter and spring, such conditions will have increased to an alarming extent by next summer. We too can see the seriousness of the situation when we realize that never in the geological history of the country have there been such dust storms as we had this last summer. Throughout the middle west there was insufficient moisture to settle out the dust which had been formed in Iowa and Nebraska and which was carried across Illinois into Indiana and Ohio by the prevailing winds.

The north interior region contains four major water bearing formations: (1) paleozoic sandstone, (2) cretaceous sandstone, (3) tertiary and pleistocene sand and gravel deposits, and (4) glacial sand and gravel deposits.

The paleozoic formations in Wisconsin, Illinois, Minnesota, Iowa, Indiana, Ohio, and Missouri in general give an excellent discharge in driven wells; and apparently this formation has not been seriously affected by the drought. In Kansas, Nebraska, southwestern Missouri, and northwestern Iowa there are also paleozoic formations immediately beneath the glacial drift; but these, consisting largely of shale and some interbedded limestone, hold only highly mineralized water. In these regions there are many surface reservoirs, and many outlying farms are supplied only with rainwater stored in cisterns and with storm flow impounded in small earthern dams. During the drought these meager supplies were exhausted, so that now many farmers in Missouri, Kansas, and Oklahoma are being supplied with water hauled from old abandoned wells, from new relief agency wells, and from Kansas City and other well supplied centers. Cretaceous formations, consisting of impermeable shale with pockets of limestone and sandstone, and in its lower stratum of Dakota sandstone, furnish through artesian wells the supply of the Dakotas. This supply has been relatively unaffected by the water scarcity of recent months.

Tertiary and pleistocene formations overlie the older forms in the great plains, and in their water bearing beds we find abundant supplies of water. The contrast is most noticeable if we examine the Nebraska Republican river. Along part of its course this stream forms a boundary between a tertiary formation on the north and a shale formation on the south. Today spring fed streams flow in unabated abundance northward into the Republican, while to the south springs have failed and the Republican's southern tributaries have dried up.

In the major part of the north interior region, all the formations are covered by the last of the world's form changes—the glacial deposits. These consist of large amounts of sand and gravel interbedded with boulder clay. As water bearing formations they are of major importance in Indiana, Michigan, Wisconsin, Ohio, Minnesota, Iowa, North Dakota, and eastern South Dakota and Nebraska. The formation varies in thickness and

(Continued on Page 10)

THE ROSE TECHNIC

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Social Life

IN an institution such as Rose there is of course considerable stress laid upon the class room work and recitation. However it is not to be expected that the students spend all their time on studying. For this reason it is obvious that some form of social life is necessary as part of the school training which must be considered.

There are several ways in which this may take form. Probably the first in importance are the school dances which are given each year. The question arises as to whether enough such functions are given in the course of a year, and the suggestion has been made that there should be at least one school dance a month, that is a dance given by some group on the campus which is open to the public. A careful consideration of the dances to be given next semester brings out the fact that there will be one dance each month. This number would appear ample for the school the size of Rose.

Besides this form of entertainment there are various banquets, dinners, games and clubs which furnish social life. All students have some diversification from the studies which should tend to make them better able to converse with and meet other people.

In order for the student to receive the greatest benefit from his college training it is necessary to have considerable social activity. For this reason we have the various social events which are so necessary to an enjoyable college life which is comparatively short in any case.

Reading

MANY of us remember in the secondary schools how it was necessary that some outside reading be done. This should have resulted in forming a habit of doing some reading every day. By reading only a short time each day some worth while article in a good newspaper on some current event or proceeding, one is able to talk intelligently to others about matters of mutual interest and also to acquire knowledge for himself.

The habit is not hard to cultivate and the time spent need not be long. The purpose is not to be an authority on any subject, but merely to be able to converse with other people on current questions and also perhaps matters connected with engineering.

The sources and availability of the material are abundant here at school. The library has daily newspapers and periodicals of interest. Such reading is for pleasure and personal information and not study. The literature should not be so difficult as to require study. If one can find time it is also well to read a few books. Reading under these conditions is time well spent and should be enjoyed if the fullest benefits are to be derived.

Farewell

ROSE is about to lose one of her staunchest men; a man who does his duties so thoroughly, correctly, and efficiently that one hardly realizes his presence. For that reason his absence will be the more noticeable. Professor Hutchins has taken a leave of absence and will leave during the holidays to take an engineering position with the T.V.A. Although we regret our loss, we extend to Professor Hutchins our best wishes and feel confident of his success in his new position.

—J. J. H.

Groundwater and Drought

(Continued from Page 9)

quantity throughout this region. In some places where the formation is thin, the meager water supplies have weakened or given out, but in others they continue in abundance, and no definite statement can be made as to the extensive effects of the drought. However, where the glacial drift overlies crystalline formations as in Minnesota and northern Wisconsin the water supply problem is acute.

Today, as never before, the importance of ground water supply is only too apparent. Too little time has been devoted in the past to study of ground water supply, and now that we realize its importance we must make an effort to increase our knowledge concerning it. Apparently ground water supplies have not been seriously depleted by the drought, but our limited knowledge does not enable us to say whether or not the supply is continuously decreasing.

NO CASE *for* *Sherlock Holmes*

No detective work is needed in locating the dealer who sells what you want. Just look in the "Where to Buy It" section of your telephone book!

There, local dealers are listed beneath the trade marks of many advertised products —such as Philco, Greyhound Lines, Willard Batteries, Buick and Goodyear. Besides helping you find easily and quickly the brand you want, this service helps manufacturers check substitution, helps dealers increase sales.

"Where to Buy It" is just one of many services pioneered by Bell System men to increase the value of telephone service.

Why not say "Hello" to Mother and Dad tonight? Bargain rates on station-to-station calls after 8:30 P. M.

