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Rose Technic Staff

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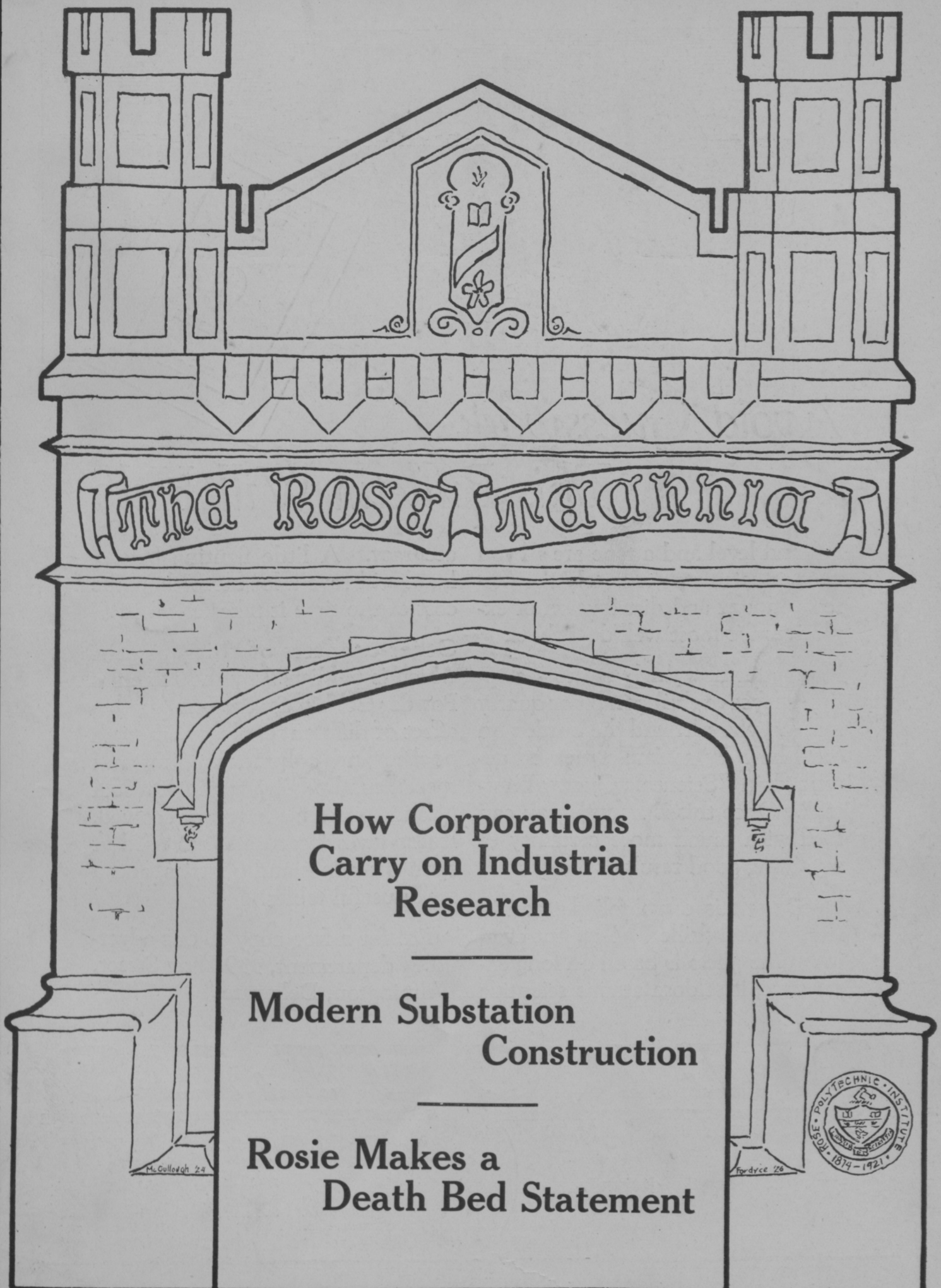
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# How Corporations Carry on Industrial Research

## Modern Substation Construction

## Rosie Makes a Death Bed Statement







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MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

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**WILLIAM KONRAD ROENTGEN**  
1845-1923

Born in Lennep, Prussia. Educated at Zurich. Awarded the Rumford Medal of the Royal Society in 1896 jointly with Philip Lenard for discovery of X-rays. Won the Nobel Prize in physics in 1901.

## “I did not think— I investigated”

One day in 1895, Roentgen noticed that a cardboard coated with fluorescent material glowed while a nearby Pluecker tube was in action. “What did you think?” an English scientist asked him. “I did not think; I investigated,” was the reply.

Roentgen covered the tube with black paper. Still the cardboard glowed. He took photographs through a pine door and discovered on them a white band corresponding to the lead beading on the door. His investigation led to the discovery of X-rays.

Roentgen's rays have proved an inestimable boon to humanity. In the hands of doctor and surgeon they are saving life and reducing suffering. In the hands of the scientist they are yielding new knowledge—even of the arrangement and structure of atoms. The Research Laboratories of the General Electric Company have contributed greatly to these ends by developing more powerful and efficacious X-ray tubes.



The General Electric Company manufactures everything electric—from fans to powerful locomotives, from tiny lamps to mighty power plants. Its products are used around the world.

# GENERAL ELECTRIC

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# HOW CORPORATIONS CARRY ON RESEARCH

By H. A. Schwartz, '01

Manager of Research,  
National Malleable Castings Company, Cleveland

IT is axiomatic that all enterprises pay for the information necessary to the most economic conduct of their operations, whether they secure it or not. In other words, it is cheaper to pay for knowledge than to incur the losses resulting for lack thereof. Most industries, therefore, engage in experimentation, though not always knowingly, and frequently uneconomically.

A very successful executive once told the present writer that he had conducted his business for years without feeling the need of a research engineer. In almost the next sentence he stated that for several years he had given systematic personal attention to determine the cause of certain operating losses due to defects in his product. The executive's position is justifiable only on one of two grounds; he may feel that he could not hire a sufficiently able engineer for any less amount than the value of his own time; or he may take sufficient pleasure in such activities to prefer to carry them on himself at greater expense than they could be carried on for him by others.

## Research and Plant Control

It may be well at this point to differentiate between research and other forms of experimentation. The distinction is one of purpose rather than of method, research properly implying a seeking after new facts or new knowledge, usually of somewhat fundamental character. The analyses and tests made for the purpose of works-control and to insure that the product meets standards of quality do not constitute research, irrespective of their exhaustiveness and precision. Neither are tests of industrial equipment, to determine the empiric conditions for the most economical conduct of a process. An instance may be in point. Some twenty years ago, nothing being then known as to the relation between chemical analysis and physical properties of malleable castings, the writer analyzed a very large number of heats, made tests of the resulting product, and determined total carbon to be the most important factor in fixing strength and the quantitative relation of carbon and strength. This constituted research, but the habitual repetition of exactly similar work on each heat made by the company since, is works-control.

Charles Kettering of the General Motors Research Corporation summed the matter up in his usual pithy style by referring to a Research Laboratory as a "fact factory."

## Research in the Plant or Outside

Industrial research is research either in pure or applied science calculated to benefit the parent industry. The relative weight laid upon the two types varies greatly with the character of the industry, the attitude of its higher executives, and the vision of its director. Thus, some of our greatest theoretical advancement in properties of materials in general, is due to Dr. Jeffery of the Aluminum Company of America. His slip theory of hardness and his metallographic application of X-ray spectrometry bears no particular relation to aluminum rather than other metals, but has been enormously fruitful of results both for the Aluminum and others. Similarly, the

telephone interests have done a vast deal of work in pure physics in order to advance the science of sound transmission.

The problems of applied science, such as the work of Coolidge of the General Electric Company in perfecting vacuum tubes for X-ray work, furnishes an example of applied scientific research; and many others, as for example, the development of ductile tungsten, might be cited.

The selection of a field of work is undoubtedly one of the most troublesome and important problems and will be touched upon later.

Industrial research is organized and financed in a number of ways with more or less success, and none of these methods is best in all cases. Very many producers feel that their major research work should be carried on independently of all outside cooperation. The position has merit on the ground that in this way the results can best be conserved for those who financed the effort, and also simplifies the situation with respect to patents. Its disadvantages are that only the larger corporations can bear the expense, and that there may result a somewhat narrower outlook than from some alternative plans.

There is no necessary connection between success and cost of building, equipment, and staff. An illustration of interest to all Rose men is the brilliantly successful work of our Dr. W. A. Noyes on the combining ratio of oxygen and hydrogen carried out at Terre Haute with the simplest of equipment, and later closely certified by his work at the Bureau of Standards. However, only the outstanding experimenter can overcome such handicaps, and generally equipment is cheaper than genius.

On the other extreme, a closely controlled research program consists of encouraging research in University laboratories and Government Research Departments on problems of fundamental interest. Such a program costs little, and enlists the services of high grade men, but only in subjects of general interest, which may be freely published. The agricultural industry of the nation has so far had its problems solved for it gratuitously, except in so far as its proportion of taxes supporting these state and national activities may be a recompense.

Research fellowships at such institutions as the Melon Institute offer another solution for those who can not afford the capital investment in a private laboratory. They lack something in contact with the parent concern, but, on the other hand, present the advantage of permitting consultations with others engaged in similar work, and insure a greater privacy than the second method.

## Commercial Research Organizations

In some cases trade organizations engage in co-operative research, as for example, the bakers and canners. Such research properly strengthens the industry as a whole, but is possessed of two disadvantages. Jealousies are likely to arise as between members over the work in progress, and there is removed the spur of self interest which is so strong a factor in all human success. Since all the information will finally become property of the entire organization,



there is a great tendency for lassitude and lack of zeal in cooperation. In the vernacular of a few years ago, "Let George do it."

A typical instance of cooperation in research is the excellent work of Professor H. V. Moore in the Fatigue of Metals investigation at the University of Illinois under the auspices of the University, the National Research Council, and the General Electric Company.

In the industry with which the writer is personally most familiar, a trade organization, The American Malleable Castings Association, representing the great majority of the tonnage of the country, through its Consulting Engineer, Mr. Touceda, and its Shop Practice Committee, carries on certain experimentation. Some of its members carry on additional research work in cooperation with public or semi-public institutions, as for example, the Saginaw Malleable, with Colonel A. E. White of the University of Michigan. At least two members maintain research organizations of their own. To the writer's knowledge, faculty members of at least two Universities, Dr. Diederichs at Iowa, and Dr. Storey, some time at Wisconsin, have carried on, of their own desires, work related to the industry.

#### Specific Cases

In the remainder of this discussion the writer will venture to use the Research Department of the National Malleable Castings Company as an example of the functioning of such an organization. In extenuation of this, perhaps, too personal attitude, it may be urged that only by dealing with the problem from an intimately familiar viewpoint can he be sure of correctly stating the position of at least one laboratory organization.

For a more formal and general survey the reader is referred to Kenneth Mee's book, "The Organization of Industrial Research."

The Company organized such a department primarily, of course, to improve its own competitive position in the field. To this end it desired to have at its disposal an adequately equipped laboratory whose attention could be centered upon these problems, which it regarded as most important in the prosecution of the metallurgical portion of its business, without the necessity of making any disclosure of its results unless it so desired.

It is obvious that if financial gain is possible from the results of research, that gain belongs to those who financed the campaign. It is, therefore, proper that the results of research must be so used as not to jeopardize the interests of the parent company.

In general, research may result in patentable improvements of process or product; if so, the disclosure may only be properly made after the matter has passed through the Patent Office. The result may indicate non patentable improvements in which the company's interest can be preserved, usually for a limited time only, in the form of trade secrets and silence is imposed upon the researcher. The results may be of such character as to benefit the entire industry by opening up new uses for a product or securing a better knowledge of its properties. Such information is useless until published, but should be circulated in an ethical manner and without exaggeration, and certainly without misrepresentation, or the organization suffers an immediate loss of prestige.

Results are rather frequently obtained having an application to pure science, and which may be di-

vorced from industrial application for publication. There seems to be a moral obligation to contribute to the fund of public knowledge whenever this is possible without detriment. Moreover, such a course stimulates criticism and discussion which are very helpful in further investigations.

The company had, at the time this department was organized, eight laboratories in its several plants. Experience has shown, however, that if research work and control work are sandwiched together into one laboratory, one roots out the other, the survivor being usually the one in which the local laboratory chief is most interested.

In research, interpretation is much more the goal than extreme precision, and there are many instances where the accuracy of routine work is much greater than that of research investigations. In other instances the sole function of research is to secure great precision of quantitative knowledge, and no result is sufficiently accurate which contains any sources of error capable of elimination.

The first and most important choice confronting the individual intrusted with the administration of industrial research is a selection of the problems to be studied. An organization may diligently seek the truth, but unless the truth, when found, is useful in the manufacturer's business, he will soon weary of paying the price and the research organization will cease to exist. This has happened in many cases. In one, an organization doing good work was disbanded, figuratively over night, because the considerable amount of interesting experimental data obtained bore no apparent relation to the gainful operations of the employer. Here it is an advantage if the chief of the laboratory has a sufficiently broad knowledge of the business to be able to decide for himself the most urgent problems for attack.

In most organizations two distinct types of investigation must be provided for, side by side. Sales, purchasing, and similar departments, which may be headed by men of business rather than those of engineering experience will submit for solution problems of the character described by the slang phrase "trouble shooting," whose importance is sometimes out of all proportion to their technical interest. In perhaps three quarters of such cases, the research department should know the answer without any investigation. In some cases it may have to make analyses or tests. Occasionally such inquiries suggest fields in which more exhaustive study may be of benefit. Such problems are set aside for future or continuous study. In general, however, a true research organization must not spend a major portion of its time on such experimentation; else it will never touch upon the fundamentals.

Ostwald has said in effect, that knowledge is advanced by research in either of two ways: the researcher having obtained a new fact or idea seeks to make as many applications thereof as possible, and determine all its possible consequences and relations to other facts and ideas, or he selects a field which he believes to be interesting, but of which knowledge is lacking, and seeks to learn all about that subject. The former viewpoint is the more stimulating and agreeable, and is, perhaps, productive of the most spectacular and rapid advancement of knowledge. Failing in one direction, the investigator is under no necessity of continuing, but can slightly divert his

(Continued on page 18)



## MODERN SUBSTATION CONSTRUCTION

FOLLOWING the trend toward complete mechanical labor to be seen in other industries, the electrical power industry is rapidly becoming more and more automatic in operation. Certainly this will eliminate mistakes and accidents due to human imperfections, provided the apparatus is designed for rigid reliability. The electrical engineer of today has the design of this apparatus as one of his important problems. How nearly mechanical devices can replace labor depends entirely upon how well this problem is solved. Let us see how far we have gone toward this goal in one of the places where it is most easily accomplished—the substation.

The substation to be described is the property of the Northern Indiana Gas and Electric Company. This company supplies the cities and industries of the Calumet district of Indiana. The power plant is located at East Chicago. From this plant are fed the cities of Hammond, Whiting, East Chicago, and Indiana Harbor, in addition to about fifty industrial plants in the district. The situation is peculiar in that the population is concentrated in several cities all confined to an area of only a few square miles. The distance between centers of distribution is too great to permit of centralized control so that it is necessary to provide substations at practically all load centers.

One of these substations is the new Whiting sub. This sub was completed in the middle of the summer and takes the place of a very old and inefficient substation. In the short time in which it has been operating it has very strongly proven the wisdom of such an investment.

The construction of the sub is similar to that used in most substations today. It is fed by three 11,000-volt lines, any one of which is capable of carrying the entire load of the station. The feeder-lines are brought from the power house by entirely different routes, so that in cases of emergency the station may be assured of a reliable source of energy. These lines are carried into the substation and brought to the automatic 11,000-volt oil-switch on busses carried on pipe work in the top of the station. After passing through this switch, the current goes to a transformer bank which is located just outside the building. At the present time this consists of three transformers of 400 K. V. A. capacity. The secondary voltage is 2200. The secondary circuit returns to the substation where it is distributed on heavy busses. The outgoing lines are three in number and are also controlled by automatic oil-switches similar to that used on the incoming line. In addition to these three lines, the street lighting current is taken from the same bus.

Voltage regulation on the outgoing lines is obtained by means of an inductance voltage regulator on two phases of each line. These regulators operate from a transfer bus and are arranged so that by means of a double-pole disconnect they may be thrown off the line at any time for the purpose of repair or change. This has proven an excellent arrangement since adjustment and cleaning are necessary at intervals. These may be accomplished without the necessity of an interruption.

The remainder of the station is given over to the street-lighting apparatus. Street-lighting in Whiting is entirely incandescent. A number of lamps are connected in series, each lamp drawing 6.6 amperes. To supply this current, constant current transformers are used. These are of the latest type and are used in connection with a plug switchboard. The lights are turned on and off by an automatic time clock which may be regulated to suit the season. The switch mechanism, controlled by this clock is also immersed in oil.

The lightning arresters used are the oxide-film type. Wherever they have been used by the company, they have proven very much more satisfactory than the electrolytic style of arrester formerly employed, on account of the fact that they require no attention.

The oil-switches are one of the outstanding features of the construction. They are all of the newest type of automatic equipment. When a switch kicks out for any reason, a timing device is started which, at the end of one minute, closes the circuit on a three-phase motor which actuates a clutch, throwing in the oil-switch. Should the switch go out again, this timing mechanism continues to run and, at the end of another minute, throws in the switch again. The mechanism is so constructed that the time intervals may be adjusted both as to length and as to number. If the operating company should desire it, as in the case under discussion, the switch is locked out after it has kicked out a given number of times. It is necessary, then, after the trouble has been located, to send a man out from the power house to put the circuit back into operation. If, however, a still better arrangement is desired, the unlocking of the switch may be controlled from a centralized switch-board in the power house.