BELL TELEPHONE SYSTEM

The Kimona Klub

CAMPUS

Herman's Kimona

Rose students and faculty were shocked not long ago to discover about a dozen replicas of Mr. Moench at work in Electrical Measurements Lab. It seems that the Junior Electricals were exceedingly envious of the mustache and smock worn by their instructor, so they provided the best substitute they could. From the Chem Lab came the burned cork mustaches, and from goodness-knows-where came the smocks, kimonas, bath robes, aprons, and coats. Bath robes were in the majority, but artists' smocks are thought to be the coming fashion for laboratory wear.

Military Ball

THE Military Ball this year lived up to the reputation of its predecessors and again makes its strong claim of being the outstanding social event of the year. Each year the Ball attracts many people who enjoy a formal dinner-dance that is distinctly different from any other held in the vicinity.

The Ball was held at the Terre Haute Country Club and the club house was beautifully decorated in red, white, and blue, with bunting and flags giving the hall a military air. Preceding the dance a dinner was served to the honor guests, to the members of Tau Nu Tau Fraternity which sponsored the dance, and the other guests.

Following the dinner the guests were formally greeted by the receiving line which was composed of Arthur W. Hess and Valerie Wade, Dr. Prentice, Major and Mrs. Knipmeyer, Miss Helen Mahley and Captain Stevenson, Captain and Mrs. Hutchins, Lieutenant and

Mrs. Garges, Mary K. Niccum and Norman H. Cromwell.

The dance started with the sounding of first call and the playing of "The Star Spangled Banner." The grand march followed and was led by the receiving line.

Music and entertainment for the evening were furnished by Jack Crawford and his orchestra. In the opinion of the guests Mr. Crawford lived up to his reputation of being the "Clown Prince of Music." The dance was appropriately closed with a beautiful rendering of taps.

Homecoming

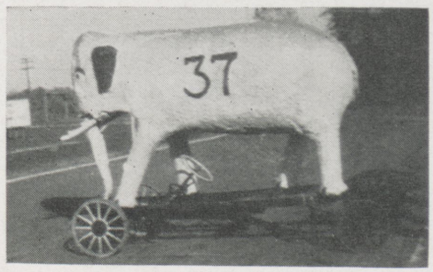
With no homecoming activities last year, those of this year were doubly welcome. An unusual amount of enthusiasm was shown both before and after the game. At a pep assembly on Thursday morning, Coach Brown, the man of many puns, introduced a new school song. It was the product of his mother, Mrs. Jessica Brown, who has on several occasions talked at student assemblies. It was the first song written exclusively for Rose by an ardent Rose booster. It is distinctive in that both words and music are original. It is called

The Receiving Line at the Military Ball

ACTIVITIES

Edited by

Carl Wischmeyer, m., '37



Rosie

"When Rosie Roves the Jungle" and reads as follows.

When Rosie roves the jungle, her trumpetings resound,
The other animals are still, and tremor shakes the ground.
She walks her way triumphant, and all the people shout,
"Make way for old Rose Poly, the Elephant is out!"

Chorus

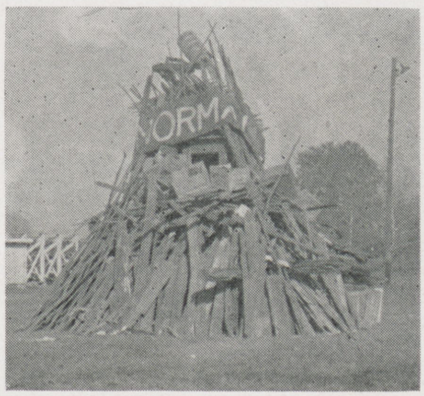
Sing, boys, sing! the team is on the field.
The ball's in play; our enemies must yield.
And when the game is over, you hear the loudest cheers
For Rosie and her playmates, the Poly Engineers.

2.

When foemen came against us, our mascot to destroy,
We made a ring round Rosie; we pummelled 'em with joy.
So shall they ever find us, all ready to defend
The honor of Rose Poly, till mortal days shall end.

Jessica Brown

Needless to say, with its clever words and catchy music, it was the "song hit" of the Homecoming. At the same assembly a new faculty yell made its appearance. It goes—



The Bonfire

Alfie, Stevie, Harvie, Doc,
Wischy, Knippy, Prexy, Stock!
Yea Rose!

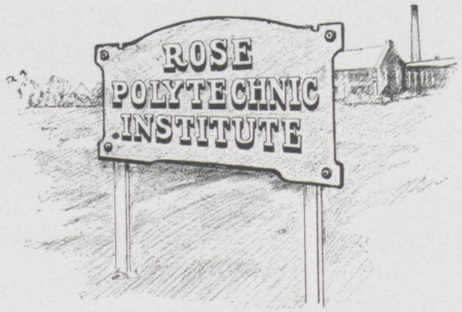
Both song and yell added much to the merriment of the occasion. In the evening Rosie went to town. Prepared in case of fire or theft, the Engineers met no opposition; and so Rosie was returned safely.

School was dismissed Friday afternoon, November 9, for the game with Oakland City, the outcome of which was most pleasing to the Engineers. The freshmen were assigned the task of getting together the makings of a super bonfire. This they did very satisfactorily. After the game the pile of timber was set off, and the flames rolled skyward. The Rose chapter of Tau Beta Pi supplied cider and hot dogs—all you could eat provided that you could stay in line to get the food. In the evening the Homecoming dance was held at the Trianon. This climaxed a most successful Homecoming. Many alumni were back for the occasion, and considerable comment was made on the fine spirit and enthusiasm shown.

Glee Club

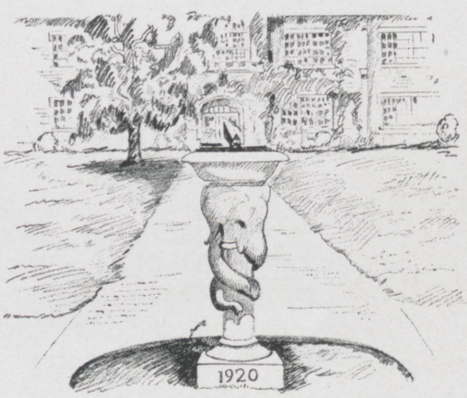
Early last month the Rose Glee Club made its first appearance. The occasion was the birthday of Mr. Herman Prox of South Center Street. Following practice the group went to the Prox home, and when Mr. Prox came to the door, they greeted him with the familiar strains of "Happy Birthday to You." The club sang several numbers including "Ave Maria" and "The Lost Chord," featuring Miss Dorothy McCullough and Mr. Bennet as soloists. Each member of the club was presented with a package of cigarettes. Refreshments were a welcome and much appreciated part of the enjoyable evening. With the singing of "Dear Old Rose," the members of the club joined in wishing Mr. Prox many more happy birthdays.