The advantage of such construction is very obvious. A substation operator must be very cool-headed to do the right things in time of emergency. With such equipment as this, however, the troubles which might occur on account of physical disability or lack of knowledge or judgment on the part of the operator are entirely eliminated.

The instruments used are all recording. It is only necessary to recharge these with new rolls of paper about once in every three months. In addition, they give a very complete record of the manner in which the station has been operating. The mechanism which actuates the rolls is highly delicate and exact and may be adjusted to maintain its accuracy through a long period of time.

In order to keep such a substation operating in the best of condition, it should be given attention about once every two weeks. This period could be considerably lengthened without damage to the station or to its apparatus. It can easily be seen, then, that the ideal conditions for substation distribution would be a chain of these automatic stations all controlled by one man at a central switch-board in the power house. This man would know exactly everything that was happening in the entire system and consequently he could locate, and remedy, any trouble much more readily than is possible with the present system of disconnected substations depending entirely upon telephones to inform the dispatcher of trouble.



A new spirit of determination has pervaded the institution and it is the earnest conviction of every Rose student and every Rose booster that athletics at Rose, under the new system of coaching, will soon reach the high standards of former years and that Rose will once more take her place among the leaders in Indiana athletic circles.

Starting with a nucleus of eleven letter men, Coach Clark has built up a formidable team which, in the opening game, flashed a brilliant offense and a steady defense.

Fisher's kicking and passing, coupled with the brilliant plunging of Dorsey and the consistent running of Skeeters featured the offensive work of the "Fighting Engineers," while Hall, Mayrose and Kelly were towers of strength on the defense.

Three Rose players were injured during the fray, White sustaining a sprained ankle, Miller a twisted knee and Captain Forsythe a torn back muscle.

#### LINEUP AND SUMMARY

ROSE		OAKLAND CITY	
Mayrose	L.E.	Blunt	
Kelly	L.T.	Royalty	
Evinger	L.G.	Whitehead	
Schilt	C.	Frederick	
White	R.G.	Apostle	
Hall	R.T.	Leighty	
Wolf	R.E.	Parker	
Forsythe (Capt.)	Q.	Taylor	
Dorsey	L.H.	Rumble	
Fischer	R.H.	Johnson	
Miller	F.	Richardson	

Touchdowns—Dorsey 4, Fischer 3, Skeeters 2, Forsythe, Mayrose, Schroeder, Blunt 1.

Try for point—Mayrose 4, Fischer 3.

Referee, Brown; umpire, Eby; headlinesman, Daugherty.

#### 12—ROSE, EARLHAM—0

Playing hard football, Coach Clark's "Fighting Engineers" chalked up their second victory in as many starts against the heavy Earlham team before a large and enthusiastic crowd at the III League Park on the 13th of October. The final outcome was never in doubt though the Engineers delayed their scoring until the third period when Fischer crossed the line for a touchdown. Two perfect place kicks by Moorehead in the fourth quarter ran the score up

to its final resting place. Every member of the Engineer eleven played good football, but the honors of the game go to "Beppo" Skeeters for his brilliant running and his direction of the team play. Bob Hall, right guard, captured some of the glory, however, getting into every play and ranging over the field like a wild man, laying low everything that came in front of him.

For the visitors Greene, right tackle and Jones, right half played the best game, while Girton, giant full-back and Captain Emslie, a highly touted "speed artist" were stopped in their tracks by the fast-charging engineer forwards.

#### LINEUP AND SUMMARY

ROSE		EARLHAM	
Hauer	L.E.	Kenworthy	
Moorehead	L.T.	Greene	
Evinger	L.G.	Stafford	
Schilt	C.	Borden	
Hall	R.G.	Bowles	
Kelly	R.T.	Spaulding	
Wolf	R.E.	Morris	
Skeeters (Acting Capt.)	Q.	Emslie	
Dorsey	R.H.	Jones	
Fischer	L.H.	Stanley	
Schroeder	F.B.	Girton	

Substitutions—Rose: Rall, Watson, Forsythe, Anderson, Miller, Rickleman, Himmelbaur, Glenn.

Earlham—Wallace, Hinshaw, Shumaker, Bowles, Brown, Parker, Kenworthy.

Officials—Morrison, Kansas U., Umpire; Vandivier, Franklin, Referee; Wilder, Purdue, Head Linesman.

#### 0—ROSE, DePAUW—27

Giving twenty pounds to the man, Rose went down to defeat before the heavy DePauw team on October 20 at Greencastle. Although the Tiger offense piled up a 27 to 0 count on the lighter Rose eleven, the battle was hard fought at all times and nothing but praise was heard from spectators for the spirit and fight displayed by the Engineers.

The game was played before a record crowd and there were some five hundred Rose rooters in the stands cheering for the Terre Haute eleven.

The DePauw eleven, conquerers of I. U., averaging 185 pounds to the man, launched a terrific offense on the Engineer line and scored one touchdown in each of the four periods. The running of Krumheuer, Nesbit and Captain Clark, along with the plunging of Burton and the steady driving of the DePauw forwards was too much for the lighter team from Rose and, all in all, Coach Ashmore's team flashed a superior brand of football which will undoubtedly place them high up in the final standing of the Indiana Collegiate Association.



For the Engineers, Hall and Evinger in the line and Fischer and Dorsey in the backfield gained the honors. Fischer consistently outpunted Captain Clark of DePauw and an average of ten yards was gained on every exchange of kicks. Rose frequently resorted to the kicking game, often kicking on the first and second downs. One forward pass, Fischer to Forsythe, netted thirty yards and was the longest gain made by the Engineers.

## LINEUP AND SUMMARY

ROSE		DEPAUW
Hauer	L.E.	Irwin
Moorehead	L.T.	Davis
Evinger	L.G.	Fisher
Schilt	C.	Johnson
Hall	R.G.	Struck
Kelly	R.T.	Hunt
Wolf	R.E.	Powell
Forsythe (Capt.)	Q.	Clark (Capt.)
Dorsey	L.H.	Nesb't
Skeeters	R.H.	Krumheuer
Fischer	F.B.	Nesbit

Substitutions—Rose: Schroeder, Mayrose, Miller, Glenn, Hall, Watson, Anderson.

DePauw—Weaver, Vanderbark, Vance, Addison.

Officials—Referee, Townsend; Umpire, Buschman; Head Linesman, Neal.

## 0—ROSE, UNIVERSITY OF LOUISVILLE—13

Playing decidedly under form, Coach Clark's Engineers took a stinging 13-0 defeat at the hands of the Kentucky Cardinals at Louisville on October twenty-seventh. The Engineers could not get started until the last quarter, when, by a series of terrific line smashes by Schroeder, the ball was carried down the field. This rally, however, came too late in the game and the final whistle left the Cardinals' goal-line still uncrossed. The Rose men fought hard at all times, but an aerial attack staged by the Kentuckians could not be stopped, and two touch-downs resulted. The markers came in the first and third quarters, Osborne, giant end, being on the receiving end of the scoring pass in each instance.

For Rose, Schroeder, Hall and Mayrose played best, while for the Southerners, Kienzle, Kimble and Osborne were the shining lights. As usual the light Rose team was forced to give a weight handicap—this time amounting to fifteen pounds to the man.

The defeat was especially bitter in the face of the splendid reception tendered the Rose team and its followers by the Louisville Alumni Association—which includes some of the most prominent technical men in the South.

## LINEUP AND SUMMARY

ROSE		U. OF L.
Mayrose	L.E.	Hocker
Moorehead	L.T.	Daugherty
Evinger	L.G.	Candill
Schilt	C.	Hawes
Kelly	R.G.	Vandever (Capt.)
Hall	R.T.	Baden
Wolf	R.E.	Osborne
Forsythe (Capt.)	Q.	Kimble
Miller	L.H.	Kienzle
Dorsey	R.H.	Corso
Fischer	F.	Thompson

Substitutions: Rose—Skeeters for Miller, Hauer for Wolf, Anderson for Kelly, Wolf for Hauer, Watson for Mayrose, Schroeder for Dorsey, Miller for Skeeters.

Louisville—Simon for Thompson, Scheingold for Candill, Weidner for Hocker, Riddle for Baden.

Touchdowns—Osborne, 2. Goal kicked—Kimble, 1.

Officials—Referee, Doals; Umpire, Funk; Head Linesman, Kenzler.

## WUXTRY! WUXTRY!

## Rosie Makes a Death-Bed Statement

IN an interview with a Technic reporter recently, Rosie, the aged and pampered pet of the Engineers made the statement that she felt her end approaching. In effect, she said that she was sure she would be unable to weather the ravages of the approaching winter and that she would undoubtedly join her forefathers in the near future. The interview follows.

Our reporter discovered Rosie in a recumbent position in the court yard of the old barn on the Monday following the DePauw game. From all appearances, the trip and the parade, coupled with the exertion contingent upon her participation in the parade in Greencastle had been altogether too strenuous for the huge pachyderm. Rushing up to her with anxiety for her showing plainly in his face, our reporter asked her if there was anything he could do to alleviate her apparent distress.

"No, son," replied Rosie. "Just let me rest here. The boys meant well in taking me on that long trip, but I'm afraid it has done for me. I can feel in my wire mesh that I'm not long for this world."

Seizing his trusty pencil and notebook from his pocket, the reporter asked her if she had any statement to make for publication and Rosie rolled her uppermost lamp-socket before making reply.

Then—"Yes, I'll talk to you. Perhaps the boys would like to hear from me once before I pass on. There isn't very much that I can say, but such as it is, you may be able to make a story out of it.

"I've had an interesting life—full of excitement and good times, and I'm ready to go now—ready to leave the boys and the old school and go to my old friends in the happy stamping ground. It's been a long time since I came to life back on the old campus on Thirteenth Street, and many strange and beautiful things have happened to me since. I've participated in every parade of any consequence—been the leading light in them, in fact,—since 1915; I've been in the river once (I'll never forget that horrible night) and I've always been treated with the utmost respect by all the boys, the Freshmen especially. Oh, I've led a happy life.

"But I've seen about all there is to see, and done practically all there is to do, so I'm reconciled to the necessity of leaving. There's one thing, though that has worried me considerably since I've felt old age approaching. That is the question of what you boys will do without me. It is unthinkable that you should be without an elephant for a mascot, and I have been afraid that you would be unable to replace me. Just after the DePauw game, though, the solution to the problem struck me, and I've made all arrangements for you to have a new elephant. I hope you'll call her Rosie 'sub two' in my honor. You will, won't you?"

"Of course," the reporter promised.

Rosie heaved a sigh. "I'm glad that's arranged," she said.

"After the new Rosie is born," she said, "I hope you'll give me a decent burial. I'd hate to think of my old wire-mesh frame resting in Potter's field."

Then the reporter had an idea.

"How would this plan suit you, Rosie," he asked. "As soon as Rosie 'sub two' is born, we'll have a

(Continued on page 22)

## ALUMNI NOTES

A recent issue of the Varsity News of the University of Detroit contains an article on the activities of Professor Herman E. Mayrose, head of the department of drawing at the university. Professor Mayrose was graduated from the Rose Polytechnic in 1915 in the mechanical engineering course and went from here to the Ingersoll Milling Machine Company at Rockford, Illinois, in the position of draughtsman and tool designer.

Later he became an experimental engineer with the machine company and in 1921 became a member of the engineering faculty of the University of Detroit. The engineering school now numbers four hundred students and the high efficiency of its drawing department is due to the direction of Professor Mayrose whose past training has equipped him to give the department one of the best courses in drawing to be found in the country. Professor Mayrose has materially changed the course under his supervision and has instituted new methods that have found favor with both faculty and students. The engineering school has a cooperative course by which industrial concerns of Detroit give students practical experience in engineering.

Eichin, '23, who has been with the Delco organization has changed to General Motors Research Laboratories also in Dayton.

Streeter, '19, who has been in Indianapolis with Nordyke-Marmon Co. has taken a position with the Terre Haute Malleable Co.

E. F. Taggart, '22, having completed the Student's Training Course at the Schenectady works of the General Electric Company has been transferred to the Toledo office of the company where he is engaged in sales work.

John E. Hubbell, '98, Counsellor at Law and Solicitor of Patents has moved his New York office to Number 8, West Fortieth Street.

John B. Huntley, '03, has recently been chosen to succeed Davis Levi, '13, as Secretary of the Cincinnati Tech Club. Some real news of old Grads is expected from Mr. Huntley.

Tetzel, '23, was a visitor on October 30.

The spirit of '16 is manifesting its presence by the ticking of the Memorial clock recently restored to operation for the first time at the new school.

## Y. M. C. A.

NOBODY takes it for granted that we will have a good football team each year, because each student knows that unless he plays, attends games, parades, yells or boosts otherwise, the thing will fail completely. But, unfortunately, the majority of students do take it for granted that the "Y", the Technic, The Rifle Club or other non-athletic organizations will or will not amount to a great deal each year. None of these organizations want a pep meeting for their benefit—though they sometimes need it—but they do want individual support and cooperation, with sincere appreciation of service rendered. These, in lieu of mere tolerance or "taking for granted" will pep up each organization.

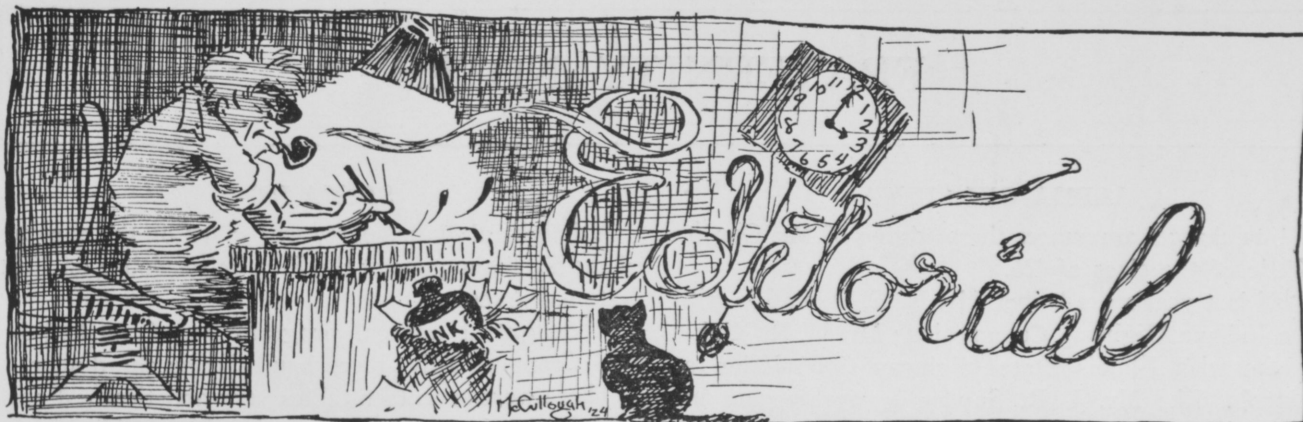
The Glee Club is taking a long vacation, but meanwhile, several students have lined up under the chairman of the "Y" Music Committee and are preparing to treat the boys to some first rate music this winter. Their aim is first to organize a quartette and to take others into their group as opportunity allows and then, as this activity begins to thrive, the next step will be a rejuvenation and reorganization of the Glee Club. Students who want to take part in this worthwhile undertaking should see Kelly of Greenleaf.

Let us not forget to pray as if everything depended on God, and then to work as if everything depended on us.

IT may seem unusual to mention the 1924 Geneva Conference at this time, because June is a long way off. It is hoped, however, to have several men lined up far in advance of the registration date, so that no last minute changes of summer programs will necessitate late choice of Rose delegates. As a means of learning how to do "Y" work most successfully and of becoming acquainted with the work of other schools, the Geneva Conference is without equal. One must attend this conference to realize the most from it; but delegates will be sent this year who can and will bring back a determination and the ability to put themselves whole-heartedly into the task of properly performing "Y" work. A sum has been set aside for payment of delegate expense, and all men who believe that they can go to the conference should see an officer of the Association soon.

Hot water heaters through which water from the engine will circulate are being constructed at McCook field, Dayton, Ohio, for use in airplanes used for altitude flying. Aviators flying at an altitude of 40,800 ft. recently suffered intensely from the cold, but with the use of these heaters altitude flying will be made less of a punishment.—Sanitary and Heating Engineering.





## THE BOOSTERS

**A**FTER several years of comparative neglect, Rose is again receiving her full due of attention from Terre Haute. The Rose Boosters Club, organized in the week preceding the DePauw game is a thing of which every member of our Student Body is justly proud.

Though the organization of the club was largely prompted by the sudden ascension of the Rose football team to heights of glory long unknown to us, that fact was only the inciting motive. The Rose Boosters Club is not merely an organization of men with the sole object of attending athletic contests for the purpose of cheering the boys on to conquest by their lusty shouts. The members of the club are serious business men who, though they relax upon occasion and let off steam when Forsythe makes a mean end run or Hall tears up a line, still have at heart the more serious interests of Rose.

Although the activities of our friends have been, so far as we could see, confined to the sponsoring of a deeper and better Old Rose Spirit with respect to our athletic interests, there is no doubt that the other, less apparent activities of the organization have done much to reestablish Rose in the good opinion of the citizens of Terre Haute.

There have been times—and rather recent—when many of our friends were inclined to doubt our motives. It was rather common, at one time, for people to feel—and say—that the Poly boys were actuated in certain moves by a disinclination to obey constituted authority. Although we, ourselves, knew at the time that such a sentiment was the result of a lack of complete knowledge of the circumstances, it is with a feeling of real pleasure and relief that we view this evidence of renewed good will on the part of the City.