Members of Tau Nu Tau Military Fraternity and Their Guests at The Ball

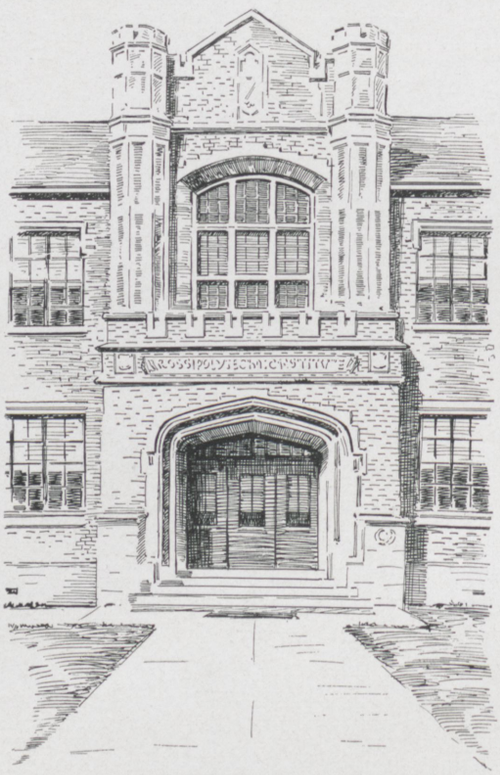


The Highway Sign

The Boulder



The Sundial



The Main Entrance

The Shop and Gym

The Dormitory

Scenes About School

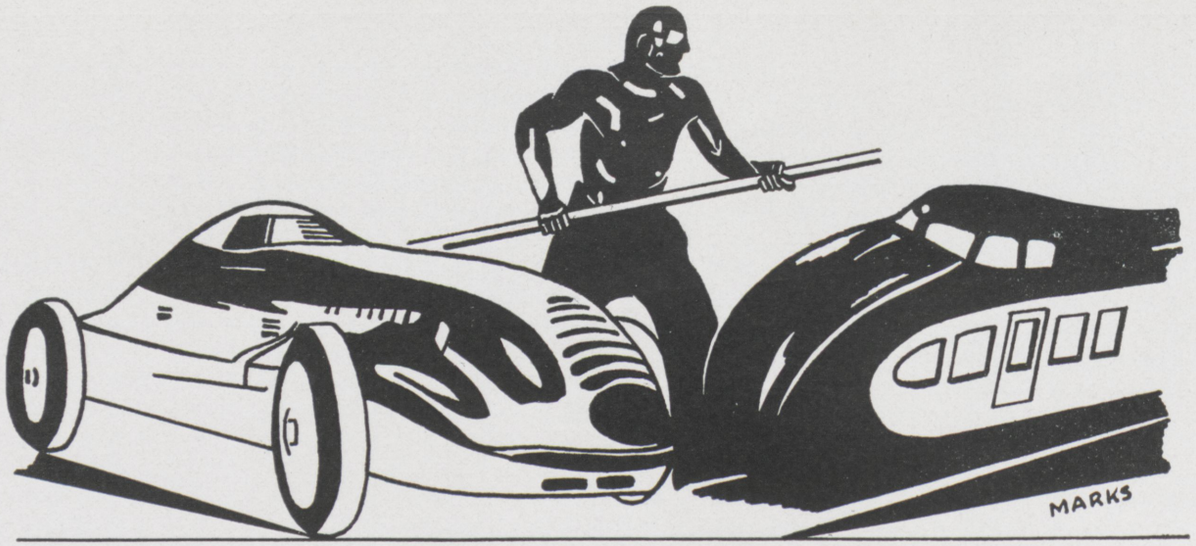
WILL YOU BE READY?

Industry is awakening. Already it is demanding technically trained men, men with engineering educations. Will you be called? Will you be ready?

Since 1874 Rose Polytechnic Institute has trained men for Industrial leadership. Well planned courses in Civil, Chemical, Electrical and Mechanical Engineering are offered. For complete information, write to the registrar.

ROSE POLYTECHNIC INSTITUTE

Terre Haute, Indiana



Research and Progress

Edited by Albert V. McEowen, c., '35

Electro-Chemical Descaling

THE increase in the use of heat-treated steel parts has accentuated the demand for a method of removing scale which would be free from some of the defects of current methods. The principles of abrasion and chemical erosion are extensively used, shot blasting, sand blasting, hand rubbing, and pickling being typical applications. All of these methods have certain common defects. The base metal is decidedly more vulnerable to abrasion, etc., than the hard outer scale; and since the scale is not uniform in thickness, nor uniformly bonded to the metal, nor always continuous, the abrasive and chemical methods are quite liable to harm the base metal while removing the objectionable scale.

It was to prevent such injurious effects that a new electro-chemical metal descaling process was introduced. The work or steel part is made the cathode in an acid electrolyte of low pH, with lead or tin anodes. A cathodic current density in excess of that used in ordinary electroplating of these metals is used. The tin or lead ions are deposited upon the cleaned surface of the metal in a thin film, forming a protective coating upon the descaled portion, and also serving to prevent the work from becoming permanently embrittled by the action of the acid electrolyte. Acid pickled samples have been tested and indications of permanent bittleness have been found. As the action progresses, hydrogen is liberated in large quantities at the surface of the work, "blasting off" the scale, while the metal deposit seems to be helpful in scale removal too by wedging its way between the base metal and the outer coating.