### Ah, Perhaps

1st Convict—"When I get out of this place I'm going to have a hot time, aren't you?"

2nd Convict—"I don't know; I'm in for life."—Phoenix.

## TECH DANCE PLANS

Elsewhere in this issue there is a short account of the first Tech Dance, held at the Deming on October thirteenth. We hope that you all attended and that you all had a mighty good time.

It is our hope to be able to give a series of dances this year that will be real drawing cards. We hope that there will be no time when anyone will say, "Yes, I'm going to the Tech Dance. It probably won't be much good, but I feel that we ought to support all sorts of student activities." We want you to **want** to go. We want you to feel that to miss a Tech Dance would be to miss a **real** time, and, in order to create that feeling, the staff is making some rather elaborate plans.

It is not our desire to divulge those plans in full as yet, but we may say just a little about our general outline for the year. We want to give you the biggest variety of music possible, so we're going to have a different orchestra for every dance,—at least until the resources of Indiana are exhausted. For the next dance we can promise you some **HOT MUSIC**. We're not going to tell you the name of the orchestra just yet, but watch for the announcement soon.

Don't forget, then: The next Tech Dance falls on November twenty-fourth. Let's make it a real celebration of our crushing defeat of Normal.

To the Boosters Club may we say this: The Rose Student Body stands ready to give its fullest support to any movement or activity which the Club may sponsor. We fully appreciate what you are doing for our school and feel that anything we may be able to do to help you at any time will be but poor return for your help to us.

### Fools There Are

Hood: "I wonder if Doc. White meant anything by it."

Loser: "By what?"

Hood: "He advertised a lecture on 'Fools,' and when I bought a ticket, it said on it 'Admit One.'"



## FRATERNITY NOTES

### ALPHA CHI SIGMA

Iota chapter announces the pledging of Mr. Gordon Kittle of the class of '26.

Of last year's graduates, Mr. E. E. Dunlap is with the Indiana Highway Commission; Mr. H. R. Kinkle is the with Illinois State Highway Commission at Lincoln, Ill.; Mr. J. R. Snyder is working on his Master's degree at Indiana University. Mr. Snyder has been elected to the Acacia Fraternity and at present is living at the Acacia House in Bloomington. Mr. Erol L. Fox is also at Indiana working on his M. A. degree and has a part-time instructorship.

### P. I. E. S.

The fraternity held its third annual dinner dance at Turkey Run on October 27. At two o'clock the members and their lady friends motored to the Run and at six o'clock they enjoyed a chicken dinner consisting of four courses. Roses were given the guests as favors. Brother Hood acted as toastmaster for the occasion and called on Brothers Stock, Jean, Reynolds, Davis, and Balsley for toasts. At eight o'clock Cliff Lowe's orchestra furnished music for a program of dances. Brother Stock and his wife were honor guests for the evening.

Brother Miles Griffith, '23, who was operated on for appendicitis has entirely recovered and is now located at Springfield, Illinois, with the Illinois State Highway Commission.

Brothers C. A. Williams, '17, of St. Louis, Missouri, Thomas M. Evans, '17, of Fort Wayne, Indiana, and Bob. Failing, '22, were guests at the fraternity house, Sunday, October 28th.

Brother Leroy Wilson, '22, is now located in Terre Haute, as Traffic Manager for the Indiana Bell Telephone Co.

### A Psychological Question

"My darling," exclaimed Willard soulfully.

Without relaxing his hold on her waist, he drew his beloved Questia to him. Then, allowing his arm to slip up about her shoulders, with the other hand he tilted her chin upwards. Bending over and slightly turning his head towards her, and turning her head towards him, he passionately kissed the rosy lips four distinct times.

"Questia," he breathed, "I love you. You are the first girl I have ever kissed."

She nestled closer.

"Ah," she whispered, "is not instinct wonderful."

The Franklin,

### SIGMA NU

A delightful dinner party was given on the evening of the Earlham game at the Fraternity House on East National Avenue.

A delightful musical program was furnished by Bud Cromwell's five-piece band during the dinner.

There were seventeen tables very artistically decorated in the fraternity colors of gold and black. In the center of each table was a beautiful bouquet of roses.

The dinner consisted of four very delicious courses. The serving was done by three colored gentlemen who were exceptionally well trained along that line.

Several interesting talks were given by coach Heze Clark, Dr. John White, Brother Forsythe, and Brother Garrett.

Following the dinner the party went to the Technic Dance at the Deming.

Brothers Claude Gray, with the Pennsylvania Railroad and Leon Watson visited the chapter house during the week end of October twenty-sixth.

### THETA XI

Theta Xi has been busying itself with moving to the new home at 1201 South 7th Street, which was recently purchased by the chapter.

Brother Bennett of the Junior Class has returned to complete his course in Civil Engineering.

Alumni members who have visited Kappa recently are, Brothers Tetzal, Woolen, Eichen, Raeber, Weinhardt, McCombs, Penna, and Bixby.

### Applied Chemistry

$KI + 2S = KISS$ : It is a conjugate salt. The reaction takes place more rapidly in the absence of light, and a slight pressure is beneficial. It has a sweet taste and ethereal odor. When taken in small quantities it produces a blissful sensation; but in large quantities it has a nauseous effect. It is soluble in distilled moonlight, and is best precipitated in the absence of humanity. The presence of a catalytic agent, for example, Love, increases the speed and temperature of the reaction.

Rookie Sentry: "Who goes there?"

Timid Voice: "N-nobody."

Rookie Sentry (to himself): "That's funny. I'd have sworn I heard someone there."

Lampoon.

## CAMPUS NOTES

The first Tech Dance of the year was given on the night of October 13, after the Earlham game. The dance was held at the Deming ballroom with Cliff Lowe and his crew of hope inspirers furnishing the necessary stimulant in the form of his usual brand of peppy music. The affair was well attended and was enjoyed by everyone as was shown by the general atmosphere of familiarity and well-being which always makes any Rose gathering a success.

As the result of an article in one of the Terre Haute newspapers concerning the manner in which the annual pipe rush was conducted, President Wagner opened a discussion of the matter in regular assembly, and it was proposed that the small pipe rush be abolished. A committee composed of the presidents of the four classes, president of the Student Council and Coach Clark was appointed to find a fitting contest to be substituted in its place. Several events used in other schools were discussed, but it was thought best to originate some new contest that would be interesting and that could be enjoyed by everyone. No doubt every Rose man will mourn to some extent the loss of this time-honored event but we will agree that an affair which is not approved by the patrons of Rose is one that should be replaced by something more suitable.

There have been quite a few complaints among the upper classes concerning the inactivity of the Sophomore class in regard to paddling of the Frosh. It is said that the first year men are not being given the usual round of warmings dealt out by the Sophs in years gone by. We all know that this is true but it cannot justly be blamed upon the Sophs. The Freshmen, as we all know, are experiencing stricter rules than were laid down for any class now in school, and the surprising part of the matter is that they are, with very few exceptions obeying them in every way. Therefore the lack of paddling is due evidently to the obedience of the Frosh and not the "coldness" or inactivity of the Sophomores.

The news that quite a few sons of Rose have taken up golf may come as a disheartening blow to some of the former Rose men but nevertheless it is quite true. One is sure of finding some loyal Engineer properly fitted, putting in the afternoon on the municipal links chasing the golf. Some of the more earnest pursuers have even gone so far as to suggest that a course be constructed on the Institute campus, which is, according to followers of the sport, ideal for the location of such a course. But how would it look?

Athletic teams at Rose have long felt the need of blankets to be used by the members of the squads during the games when not in action. A movement and subscription toward the securing of these blankets was started by Coach Clark, which resulted in the purchase of handsome blankets of light gray material, bordered with old rose and with a large "R" of the same color in the center. The blankets certainly add much to the appearance of the team on the field.

They will also be used during the basketball and track season. The robes were given the initial try-out at the U. of L. game.

The Senior Mechanicals surprised the student body and awed the Freshmen by appearing at the Institute topped with white navy hats. Accompanying the debut of the hats was a peremptory notice signed by the black hand, which very emphatically informed the students and frosh that the wearing of said hats was strictly a Senior Mech. affair, and also that fitting punishment will be dealt out to anyone found wearing the distinguishing Senior Mech. markers.

"Rosie," the Institute's dear old elephant, signified her desire to attend the DePauw game in a manner known only to true sons of Rose. Her request was considered and she was graciously transported to the den of the Tigers aboard a fast motor truck.

"Rosie" encountered some difficulty at the entrance to the den but she finally succeeded in battling her way onto the field where she galloped playfully about between halves under the guidance of her dutiful care-takers. After leaving the field "Rosie's" capture was attempted by a litter of spotted kittens but she was loyally and successfully defended by her escorts.