Another important act of the metal film is evidenced by the "throwing power" it imparts to the descaling process. When work covered with scale is placed in the cell, a film of hydrogen is developed around the work. As the scale is removed, the areas uncovered are covered simultaneously by the metal film. This film builds up a counter electromotive force equal to the hydrogen over-voltage of the metal of which it is composed, and this counter e. m. f. acts as an added resistance in the current paths leading to the metal covered areas. Consequently, the current shifts to the paths of least resistance and is concentrated upon the remaining scale covered areas. This throwing power increases the speed of the operation and adds to the efficiency by reaching remote surfaces as well as the more exposed ones.

One of the original electrolytes used was an aqueous solution of sulphuric acid, hydrochloric acid, and sodium chloride. Lead was used for the protective film. The bath operated at temperatures from 150 to 180 degrees fahrenheit, and the cathode current density was about 75 amperes per square foot.

The protective metal film added by this process can be removed by a reverse process in which the work is the anode in an alkaline electrolyte composed of an aqueous solution of caustic soda and trisodium phosphate. If this is done just before electroplating, painting, or otherwise protecting the surface, a much better job is obtained, since the film serves as a guard until the last moment and grease and dirt are removed with the metal. This film has a marked beneficial effect by prolonging the storage or shelf life of the part, preventing rust, etc. Some coatings can be put on without removing the film; hot-dipped coatings have been applied

in this manner with marked success.

Platform Vibration of Cement Bound Macadam

An experimental road was recently constructed at Elmhurst, Illinois, in which several different methods of compaction were used. The methods used were rolling with two weights of rollers, hand tamping, vibrating with three motors on a heavy wooden screed, and platform vibrating.

Both vibrators were found effective, but the platform vibrator has certain interesting features and is a new innovation, so it will be discussed more fully. A high frequency vibrator, mounted on a three by four foot wooden platform that moved back and forth as the position of the vibrator was changed, was the device used. One trip was made across the pavement immediately after the placing of the grout, and another trip after free water was no longer being released from the grout. The aggregate was not rolled before being grouted. The action of the vibrator mounted on the platform causes it to move across the pavement practically unaided, the direction being controlled by the position of the vibrator unit.

This device has some practical construction advantages: it is light, mobile, inexpensive, has a low operating cost, and requires only two laborers to handle it. It aids effectively the penetration of the grout, but must be put into operation at the time the grout is deposited to do any good. As compared to the roller method, its use resulted in a saving of coarse aggregate, since less was pushed into the sub-grade; but more grout was used, probably because the aggregate was not compacted first. The depth of the finished slab was more easily and closely controlled, slight differences in compactness being less noticeable than when rollers pressed the stone down more into the earth, a factor that would create a material saving if rains softened the sub-grade during the construction period. This type of vibrator is new in this country, but one similar has been used for some time in France in placing cement bound macadam pavements.

Lightning Equaled

The engineers in the General Electric Company's high voltage laboratory have been successful in producing a current discharge of a magnitude greater than that of any lightning stroke recorded to date. A quarter of a million amperes is the new record. Their equipment is not very impressive, particularly when compared to their other production, the high voltage transformer. On a wooden platform supported by insulators filled capacitors rated at 50,000 they placed ninety-six Pyranol-volts each, forming a hollow square, with three rows of eight on each side. The capacitors are connected three in series to give 150,000 volts, and thirty-two of these units are then connected in parallel. Heavy copper straps connect one terminal of these banks to a heavy copper plate in the center of the square, and the other to the upper of three spheres which are above this plate. The outer spheres are far enough apart to keep the 150,000 volt charge from jumping across, while the middle one is used to set off the discharge. The generator is charged with 110 volt, 60 cycle current, stepped up to 75,000 volt crest and passed through two Kenotron rectifier tubes in series, which convert it to 150,000 volts direct current. The capacitors are charged in about a half minute.

Many interesting and startling effects were produced by this extremely high current, which is as destructive as the lightning it imitates. A copper wire a tenth of an inch in diameter was completely vaporized, an iron wire of this size "exploded", a section of reinforced concrete was shattered, a fiber tube used to confine the arc was blown apart by the pressure, and a pane of glass several inches away was shattered by the discharge in open air. These are some of the lightning-like attributes of this current discharge. When it does not destroy, the current still exerts a tremendous force. A flat strap conductor was crumpled to an almost round cross-section when it carried the discharge, and two parallel wires bent apart in the middle were drawn together so strongly that they were flattened by the impact.

This ingenious piece of apparatus was not designed merely to give amazing effects, although these seemingly weird results have their place in the work. The G. E. high-voltage laboratory uses these developments in the study of lightning effects, with the intention of preventing power interruptions from such sources.

Reflectometer

It has become customary in recent years to specify paints, varnishes, etc., by their light reflecting power rather than by their color. The coefficient of reflection of the surface is used for this purpose. It can be measured for a mat surface by one method, and for a specular surface by another, but the two tests do not give accurate results if interchanged. A specular surface is one similar to silver or silver on glass. A large number of paints, papers, enamels, etc., give results which indicate a mixture of the two actions, so a reflectometer must be able to measure both accurately to be of any value.

An instrument has been developed which will measure correctly the extremes of specular and mat reflection; and it is believed that combinations of the two can be handled accurately as well. The reflectometer, an attachment for a direct-vision photometer, consists of a two inch hollow sphere of magnesium carbonate into which there are three openings. One opening is located in the bottom and admits light from a small lamp in a housing under the sphere, this light falling on a ground glass cover over the opening upon which

(Continued on Page 19)

Fraternity Notes

Sigma Nu

Beta Upsilon of Sigma Nu was pleased to see Mr. and Mrs. H. S. Richardson of Cleveland Heights, Ohio here on November 9 for the Homecoming game with Oakland City and for the dance at the Trianon that night. Mr. Richardson is a graduate of Rose in the class of 1900. He is a staunch member of the Sigma Nu fraternity.

Mr. and Mrs. C. B. Trowbridge of Chicago, Illinois visited here the week end of the Homecoming game and during the Thanksgiving holidays. Mr. Trowbridge who graduated with the class of 1905 is a member of Beta Upsilon chapter of Sigma Nu Fraternity.

Members of Beta Upsilon entertained friends with an informal dance at the Sigma Nu house, 441 North Eighth Street, Friday night November 23. Part of Leo Baxter's orchestra furnished music for the dance. Prof. and Mrs. Bloxsome and Lt. and Mrs. Garges were guests from the faculty.

Beta Upsilon were glad to have as their guests for the Military Ball Grant Phillips, a Sigma Nu from the University of Illinois, and George Davis, a Sigma Alpha Epsilon from the University of Wisconsin.

The Sigma Nu's of Rose Polytechnic wish to congratulate Bernard P. Melton of the class of 1935. He is the proud father of an 8¾ pound bouncing baby girl. Her name is Myra Jo Melton.

Theta Xi

Kappa chapter of Theta Xi fraternity celebrated the Thanksgiving holiday with a stag party held at the chapter house the evening of Wednesday, November 28. Many active members, pledges, and alumni were present and declared the event a big success.

On the evening of November 5th a banquet was held at the chapter house. Kappa chapter was pleased to have Prof. Henry C. Gray, of the faculty as its guest for the evening. The active members, pledges and alumni present spent an enjoyable evening.

Alpha Chi Sigma

Iota chapter of Alpha Chi Sigma takes pleasure in announcing the initiation of Norman Cromwell and Robert Shattuck.

The freshman chemists were honor guests at a departmental party held in the chemistry laboratory on the evening of December 7. Dr. Pruess of the Commercial Solvents Corporation was the principal speaker. In addition to the students and faculty several professional men attended this meeting.

Theta Kappa Nu

Indiana Gamma chapter held its annual Rabbit Hunt November 17, with an all day party for the actives and pledges. All the would-be hunters participated and killed more rabbits than we thought existed.

An open house was held Friday, November 23, and was attended by a large number of actives, pledges, and alumni. Refreshments were served by the pledges, much

to the satisfaction of the actives. This was one of our most successful parties held this season. Professor Stock and Walter Osmer and their wives were the chaperones.

The officers of the chapter for the fall and winter are: Robert Self, President; Richard Metz, Treasurer; and Paul Bennett, Secretary.

We were glad to welcome back several of our alumni who were fortunate enough to get a vacation over the holidays.

Alpha Tau Omega

Next Friday evening, Dec. 21st Gamma Gamma will hold its Christmas formal dance at the Deming ballrooh. Bill Epple and his Chicago music will play from 9:30 until 1:00. Invitations have been issued to Province Chief Jake Maehling and actives from the chapters at Indiana, DePauw, and Purdue. All alumni of the chapter are cordially invited to return for what gives promise of being one of the highlights not only of the chapters activities but also of the local Christmas season as well.

The Mother's Club has refurnished the chapter house this fall in preparation for entertaining the freshmen during rush week. The kitchen has been redecorated and new rugs have been placed in first floor rooms.

Gamma Gamma chapter takes this opportunity to extend to all Greek letter organizations on the campus, to alumni of this chapter, and to friends of Alpha Tau Omega its best wishes for a happy Christmas and a more prosperous year to come.

Research and Progress

(Continued from Page 17)

the test surface is placed. The third opening permits a view of an equatorial section of the sphere against which the photometer balance is made. The aperture plate is made of optically clear glass one mm. thick, deeply etched on both sides. The source of illumination is a photometer lamp carried in an adjustable housing, the light passing through a small circular diaphragm and illuminating a spot about one cm. in diameter in the center of the aperture plate. The amount of light entering the instrument is controlled by moving the light in the housing.

The instrument needs to be calibrated regularly to keep it accurate. This is done with the aid of two standards and an auxiliary. One standard is a block of magnesium carbonate which has been measured by other methods to have a coefficient averaging .98; and the other standard is a hollow metal hood, formed like an acorn, painted dead black inside, and constructed so that the reflection factor is taken as zero. Black photographic paper is used as an auxilliary, its coefficient being measured by some independent method before it is applied to give intermediate points on the calibration curve.

In calibrating, the magnesium carbonate standard and the black hood give the extremes of the curve, while a novel method is used for the others. With the aid of lines marked on the cover of the instrument, the black photographic paper is placed over part of the aperture, and the magnesium carbonate is used to cover the rest of it. The coefficient of the composite surface is the average weighted coefficient of the two. This method is limited in accuracy only by the errors in placing and measuring the areas of the two surfaces, and the use of the lines on the cover reduces this to a minimum. The small number of standards used prevents more serious variations.

Since it has been shown that the reflecting power of a surface varies with the angle of incidence and that an integration of the reflecting power up to an angle of sixty degrees gives a coefficient about equal to that at forty-five degrees, the reflectometer has been designed to give an integrated coefficient equal to the forty-five degrees coefficient. The angle of incidence seldom exceeds sixty degrees, so higher values were excluded.

The surfaces to be tested are placed in contact with the diffusing disc covering the aperture, the photometer is balanced, and the calibration curve gives the coefficient. With second surface mirrors, correction factors allow for the glass thickness.

SPORTS

Edited by

Harry Richardson, m., '35

Rose vs. Oakland City

Rose continued to lengthen its string of consecutive Homecoming victories when the Fighting Engineers put down a scrappy Oakland City team by the score of 15-13. The game was very exciting to watch because it brought out so many of the interesting features of modern football.

Rose started off well by advancing the ball steadily to the Oak twenty yard line by means of a versatile attack. Here the Oaks stiffened and the Engineers were confronted with a count of fourth and six to go on the twenty yard line. However, Richardson dropped back to the twenty-seven yard line and, with Hufford holding the ball, kicked the ball cleanly between the uprights for the first Rose field goal in years.