"Rosie" is not in the best of health and it might also be stated that a wise move on the part of the Sophomores would be to restore her to her former condition of health and vigor.

Faster and faster moves this old world. We are living in an age of speed. It is commonly known that transportation facilities have been so improved that what was once a trip consuming months is now a matter of hours.

It is not only transportation of individuals that has been so greatly improved, however. According to the eminent Professor of Materials of Construction, it is now possible for whole cities to be moved hundreds of miles literally over night. Not that the Professor said so in so many words, but his meaning could not possibly be misconstrued, for, whereas we noticed on a certain Monday evening that New Orleans was located in southern Louisiana, it was no later than the following morning that we were informed by Professor Diefendorf that the aforementioned city was then situated in Missouri.

The world do move!

Several former Rose men have returned this year, after absences from school work, to complete their courses in engineering study. Those who have returned are: Al Standau, Senior; E. A. Dahlquist, Junior; H. M. Hesser, Junior; Z. Bennet, Junior; W. Weaver, Junior; J. Wilson, Freshman.

The Rea Scholarship awarded to Perry Wilson for scholastic standing in the Freshman class last year was reawarded to Ernest Pifer, '26. Wilson is not attending school this year as he has taken a position with the Commercial Solvents Corporation. He intends to return next year.



# TECHNICALITIES

## Here's Bill Again

Dearest Sweet Woman:

At six A. M. yesterday morning the alarm rudely hashed up my pieceful (?) slumber and, paragonically, I awoke to the fact that the day of combat between Dee Paw and Rose Polly had arrove.

After doing my daily dozen of chores by which I keep the landlady and other misc. wolves from the door, I cranked my "Ford of shiny tin," donned my verdent headgear and headed for Greencastle. Incidentally 4 other very fresh-men were safely (?) ensconced in my costly motor car (show me one that ain't) so you see our party was circulating on all six.

At purty near 2 (two) bells we were kicking up dust in Greencastle just in time to become an integral part of the mammoth Booster parade "imported at great expense" from Terry Hut. Say Woman! it looked like everybody wuz there—even the Elefunt—"Rosie" the venerable Polytechnic Pachyderm gleefully tossed her trunk aloft as the Freshmen sponsored her actions around the Greencastle "public square."

B'leeve me, them Greencastle ginks saw so much traffic that the police force, who is a very nice man, telephoned to Seelyville for reserves to handle the monstrous multitude.

At about 2:30 P. N. we parked ourselves on our allotted bleachers breathlessly waiting for the Fighting Engineers to tear up the turrible "Tigers." But when the Dee Paw gang stalked onto the field I sorta shivered and began to feel a funny sensation where my back bone is alleged to be. Take it from yours truly, them guys was BIG!! I saw right then that Sammy Forsythe's best bet was to run between the legs of the DeePaw ends if he hoped to see the Rose goal line. But size didn't terrorize our outfit by a durnsite—they knew they were gonna fight the hardest game that Rose had seen for a very extended while, but they got in and went! Play after play Battling Bob Hall hurled his huge frame against a line that looked capable of withstanding a cyclone—The whole Rose team, for the matter, was rarin' to go. Sammy Forsythe—Sammy the deboniar—Sammy the gay hopped hither and yon giving words of encouragement to his team, but every second he was alert and on the job.

The turrible tigers forced our men back across the line for 4 touchdowns but what was that? They were earning every one, because the Engineers sold all four at the price of a superhuman struggle.

I was doggone proud of the Team and they sure was a credits to Mr. Heze Clark's coachibility. The boys had the skill, the speed and plenty of wham, but the overwhelming weight of the DeePaw eleven

made the game just a question of time. The Tigers slowly battered down the lighter defense of the Engineers, but they didn't batter their spirits or their pep. The Rose team finished the game hitting like a Deussenberg and the Dee Paw gang will remember that game for some little time to come.

Well, after the game yu know, our unpassive resistance sorta riled a flock of these university shieks so they comes tearing across the gridiron bent on doing destruction to Rosie, our mammoth mascot. So, accordingly they started to assault the meager bodyguard of freshmen. But right then Jock Wilson made the name "Fighting Engineer" a painful reality for a brace of the slick haired boys when he clanked home a mean right and left that carried a jolt like the kick of an ostrich.

Immediately the attack took a negative reciprocal form often known as a retreat, so Rosie was trundled onto her truck with perfect safety.

We hung on the feed-bag at one of the hash-houses where a hot looking flock of flappers did the biscuit shooting, so we sheepishly admitted that Dee Paw had a few good points in that respect at least.

En Route home we passed Rosie on her truck, and, sorry to say, she looked anything but happy. Defeat had been too much for her. Rosie—our prized pachyderm dolefully draped her tail on top of the driver's cab and dejectedly drooped her trunk over the rear of the platform. For her and the rest of us it had been a slightly imperfect day, so with tears of chagrin, I drove in the garage and flopped the tonneau cushion instead of the accustomed hay.

Your loving sweetheart,

Bill.

### Sounds Bad

Masculine voice: "Please!"

"Aw, come on be a sport."

Feminine Voice: "Nope."

"Aw, please, just once."

"POSITIVELY NOT!"

"Aw, gee Mom, all the other fellows are going to wear longies 'n I always have to look like a kid."

Ex.

### Today's Proverb

If brevity is the soul of wit, there is nothing funny about the last morning class.

The Franklin.

"I made a political speech in Carnegie Hall last night!"

"Really! How'd you come out?"

"Limping, but wasting no time."

Lampoon.

### Easily Seen!

This is the story of Johnny McGuire. Who ran through the town with his trousers on fire. He went to the doctor's and fainted with fright. When the doctor told him that his end was in sight.

## TECHNICAL EXCHANGES

### LIQUID OXYGEN IS NEW HIGH EXPLOSIVE

The latest thing in blasting explosives, cartridges of lampblack soaked in liquid oxygen, was given a trial at a local quarry near Martinsburg, W. Va., recently. The tests were conducted by a representative of a German firm of manufacturers of liquid oxygen apparatus under an arrangement with the U. S. Bureau of Mines. The test was said to have been successful.

A natural gas well at Pelican Rapids, about 165 miles north of Edmonton, Alberta, became ignited recently and the engineers of the Canadian government were called upon to put it out. Due to the peculiar nature of the flame, the top of the pipe had to be cut off before the actual work of extinguishing the flames began. Steel-jacketed bullets shot from a Lee-Enfield rifle cut the top of the pipe off and permitted the flame to shoot straight up into the air, reaching a height of 75 ft. A 30-ft. section of smoke stack was then raised and one end placed over the flame, thus transferring the flame from the end of the pipe to the end of the stack. The other end was lowered close to the ground and held in that position until the gas pipe had cooled off. The lines holding the stack were then released and the stack dropped off the gas pipe, cutting off the supply of gas and extinguishing the flame.—Engineering and Mining Journal-Press.

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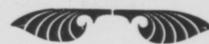
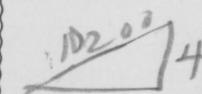
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## BOOK REVIEWS

### THE FUNDAMENTALS OF RADIO

By J. L. Thomas

This book is strongly recommended to those who would like to know the theory of radio transmission and reception. It is couched in terms which almost any amateur experimenter can understand readily and simply. The book opens with a discussion of the electrical characteristics of the apparatus used in radio work, giving an excellent foundation for the material which follows. Although the book deals with theory, it is written in a manner which, in addition to being interesting, is easy to connect with the practical side of the subject. It is published by D. Van Nostrand Co., New York, and is priced at \$1.50. Illustrated, pocket size, 260 pages, cloth-bound.

### ORGANIC CHEMICAL TRANSFORMATIONS

This pamphlet gives all the important reactions of Organic Chemistry. Starting with benzene in one case, and ethane in the other, all of the various reactions are carried through very thoroughly. It is an indispensable aid to a clear knowledge of Organic Chemistry. Price, twenty cents.

### AN OUTLINE OF QUALITATIVE ANALYSIS

This outline is an admirable little treatise. With such a scheme for working, it is comparatively simple to analyze an inorganic compound. Price, fifteen cents.

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This pamphlet is, in reality, a text-book, the only difference being that, instead of reading three hundred pages, the same knowledge may be acquired by a careful study of six pages. It is just what is needed to give a beginning student a clear knowledge of the reactions of chemistry. Price, twenty cents.

The above pamphlets are all published by D. Van Nostrand Co., New York.

### EVERYTHING IN INSULATION

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Wisconsin Engineer.

Eighteen months ago a comparatively uninhabited patch of land and today the most up-to-date and largest radium producing plant is the story of Katanga fields at Oolen, Belgium Congo. Tons of uranium ore are treated, but only one part of radioactive matter is found out of ten or twenty million parts treated. After forty operations a small amount of barium salts are produced which contain one part of radium in 125,000. Three or four grams of radium are produced monthly at the Katanga deposits.—Engineering and Mining Journal-Press.