The beginning of the second quarter found the ball in possession of Rose on its own 44 yard line. From here a combined passing and running attack gave the Engineers a first down on the five yard line. After two tries at the line, Richardson shot a short pass to Hufford for the touchdown. The first kick for the extra point was good, but Rose was off side. The second kick was wide. Two plays after the following kickoff Hutchinson, Oak fullback, went through the right side of the Rose line, reversed his field, and scampered 80 yards for a touchdown. An off tackle play by Vire was good for the extra point. Rose received the kickoff, but two plays later lost the ball on a fumbled triple pass. On the next play Vire went through the left side of the Rose line, reversed his field, and scored. He was stopped on the line of scrimmage on an attempted plunge for the extra point. However, the Fighting Engineers lived up to their namt by coming back with a drive which started from their own 35 yard line and ended in a touchdown when Richardson passed to Campbell, who twisted his way 15 yards to a score. The kick for the extra point was blocked. Rose started another drive down the fied, but it was cut short by the end of the haf.

The second half was featured by play of an entirely different nature. The Engineers started under a handicap when they were penalized for coming down to the field late, and were obliged to kick off from their own 15 yard line. This put Rose on the defensive from the start, and, although numerous drives were made deep into Oak territory, the Engineers seemed to be content with their two point lead. Oakland City never threatened seriously in the second half, but the spectators lost a heartbeat or two as the Oaks threw pass after pass in an effort to score. The game ended with the ball in possession of Rose in midfield.

Lineup and summaries:

Rose—15 vs. Oakland City—13

Score by quarters:

Rose	3	12	0	0	—15
Oakland City	0	13	0	0	—13

Scoring: Rose — Touchdowns: Campbell, Hufford. Field Goal: Richardson.

Rose vs. Evansville

Rose lost to an apparently beaten Evansville team in the fourth quarter. The defeat was caused lergely by two blocked punts, which served to take a lot of the fight out of the Engineers.

The Rose gridsters broke into an early lead in the first quarter when Richardson slipped through tackle and ran 60 yards past a perfectly blocked Evansville secondary. Richardson's kick for the extra point gave Rose a 7-0 lead. The Engineers, aided by a strong wind at their backs, kept the play for the remainder of the quarter in the Evansville half of the field.

Midway in the second period the Aces recovered a Rose fumble on the Engineer's 18 yard line and promptly took advantage of their break by scoring, Theby making the final yards as he went over from the three yard marker. Johnson's kick for the extra point was good. Evansville finished out the half trying to score by way of the air, but an alert Rose secondary spoiled every pass.

The play during the third quar-

ter was rather quiet and uneventful. However in the final period things began to happen. A kick was blocked and recovered by Evansville on the Rose 8 yard line. Here the Fighting Engineers held off the Aces for a 3 yard gain in four attempts. However, Evansville scored again on a reverse from the Rose 35 yard marker, and then scored again from the 5 yard line against an apparently listless Rose eleven.

Lineup and summaries:

Rose—7	vs.	Evansville—25
Laughlin	L.E.	Pollard
Vondersaar	L.T.	Bufkin
Colburn	L.G.	Epperson
Tucker	C.	Johnson
Lyons	R.G.	Theby
Presnell	R.T.	Ramsey
Tait	R.E.	Thuerbach
Bard	Q.B.	Hartke
Richardson	L.H.	Graham
Campbell	R.H.	Grote
Fox	F.B.	Walsh

Score by periods:

Rose	7	0	0	0—	7
Evansville	0	7	0	18—	25

Substitutions: Rose—Sentman, Wodicka, Hoffman, Cartwright, Eyke, Fuller, West, Sears.

Rose vs. Earlham

Rose dropped a heartbreaking decision to the Earlham Quakers by the score of 6-0. The game was played in a sea of mud, with rain, driven by a hard wind, making playing conditions still worse. The game was based upon a punting duel with Earlham having a slight edge on net yardage from kicking plays. Trick plays and passes were not in order for the day, so that the resulting game was a bitter struggle of smashing line play.

The Engineers made their only threat early in the first period when they recovered an Earlham fumble on the Quaker 25 yard stripe. Although hampered by a 15 yard penalty for holding, Rose completed two passes to put them in scoring territory. However, the Quakers held on their one yard line and kicked out of danger.

Earlham threatened in the same manner when a poor kick gave them the ball on the Rose 30 yard line. They also penetrated to the Rose 3 yard marker, but were held by an eleven of Fighting Engineers and the score at the end of the first half remained a scoreless tie.

Play during the second half continued on even terms as far as ground gaining was concerned, with the exception of one play. Just one play, the ruination of many a good game, put the kibosh on this game as far as Rose was concerned. Hall slid around right end on a single reverse from a double wing back and slipped 44 yards for a touchdown. He was apparently stopped several times, but the mud was in his favor and the would-be tacklers slid off. It was a tough game to lose, but the Engineers for the first time this year, showed a lot of fight during the entire game.

Scoring by periods:

Earlham	0	0	6	0—	6
Rose	0	0	0	0—	0

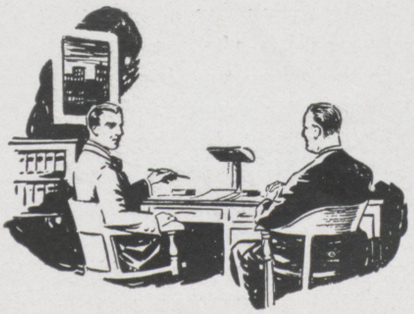
Substitutions: Rose—Wodicka, Eyke, Fuller.

(Continued on Page 22)

Alumni

Edited by

Jay F. Hall, e., '35



Here and There With the Grads

'97 Jay H. Hall, who became ill last June with heart trouble, has recovered in fine shape and is now able to go back to work.

'00 Harry S. Richardson and his wife came back to Rose in November for homecoming and also to see their son Harry H. Richardson, who is now a senior.

'02 Fred R. Fishback, President of the Electric Controller and Manufacturing Compony in Cleveland, was elected Vice-President of the National Electrical Manufacturers Association by the board of governors at the association's recent annual convention in Chicago.

'04 Harry Smith is now Master Mechanic with the Union Carbide and Carbon Company at Whiting, Indiana.

'05 Charles B. Trowbridge was back for homecoming, and also to see his son who is now going to Rose.

'06 Earle S. Butler and his wife spent the Thanksgiving holidays in Terre Haute with their son.

John M. Rotz and family were back for homecoming. Mr. Rotz's son is also a student at Rose.

'21 Ray Miller visited Rose November 19th. He is located in Indianapolis as district manager for the Century Electric Company.

'22 Eugene S. Whitlock now has a position as engineer with the Gulf Refining Company of Toledo, Ohio.

'31 Anthony G. Blake, who is with Commercial Solvents, has been transferred to Peoria, Illinois.

'32 William A. Haynes is working for the Pennsylvania Railroad on electrification. At the present time he is stationed in Baltimore.

Bertram M. Menden is taking student engineer training with York Ice Machinery Company at York, Pennsylvania.

'33 W. Franklin Crawford is in the tool designing department of the Packard Company at Detroit.

John C. Dalrymple is with Inland Steel at Indiana Harbor.

Alfred E. Hilgeman is assistant to the Chief Chemist of the United Electric Coal Companies, at Du Quoin, Illinois.

Dan Ringo is with the Union Carbide and Carbon Company at Whiting.

Charles B. Sipple is with the Sinclair Refining Company at East Chicago.

James C. Skinner is now working for the Pennsylvania Railroad and is located at York, Pennsylvania.

'34 John Babillus is with the Reynolds Coal Company at Staunton, Indiana.

Jack Foulkes is now working for Hulman and Company.

Harry McGurk is connected with the International Harvester Company in Peoria, Illinois.

J. Robert Motz, who is with the Wyoming Highway has been transferred to Farson, Wyoming.

John R. Mattingly has a position with TVA.

ex'09 November 4th the senior civils at Rose went to Illinois University where they made the acquaintance of Mr. Tuthill, who is Associate Professor of Railway Electrical Engineering.

ex'33 Harold Barrett has entered General Motors School of Technology at Flint, Michigan. He is doing his cooperative work at the Fisher Body Company.

Marriages

Samuel B. Dibble was married in November to Miss Eva Jenkins. The wedding ceremony took place in Elizabethtown, Kentucky.

Ronald W. Updike was married in November to Miss Virginia Wythe of East Glenn, Indiana. Mr. Updike graduated from Rose last June and is now employed by Switzer Cummins Automotive Industry in Indianapolis.

Births

John W. Chinn, who graduated from Rose in 1930, recently announced the birth of a son. Mr. Chinn is now with A. T. & T. in New York City.

Rose vs. Millikin

(Continued from Page 21)

Rose took a trip to Decatur, Illinois on Thanksgiving Day to play James Millikin University. This game marks the first time that Rose has ever played on Thanksgiving Day. The game was originally scheduled in order to complete an eight game schedule; however no false hopes were ever entertained for a possible victory. Millikin more than lived up to its undefeated record by pounding its way to a 62-6 victory. The game was very peculiar in that I have never seen a team look so good in a game in which it took such a terrific numerical beating.

Millikin put upon the field two equally fine teams, with heavy fast-charging lines, and speedy shifty backs. Each team played half of each quarter; consequently the Engineers were continuously

playing against a practically fresh team. Millikin never let up, as one might expect they would, but kept on driving in an effort to pile up a big score. All of their touchdowns were made on long runs from 25 yards and up, with most of them of the longer variety; however they seemed to be completely stopped the remainder of the time.

Rose, although hopelessly outclassed, put up a fighting, peppy game, and never seemed to show evidence of the beating it was taking. It is my opinion that Millikin was talked out of a good many points by the large order of chatter and banter put out by the Engineers. Although Rose never threatened seriously, five first downs were made; and Garmong and Hufford returned kickoffs past the midfield stripe. The Engineers scored when Captain Richardson, playing his last game, intercepted a Millikin pass on the 20 yard line and slipped 80 yards through the mud for a touchdown. His kick for the extra point was wide.

Lineup and summaries:

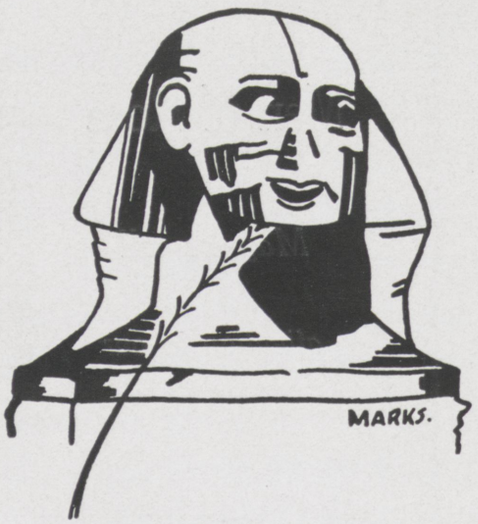
Rose—6 vs. Millikin—62

Substitutions: Rose — Hufford, Fuller, Hoffman, Wodicka, Garmong, Sentman, Stanfield.

At a banquet after the Millikin game, James Hufford, one of this year's quarterbacks and a letterman for the past three years, was elected Captain of the 1935 football team.

At a meeting of the Student Athletic Board on Tuesday, December 4, the following men were awarded letters in football: Seniors—H. H. Richardson, L. Lyon, D. Colburn, N. Tucker, A. Bard, W. Eyke, and P. Presnell; Juniors—J. Campbell, J. Hufford, S. Tait, R. Laughlin; Sophomores— J. Fox, E. Wodicka; Freshmen—H. Vondersaar, C. Fuller.

CONDENSED VAPORIZATIONS



Edited by

Edd A. Coons,
Ch., '36

We read that for every dollar spent on books twenty-seven dollars are spent on chewing gum. No doubt, but you must remember that you can borrow books.

Why is it that Tappan always uses a straw when drinking a coke? Force of habit?

When we look at some basketball games we wonder why it is necessary to send to Africa for ivory.

It was on top of a crowded bus in Chicago.

"Low bridge!" shouted the conductor to the passengers. "Everybody keep his seat, and face to the front."

A gay little flapper up forward turned around, smiled sweetly, and said, "My dear, you know that can't be done."

—*The Michigan Technic.*

He: "You don't drink?"
She: "No!"
He: "You don't smoke?"
She: "No!"
He: "I'll be up to see you tonight, you must do something."