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# TECH DANCE

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## Railroad Reconnaissance

The highest form of bumming consists of a luxurious ride between the backs of two seats or in the washroom of a car. The late Spike always travelled Pullman, disdaining the vulgar closeness of the day coach, but this practice should not be considered in an elementary work. Freight trains prove unsatisfactory unless your genial wit can secure you a berth in the caboose of a fast freight, the crews of which are fond of college men. We can give no formula for bumming a meal in the diner. A hint that ought to be appreciated is the chance of inducing the occupant of a drawing room to take you in. It may not be generally known, but it is true that a lower berth will accommodate more than one occupant.

Ex. 3. A berth is 6x3x4 with compartment underneath. How many can be fitted in?

Solution: Shove the two weakest under the berth. Above, there is 72 cu. ft. of space. This will hold 72x62.4 pounds of water. Multiplying by .9 gives the number of pounds of boy that it can hold. A slight lubrication factor may often have to be introduced.

## Concluding Remarks.

The object is to get there! It makes no difference how. We hope you will find the above elucidated principles of value and Don't get discouraged!

Rensselaer Tech.

## Working His Way

"Dearest," said the young efficiency engineer, as he opened the front door after saying goodbye to the Queen of the Fairies, "this door swings very stiffly. I am sure that with my engineering training, I can adjust it so that it will not be so hard to open and shut."

"You mind your own business and let that door alone, young feller," came father's voice from the remoter portions of the domicile, "Every time one of you fellers opens and shuts that door it pumps two buckets of cistern water."

Wisconsin Engineer.

E. W.—"I'm so mad at Tom I don't know what to do."

R. S.—"What about?"

E. W.—"He knows so many naughty songs."

R. S.—"Does he sing them to you?"

E. W.—"No, he only whistles the tunes!"

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clothes here.

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\$25 to \$75**

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Corduroy Pants**



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666 Wabash Avenue*

### HOW CORPORATIONS CARRY ON INDUSTRIAL RESEARCH

(Continued from page 4)

interests and gain other novel information. The latter method is, however, almost forced upon an industrial organization, for it is usually necessary to show an adequate connection between the problems under consideration and those of the operating department.

It behooves the head of the research organization to select one or more subjects of industrial significance as the objectives of his attack. A fairly good method of selection is to choose those subjects in which the plants are least able to account for their mischances. Upon meditation these subjects can be analyzed into aggregates of simpler problems, and each one of these examined with respect to the sufficiency of our knowledge. In this manner one or more subjects of fundamental character will be disclosed on which we signally lack adequate understanding.

Before undertaking experimentation it is well to search the available literature in order to determine whether this ignorance is personal in character or general. If the latter then a suitable general subject has been found which will repay the expense of experimental study. The preceding intellectual process has yielded in our specific case less than half a dozen fundamental problems deemed worthy of consideration. One of these is graphitization; i. e., the process by which cementite becomes iron and carbon. A vast amount has been written on the subject, and many experimenters have reached what they regard as final and conclusive results. You can find their opinions in the literature, but unfortunately, the experimental facts always point to new vagaries inconsistent with the opinions. For example: an able experimenter deduced a relation between silicon content and graphitizing rate, and expressed the matter in mathematical terms, but:—two metals of identical chemical composition do not usually graphitize at the same rate;

Hence, certain researchers spend their time in our laboratories causing metal to graphitize, and observing very carefully what happens under various conditions. In this way, little by little, we put together generalizations. First they cover only small fields, later we determine the metes and bounds of these fields, determine, perhaps, what takes place beyond them, and why differences exist. Perhaps a greater generalization is possible, and so our knowledge continually grows and finally becomes adequate to our needs.

We must not overlook another source of inspiration and knowledge. It may happen that an investigator in a kindred field publishes work which, though dealing with a different subject, has an apparent relation to our problems. Then it is well immediately to test out the bearing of his observations on our problems. If they apply, a vast stride forward is taken, if not, it is well to reserve the matter for further consideration before rejecting it altogether.

When a new tool becomes available, Radio Spectrometry, for instance, it is well to apply it to those problems which are stored away as so far unsolvable, to which it may apply. There is in the writer's mind a very recent instance where the publication of a new and unusual analytical method has thrown new light on a matter which had proved an absolute puzzle to all concerned for over a year.

Very frequently an industrial research laboratory  
(Continued on page 20)



## DAYLIGHT ILLUMINATION.

The angle of refraction being equal to the angle of incident, it is a simple matter to determine the correct angles to use in manufacturing glass which will give good illumination. But for proper industrial plant illumination, there is more to be considered than mere deflection of light. The direct beam of light must be eliminated in order to prevent sun glare, which is objectionable on account of its causing heavy shadows and strong contrasts which decrease the efficiency of employees and necessitate the use of shades which in turn reduce the light to such an extent that daylight illumination any distance from the light source is not sufficient. Therefore, in order to produce a glass which when used in the windows of industrial plants will produce as near to ideal illumination as possible, we must first eliminate the direct rays of the sun by deflecting the light to the ceiling and side walls which re-deflect it back to a distance 25 to 50 feet from the window throughout the entire working area. To accomplish this we have scientifically designed a type of glass which is named "Factrolite."

Factrolite consists of 30 ribs to the inch, running at right angles, forming 900 pyramidal prisms or 3,600 light deflecting surfaces which completely disintegrate the direct beam of light from the sun. Furthermore, the depressions in the surface of Factrolite are so slight that the accumulation of dirt and dust is minimized and can be perfectly cleaned with an ordinary dry scrubbing brush. Incidentally, the cleaning of windows is most important for keeping up production and increasing the efficiency of any industrial plant and should be given more consideration in plant management.

If you are interested in the distribution of light through Factrolite, we will send you a copy of Laboratory Report—"Factrolited."

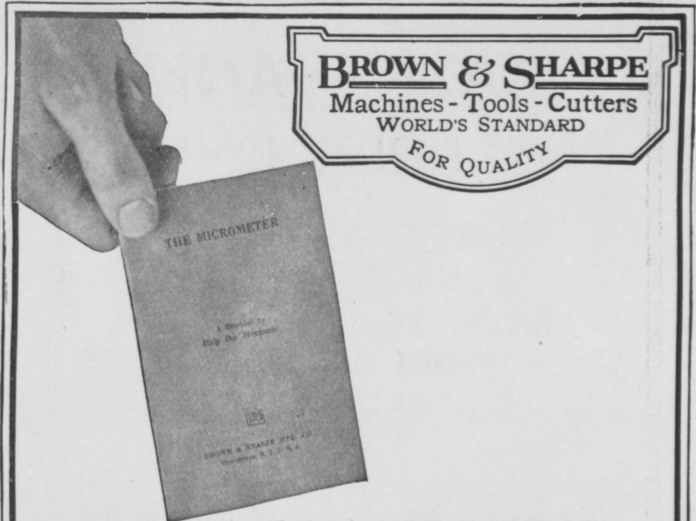
MISSISSIPPI WIRE GLASS CO.,

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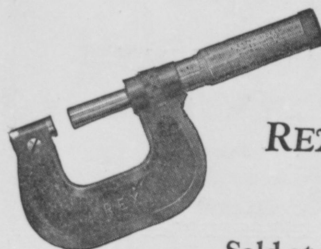


*Though written for the mechanic this booklet contains facts you should know*

**T**HIS little booklet is crammed full of information about the Micrometer—tells its history, how it is made, shows the principle on which it works, contains tables of decimal and millimeter equivalents of parts of an inch (tables you'll use every day), describes representative styles of micrometers, and concludes with a few Do's and Don't's which every mechanical man ought to know.

Perhaps you own a micrometer now. Perhaps you don't. But sooner or later a mechanical student is sure to get pretty well acquainted with a micrometer—the sooner the better. There's no better way to get acquainted than by sending for this booklet which we shall be glad to mail you on receipt of your name and address.

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**CHOCOLATES****are sold at the Poly  
DELIVERED FRESH EVERY DAY—****Snuggle Bars, 5c****Scrumptious, 5c****Croquettes, 5c.****Many other good ones**

(Continued from page 18)

has occasion to study very thoroughly the properties of its owner's products to demonstrate their superiority or to improve their quality. For this purpose one applies as many test procedures as possible to the product, and records its behavior. If alternative methods exist in manufacturing processes the effect of such changes is learned by studying the various products. Such information is extremely valuable in money.

This Department was once able to solve in two days the problem of how to make a material of certain characteristics required by the customer, merely because it had of record very complete information as to the effect of certain variations in heat treatment on one of its products. The solution opened up a previously non-existent line of business of fair magnitude, besides gaining the increased confidence of an important customer. Of such is the financial return of industrial research.

In these personal reminiscences the writer is tempted to proceed to far greater limits than those imposed by a Technic article. Two points should, however, be touched on before closing:

Firstly, it is very expensive to attempt to operate a research laboratory without cooperation with other agencies. In order of importance these auxiliary agencies are:

Familiarity with the literature in one's field, which also includes the consideration that if every one withheld all facts there would be no literature.

Contact and cooperation with others in similar lines of work; for example, competitors and customers, so far as that is ethically permissible, the various public and semi-public organizations such as the Bureau of Standards, the National Research Council, the various National Engineering Societies, etc.

Such cooperation in furthering research work in educational institutions as may be possible by suggesting subjects of investigation, furnishing material or help in the experimental program.

And lastly, as to research personnel. Most unfortunately the current conception of a research worker is that he is a genius who by a few well chosen and simple experiments solves the most baffling of problems in a manner capable of immediate industrial application, to the enormous financial benefit of his employer, and gets a large raise for doing so. In general, he is not a genius, but an individual so filled with curiosity that he can not rest till he knows as much as possible about any subject assigned him for study. He does his work by patient repetition of sometimes numberless, individually tedious experiments, often requiring patience, perseverance, long hours, and hard work.

His results must usually be introduced into practice with difficulty, as they probably involve the development of new methods and equipment, as well as overcoming the psychological inertia of operatives in a plant.

He always earns more than he gets, as do all employees, for the employer will naturally dispense with those on whom he makes no profit.

He works under pleasant surroundings, at intellectual pursuits, and in general, receives rather more for his services than is paid for similar work in other connections.

The joy of creation in its truest sense is his, for he manufactures that most valuable of all thing—**facts!**

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Eastman Kodaks, Cameras  
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No Home  
complete without  
a Telephone

## ROSIE'S DEATHBED STATEMENT

(Continued from page 7)

big celebration. At the first game after her birth, we'll trundle you both around the field with all honors and you can have your last taste of glory. Then, after the game, the Student Body will repair to the Rose campus, and there, under the spreading trees, we'll hold your funeral with a full corps of professional mourners and a military salute as your body is lowered into the earth. We'll make it a real affair with all the trimmings. How would you like that?"

Tears of pleasure dimmed Rosie's light globes as she replied, "Now wouldn't that be jest grand?"

The reaction seemed to be too much for our old mascot and she subsided to rest. Not another word could the reporter elicit, so, with eyes dim with sorrow he left her there and made a mad dash for Doc's Calculus class.

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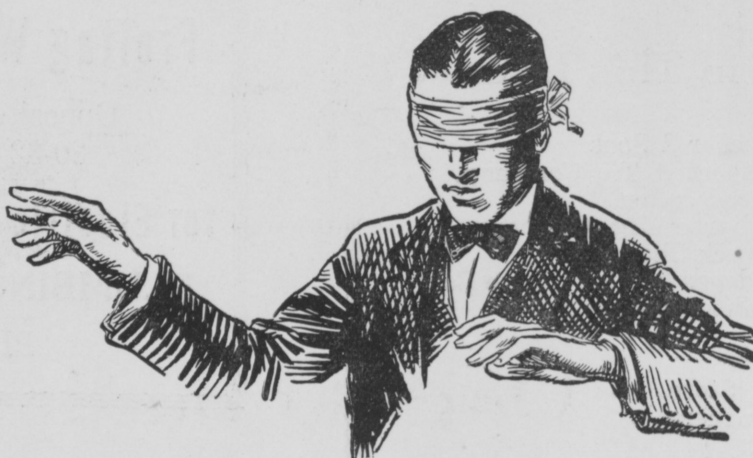
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 the Best Road Shows and Concerts

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## Most popular college sport

"As I look back on my college days," said the old grad, "it strikes me there were more men playing blind man's buff than all other games combined. I understand this is still the case.

"Get me straight. It was no child's play. What we were groping around for was pretty serious business—nothing less than a career.

"Too many men are in the dark as to what they will do after graduation. Either they neglect to specialize in anything, or hastily select a major which they afterwards regret.

"I know I would be considerably ahead in business if back at college I had sat down for a few hours' earnest thought to find out just what work I liked best—and then gone in for it heart and soul.

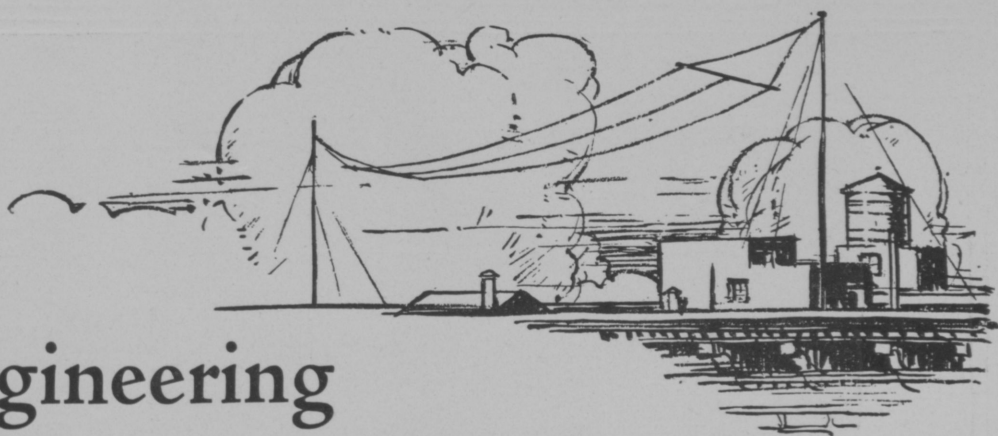
"Pick the thing that appeals to you, and don't let them tell you that particular line is overcrowded. Talk this over with graduates you know. Talk it over with your professors. Talk it over with the industrial representatives next Spring. Most of all, talk it over with yourself.

"The main thing is to get on the right track and to keep going. There's no fun in being 'It' in the game of life, with every change in fate ready to push you off an uncertain course."

*Published in  
the interest of Elec-  
trical Development by  
an Institution that will  
be helped by what-  
ever helps the  
Industry.*

## *Western Electric Company*

*Wherever people look to electricity for the  
comforts and conveniences of life today, the  
Western Electric Company offers a service as  
broad as the functions of electricity itself.*



# What Engineering Owes to the Imagination

From An Argument Over  
Watches Came KDKA



**B**ACK in the days when wireless was just beginning to spread, Frank Conrad (now Assistant Chief Engineer of the Westinghouse Electric & Manufacturing Company) and another official, happened to compare watches, to see if it was time to go back to work. Their watches differed.

Unable to convince his friend that his watch was right, Mr. Conrad suddenly remembered that the naval station at Arling-

ton, Va., had just inaugurated a system for sending out daily time signals by radio. Just the thing to prove his point!

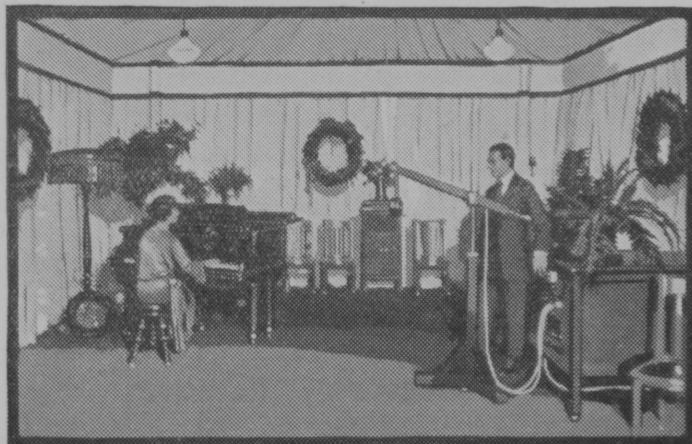
So he built a simple set of receiving apparatus, erected an aerial, and—you can imagine what happened! He was badly bitten by the radio bug. After proving to his satisfaction the accuracy of his watch, he started experimenting with the transmission of music by radio, with good success.

He began sending out phonograph music from his home, and attracted the attention of some of the big department stores, that had installed radio departments. They in turn, started advertising Mr. Conrad's "musical evenings."

Then, one day, upon arriving at his desk, he was summoned to the office of Harry Phillips Davis, Vice President of the company.

"Frank," said Mr. Davis, "I'm going to close your radio station." His attention had been attracted the night before to a simple note in a full-page advertisement, which read, "Mr. Conrad will send out phonograph music this evening."

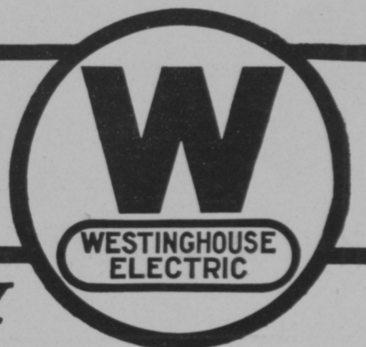
You know the rest. In November, 1920, "KDKA" was formally opened to send out election returns. It had received the first license issued by Uncle Sam. Today over 500 broadcasting stations entertain and educate millions of people each night, a wonderful result from so insignificant an argument as one over watches.



Broadcasting Studio at Station KDKA, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

# Westinghouse

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Architects

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