Cheer up freshmen, there must have been dumber guys than you at some time or other, else where did the seniors come from?

Condensed Vaporizations

Table Don'ts for the Dorm

1. Don't reach across the table unless you have at least one foot on the floor. Disregarding this rule is considered unfair to other members.
2. Don't permit butter patties to land anywhere except in the receiver's eye when throwing them across the table.
3. Don't leave your spoon in the cup. Swallowing a spoon is worse than swallowing a fish bone.
4. Don't rest your arms on the table, the legs may be weak.
5. Don't butter large pieces of bread. It may tempt you to take too large a bite.

Judging from present day dancing, familiarity doesn't breed as much contempt as it ought to.

—*Life.*

We hear that William R. (Roustabout) Huff, who hails from somewhere back in them thar hills, pulled the prize boner of the year. He wrote a prominent cereal manufacturer the following testimonial:

Dear Sirs:

After taking four boxes of your corn flakes, my corns have all dropped off. Thanks to you I am able to arrive at school at 5:30 instead of 6 A. M.

Glossary of Rose Terms

A Senior—Composition: Corduroy 100%, Work 0%, Brain, A trace (Less than ½ of 1%).

Applied Mechanic—A course in string tricks and old jokes.

Exams—Teachers answer no questions; students answer no questions; which makes the score even.

Senior Bench—Hot seat for underclassmen.

Book Store—Buzz in and get stung.

Civil Lab.—Big machines for little men.

Chemistry Lecture—Verbal anaesthetic.

A Freshman—An animal who has no reason for existence.

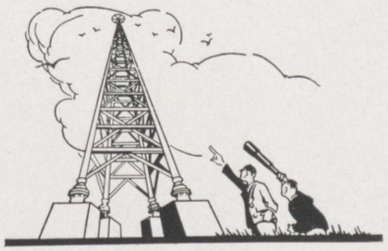
I hear that two senior "smelleruppers" have selected for their research the problem of "How many legs on the periodic table?" or "How to be a mortar to your country."

Prof. Bloxsome: (Trying to give the members of his public speaking class confidence) "Just remember, nothing is impossible."

Voice from read: "Ever try to strike a match on a cake of soap?"

One of the oldest and meanest tricks in life is dropping your girl till after Christmas, but it's still quite popular.

G-E *Campus News*



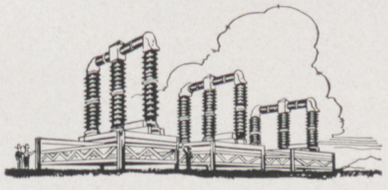
TALKING TOWER

The highest self-supporting tower in the United States used as an aerial is now in operation at General Electric's radio station KOA at Denver. The tower, standing 470 feet high, is a departure from the customary type of radio antenna, where copper wires are stretched in "clothesline" fashion between two towers. It will act as a vertical radiator of radio waves.

With the "clothesline" antenna, a large part of the electric energy released flows directly upward and is lost in space, whereas with the new type of radiator at KOA, a larger quantity of the broadcast waves radiate parallel to the earth's surface.

Slender compared with others of its kind, the tower is but 35 feet square at the base and tapers to two feet square at the top. It will withstand a wind of 125 miles an hour, and its 50-ton weight is carried by four huge porcelain "eggs," which insulate it from the ground.

The new antenna was installed this summer in connection with a new 50,000-watt General Electric radio transmitter.



RECORD-BREAKING BREAKERS

The 287,500-volt transmission lines from Boulder Dam to Los Angeles will be protected by eight General Electric super-speed impulse oil circuit breakers—having higher ratings than any other circuit breakers so far developed. In appearance, the breakers are completely different from previous breakers. They resemble great "E's" lying on their faces. They will be used at a higher voltage than any other breaker. They are rated to interrupt the circuit in slightly more than one-third the time required by previous high-voltage breakers. The most startling fact about the breakers, however, is that the complete units will weigh less than the oil which would be required by a unit of conventional design.

The impulse type of breaker, in which a piston drives streams of oil into the arc paths when the contacts separate, was developed by General Electric engineers at first for electric railway service, where it has proved highly successful.

COFFIN FELLOWSHIPS

Eight technical graduate students resumed their studies this year with the reassuring thought that a good part of their expenses will be taken care of by fellowships granted them by the Charles A. Coffin Foundation, which was established by General Electric in honor of its first president.

The fellowships were granted to: Russell Charles Buehl, Brooklyn Polytechnic Institute, '32, M. S. at Massachusetts Institute of Technology, to study at M.I.T.; Milton G. White, U. of California, '31, to continue study there; Bascom Henry Caldwell, Jr., U. of Texas, '30, to study at Yale; Thomas Benjamin Jones, Johns Hopkins, '33, to continue study there; Sidney Kaufman, Cornell, '30, to continue study there; Leonard Trainer Pockman, Stanford, '33, to continue study there; Arnold Byron Steiner, Stanford, '33, to continue study there; and Clark C. Stephenson, U. of Kansas, '32, to study at the U. of California. All the fellowship winners are carrying on investigations in electrical phenomena; two are specializing in high-voltage research.

In addition to these fellowships, the Charles A. Coffin Foundation annually grants awards for the highest achievements in the utilities and electric railway fields, and honors G-E employees who have made outstanding contributions to the progress of the Company and the industry.

96-85DH

GENERAL ELECTRIC

A man and his wife who had just returned from a round-the-world cruise spoke of Chesterfield as "an international cigarette."

It means something

. . . that Chesterfield Cigarettes are on sale in 86 countries all over the world.

It means something that Chesterfields may be purchased on nearly all ships and at almost every port.

It means that for a cigarette to enjoy such popularity, it must have merit. We do our level best to make Chesterfield as good a cigarette as can be made.

Smokers say . . .
in almost every language

they Satisfy

Above—Vacuum tin of 50 —air tight—water tight—fully protected even if submerged in water.

Packages of 20 wrapped in Du Pont No. 300 Cellophane—the best made.